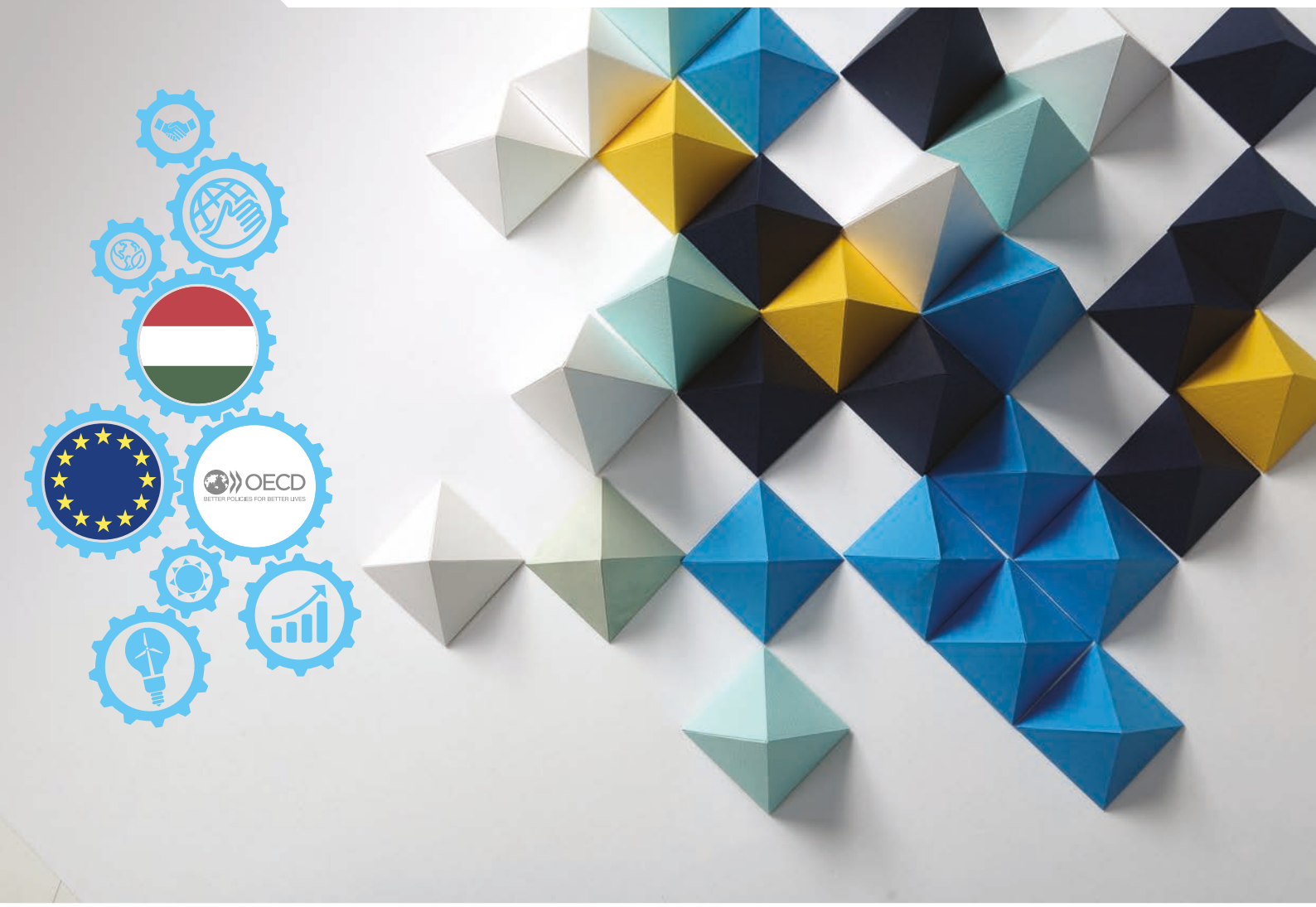
Higher Education

Supporting the Digital Transformation of Higher Education in Hungary



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Foreword

Digital technologies have transformed the way people interact, work and learn. In higher education, the digitalisation of teaching and learning, research and engagement has been underway for decades but with wide variation across and within higher education systems. The forced transition to fully online activities resulting from the coronavirus (COVID-19) pandemic has been particularly pronounced in higher education as most institutions across OECD countries closed their physical premises for prolonged periods of time. This switch to digital higher education revealed the ability of higher education institutions (HEIs) to ensure the continuity of their activities but also showed that much work remains to be done to ensure digital technologies are effectively used to promote quality, efficiency and equity in higher education.

The Hungarian government has placed special emphasis on the digitalisation of higher education in recent years, as outlined in its recent national strategies, namely in the Digital Education Strategy and the Shifting of Gears in Higher Education Mid-Term Policy Strategy (2016-2030). Both strategies have positioned digitalisation as a key driver to develop a modern, competitive and attractive higher education system. The Hungarian government has also invested in digital infrastructure, especially in expanding high-speed Internet access. In parallel, many HEIs, their staff and students, have increasingly adopted digital practices, with a significant increase in digital technology use resulting from the pandemic.

Despite these steps towards a digitalised higher education system, gaps in access to suitable digital infrastructure and equipment remain. Likewise, the use of digital technologies has not been accompanied by a systematic updating of pedagogical practices and institutional policies. The adoption of learning management systems is wide but not universal, and productive uses of digital technologies and the data they generate, such as learning analytics, are in their early stages. Higher education data systems, while they offer a detailed view of the system's features and outcomes, do not currently permit the monitoring of digitalisation in HEIs.

The project "Supporting the Digital Transformation of Higher Education in Hungary" offers an assessment of the current state of digitalisation in higher education in Hungary, identifies policy recommendations to strengthen the current policy framework supporting digitalisation and provides suggestions to help Hungarian authorities and stakeholders develop a monitoring framework and indicators to measure the digitalisation of the higher education system.

The analysis and recommendations contained in the report are based on analyses of the Hungarian higher education system, international examples of policies and practices supporting the development and measurement of digitalisation in higher education, and engagement with a wide range of stakeholders. Engagement included interviews and group discussions with higher education stakeholders and the implementation of an online stakeholder consultation survey to hear from higher education students, staff and leaders.

The project is a collaboration between the European Commission's Directorate-General for Structural Reform Support (DG REFORM), the Hungarian Ministry for Innovation and Technology and the OECD's Directorate for Education and Skills.

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Warm thanks go to many stakeholders in Hungary's government agencies, higher education institutions, and other organisations involved in activities relevant to the digitalisation of higher education, all of whom shared their time and insights during the project's interviews, roundtable discussions and international expert meeting on measuring digitalisation in higher education (a list of participating organisations is included in Annex A). The insights and opinions of Hungarian stakeholders provided the OECD team with important information that contributed to the analysis and recommendations contained in this report.

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This report was prepared by the OECD's Higher Education Policy team in the Directorate for Education and Skills with contributions from external experts (Jonathan Medow, Oliver Sheldrick, Roger Smyth and Carlos Teixeira). Patricia Mangeol was the project leader responsible for co-ordinating the review. The authors of this report were:

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While the report draws on data and analysis from the OECD, data and information provided by Hungarian stakeholders to the OECD team and a range of other published sources, any errors or misinterpretations remain the responsibility of the OECD team.

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Executive summary

Hungary's progress to date in digitalising higher education

The Hungarian higher education system experienced a sudden and massive shift to fully online learning in the spring of 2020 in the context of the coronavirus (COVID-19) pandemic. While the Hungarian government had announced ambitious goals to support the digitalisation of higher education before the onset of the pandemic, progress until then had been uneven and difficult to track. This is due, in part, to the variety of approaches that higher education institutions (HEIs) take to the digitalisation of their practices and to the lack of system-wide definitions and measures of digitalisation – a situation that Hungary has in common with many OECD countries.

Despite these limitations, Hungary has achieved some success in a number of dimensions relevant to the digitalisation of higher education:

- In terms of the digital readiness of its higher education system, Hungary has made progress through infrastructure investments, notably with respect to Internet connectivity and the development of data systems for higher education management.
- The Hungarian government has also set up a policy framework to encourage the digitalisation of higher education through the Digital Education Strategy (DES) and the Shifting of Gears in Higher Education Mid-Term Policy Strategy (Shifting of Gears), both involving action plans established for the period 2016-20. Together, these strategic documents identify current barriers to digitalisation and strengths on which to build, set ambitious objectives, and formulate a series of specific actions that could advance digitalisation.
- The take-up of digital practices in Hungarian higher education for teaching, learning and research has significantly increased as a result of the pandemic, with both students and teachers reporting widespread and frequent use of digital tools according to the project's survey. In addition, the pandemic has played an important role in making digitalisation a key priority of HEIs, most of which reported institution-wide initiatives to develop learning materials and facilitate remote teaching.

Areas for improvement include the need for broader take-up and more effective use of digital technologies among students and staff. This requires the provision of adequate support for both teachers and students to assist them in using technologies, as well as incentives that increase the motivation of higher education staff – especially teachers – to use technologies. Broader take-up can, in turn, improve the shares of expert users of digital technologies among students and staff. Broader take-up of digital technologies can also facilitate the development of approaches such as learning analytics, which take advantage of data generated by digital practices to identify students at risk of academic failure and connect them with proper supports, whether on line or in person. These improvements require joint efforts by public authorities and HEIs, including higher education students, staff and leaders.

Policies to further support Hungary's digitalisation of higher education

The government's DES and Shifting of Gears Strategy established valuable objectives and actions to contribute to the digitalisation of the national higher education system. However, these strategies need to be complemented in two main ways. First, policy changes need to remove barriers to digitalisation in higher education. They also need to incentivise the substantial change in institutional and individual practices required for digital practices to take root in the Hungarian higher education system and contribute to enhanced higher education performance. Second, a framework to measure the digitalisation of higher education needs to be established to monitor progress and identify areas for improvement and investment.

Based on an analysis of current policies in Hungary and drawing from international experience, this report provides 12 recommendations across 4 areas that the Hungarian government, in close collaboration with HEIs, may consider. These areas can be regarded as phases in implementing a comprehensive higher education digitalisation strategy. The recommendations are outlined in the table below.

Setting the direction: The policy framework This means understanding the needs and experiences of higher education staff and students, defining and communicating the strategy for digitalisation and developing a plan that will deliver on the strategy. It involves including the costs of digitalisation in budgets and ensuring there are tools for measuring digitalisation and monitoring success in achieving the goals and objectives of the strategy.	
Recommendation 1	Create mechanisms to build (and regularly revisit) an understanding of higher education staff and students' digital practices, needs and attitudes to inform policy
Recommendation 2	Review the regulatory and funding framework for digitalisation in higher education to encourage institutional strategies that support the take-up of digital practices among students and staff
Recommendation 3	Encourage institutions to draw on best practices, from Hungary and other countries, in planning for and rolling out the digitalisation of higher education
Recommendation 4	Design a plan for collecting and analysing data on digitalisation in teaching and learning
Building the foundation: Digital infrastructure and data systems This means providing and funding the infrastructure necessary to implement the strategy, infrastructure that allows for data to be collected, housed, managed and analysed. It includes, but goes beyond, digital infrastructure. It means ensuring there is a reliable network and the availability of skilled people to manage and maintain the infrastructure. It includes creating policies and standards, such as the requirement for interoperability of systems, uniform data quality processes and standards, and minimum hardware standards. To get value from the additional data generated by a digitalised higher education system implies ensuring that people are employed to analyse the data and communicate the analysis findings.	
Recommendation 5	Reconsider the centralised approach to ICT systems procurement and collaboratively develop with HEIs criteria to support well-informed digital infrastructure strategies and investments
Recommendation 6	Consider targeted funding to expand access to hardware and software and increase the capacity of HEIs to provide support to students and staff
Recommendation 7	Create data policies and standards
Developing the processes: Teaching, research and engagement Effective digitalisation implies changes in teaching, learning, research and engagement. This requires changes in both incentives and capabilities. Incentive systems – the funding of institutions and the remuneration and career advancement of individuals – need to be adapted to reflect the new opportunities, and the new tasks, created by digitalisation. Increasing capabilities requires a commitment to the training and support of staff.	
Recommendation 8	Strengthen supports for higher education staff to expand the adoption of digitally enhanced, student-centred pedagogies
Recommendation 9	Revise the employment framework for Hungarian higher education staff to reward quality digital teaching and identify and disseminate examples of excellent teaching
Recommendation 10	Explore the potential of using learner analytics to lift learner success
Delivering benefits to users: Students, graduates and employers A digitalisation approach needs to ensure that actors within the higher education system – students, research consumers, employers – benefit from digitalisation. For students, this means designing academic programmes that recognise learning outcomes from digital (as well as traditional) formats. It includes enabling students to have sufficient access to the information they need to support their learning. It means allowing them to study in flexible modes and ensuring that they graduate with the digital skills that employers want and expect of graduates in the 21st century. It also includes providing support for student learning and ensuring that delivery is designed to be interesting and enjoyable, as well as instructive.	
Recommendation 11	Engage in analysis and research into problems of access to higher education among some groups and develop interventions to enhance equity of access

Recommendation 12	Analyse patterns of students' take-up of and achievement in online learning

Measuring the digitalisation of Hungary's higher education system going forward

OECD countries face difficulties in measuring how much digitalisation is taking place in their higher education systems, the ways digitalisation is unfolding and changing the practices of their staff and students, and the impact of digitalisation on higher education performance. The lack of system-level data on the digitalisation of higher education observed in Hungary and other OECD countries stems from several factors. These include, in particular: 1) the low priority – until recently – placed by government on monitoring digitalisation in higher education; 2) the difficulty of defining digital higher education given the wide diversity of practices referred to by commonly used terms, such as "e-learning" or "digitally enhanced teaching and learning", and the increasingly blurred line between different degrees of digitalisation as the use of at least *some* digital technologies for *some* higher education activities is now widespread; and 3) the need for adequate, and potentially costly, data collection tools to help understand the practices and attitudes to technology of higher education students and staff. At the same time, the digitalisation of higher education involves new measurement opportunities: combined with student outcomes data, the rich data generated by learning management systems (LMS) and virtual learning environments (VLE) can generate rich insights into student engagement in learning and can be used to support student success.

Three key methods for measuring the digitalisation of higher education used internationally include national administrative data collection; surveys of higher education students and staff; and learning analytics. Each of these methods involves benefits and drawbacks for monitoring the digitalisation of higher education, discussed in the report. Given their respective benefits, however, these three methods can be used in a complementary manner to generate a nuanced understanding of the level, nature and impact of digitalisation in higher education.

Hungary has a comprehensive administrative data system in higher education. However, administrative data collection on the digitalisation of higher education is limited, and evidence on the digitalisation of higher education is primarily collected through surveys. In 2020, a student survey and two ad hoc surveys of institutional leaders were conducted to support higher education policy making and institutional planning and management. While the use of LMS/VLE has substantially increased since the start of the pandemic, learning analytics does not yet seem to be widespread in Hungarian higher education. Opportunities therefore exist for Hungary to further improve the collection – and use – of data to support the monitoring and improvement of digitalisation in higher education.

Drawing from comparative analysis regarding the implementation of these data collection methods and a review of higher education data systems in Hungary, the report provides suggestions to support Hungarian authorities in moving forward with measuring digitalisation in their system. These suggestions include:

- Analytical steps to take prior to new data collection, with particular emphasis on defining the purpose of new data collection and enhancing the use of current and future data collected.
- The recommendation to develop a descriptive, qualitative summary of the state of alignment between the Hungarian higher education policy framework and the needs of a digital higher education system.
- A list of 30 potential digitalisation indicators generating quantitative information. These include 6 indicators of digital readiness, 14 indicators of digital practices, and 10 indicators of digital performance.

The list of potential indicators for measuring the digitalisation of Hungarian higher education is deliberately extensive. It aims to be a starting point as Hungary's public authorities and higher education stakeholders collaborate in the development of a system to monitor the digital transformation of their nation's higher education system.

1 Introduction

This project, a collaboration between the European Commission's Directorate-General for Structural Reform Support, the Hungarian Ministry for Innovation and Technology and the OECD's Higher Education Policy team, reviews the current policy framework supporting the digitalisation of higher education in Hungary.

This chapter outlines the project's working methods and scope. It introduces the key concepts used to guide the analysis: digital readiness, digital practices and digital performance. It then presents the analytical approach and structure of the report.

This project, a collaboration between the European Commission's Directorate-General for Structural Reform Support (DG REFORM), the Hungarian Ministry for Innovation and Technology (MIT) and the OECD's Higher Education Policy team, reviews the current policy framework supporting the digitalisation of higher education in Hungary. Further, the report provides policy recommendations to expand and improve the digitalisation of higher education in Hungary and advice on potential data sources and indicators to guide the development of a national digitalisation monitoring framework. The project began in July 2020 and will conclude with the release of an official OECD publication in November 2021.

1.1. Working methods

The European Commission-Hungary-OECD project involved desk research, an online stakeholder consultation survey and a series of stakeholder meetings to seek input on the current state of digitalisation in Hungarian higher education and on policies with the potential to expand the quantity and quality of digital higher education in Hungary.

Between September 2020 and July 2021, several activities were organised by the OECD and the Hungarian MIT, with the participation as observer of the European Commission's DG REFORM. These included:

- an introductory webinar with approximately eighty participants from across the Hungarian higher education system
- interviews with twenty-nine key stakeholders, including higher education institution (HEI) leaders, staff and students, as well as business, innovation and research leaders
- roundtable discussions with thirty-six representatives of higher education institutions, eliciting the experiences and suggestions students, academic and professional staff and institutional leaders
- an international expert meeting on the measurement of digitalisation in higher education gathering approximately fifty-five participants and including presentations by experts from Hungary Germany, Ireland, and the Netherlands.

The report relies on a range of information sources, including published research and analysis relevant to Hungarian higher education, policy documents made available by national authorities, and information provided by stakeholders.

The OECD team also developed a web-based stakeholder consultation survey to seek views learners, instructors, and administrators about their experiences of digitalisation, and their views for priority areas of policy development. More than 3 000 higher education and staff participated in the survey, which generated more than 1 000 completed responses used for the analysis. Key results are provided in Annex B to this report.

1.2. Scope

The digital transformation of higher education is a large and complex area of analysis with implications for the full range of operations in HEIs. Brown, Reinitz and Wetze (2020[1]) define it as:

> *a series of deep and co-ordinated culture, workforce, and technology shifts that enable new educational and operating models and transform an institution's business model, strategic directions and value.*

The project acknowledges the broad scope of activities that are affected by the "digital transformation of higher education", a term used interchangeably in the report with the "digitalisation of higher education" and "digital higher education". The project focuses on the three following areas of analysis:

1. **Data infrastructure and data systems**: Digital infrastructure refers to the array of digital technologies, including Internet connectivity, hardware and software, that can be used for teaching, research and learning, administrative and management processes, and services to the higher education community. Data systems broadly refer to the array of tools and mechanisms that allow for collecting, analysing, sharing, and protecting data in a digital environment.
2. **Teaching, research and engagement**: This includes methods for teaching, assessment and credentialing, research implementation and dissemination, and engagement of the wider community. It also covers issues related to the training of higher education staff, the structure and role of the academic workforce and the ecosystem of supports supporting academic staff. While the role of digitalisation in research and engagement is referenced in the project, its main focus is on teaching.
3. **Students' experience and learning**: This refers to student preferences and behaviours, the equity in access to learning, student retention and success and learning outputs and outcomes of digital higher education (e.g. higher education attainment, impact of learning in a digital environment on knowledge and skills of graduates).

With the above scope in mind, the project examines the following questions:

- What is the current state of digitalisation in Hungarian higher education? (Chapter 2)
- What types of public policies and institutional strategies may be developed to promote Hungarian higher education's digital readiness and performance? (Chapter 3)
- What indicators may be helpful to measure the digital readiness of higher education in Hungary, digital practices of students and staff, and the performance of digital higher education? (Chapter 4)

1.3. Key concepts

The report discusses a wide array of digital technologies and data used in higher education, recognising that these are highly diverse and constantly shifting and expanding. It also uses three concepts to analyse the digitalisation of higher education: digital readiness, practices and performance, discussed in the sections that follow.

Digital technologies and data used in higher education

Higher education stakeholders – institutional leaders, staff and students – use a variety of digital technologies in their daily tasks. These include broadly used tools that are not specific to the field of education, such as wireless networks and cloud computing, hardware such as mobile devices and software such as communication tools. Emerging technologies, such as artificial intelligence, blockchain, robotics and data analytics, are also used in various higher education systems. These technologies continuously advance and expand in terms of their processing power, diversity of attributes, and use cases. Taken together, they constitute a digital technology ecosystem, which is, potentially, "much stronger and functional than its individual components because they interoperate with and complement one another, opening up new possibilities" (OECD, 2019, p. 19[2]).

Technologies that are specific to education and are well developed in higher education systems include, in particular, learning management systems (LMS) or virtual learning environments (VLE). LMS and VLE are web-based software applications that integrate learning and teaching activities as well as course administration tools (Ifenthaler, 2012[3]). They can be used to manage the teaching, learning, assessment and learning support for each course. They allow different types of information (presentations, text, video, etc.) to be organised and stored for access by students at their convenience. They provide chat rooms for peer-to-peer and instructor-student communications. They have functionalities that allows for class and user management (e.g. syllabus, managing student activities, office hours) (Ifenthaler, 2021[4]).

Alongside the development of digital tools, the production of data has grown exponentially in recent decades due to enhanced collection and storage capacity. That applies in all industries; higher education is no exception. The availability, analysis and dissemination of data are important elements of the digitalisation of economies and societies. Data, in itself, produces, or has the potential to produce, value for all stakeholders, including policy makers. How data is collected, analysed and used is an important element in analysing the digitalisation of all sectors, including higher education. As discussed later in this report, a large amount of data can be collected and used to support student learning in higher education.

Digital readiness, practices and performance

This project examines the digital transformation in higher education in Hungary by exploring three key dimensions of the digital transformation in higher education: digital *readiness*, digital *practices* and digital *performance*. Digital readiness is a prerequisite for digitalisation, but it is only one component of the process of digitalising higher education. It needs to be complemented by actual take-up of digital technologies (digital practices) by system and institutional leaders and by students and staff. Furthermore, attention needs to be paid to the impacts of digitalisation on the quality, efficiency and equity in higher education (digital performance). These concepts and their relationship are outlined below.

Digital readiness in higher education is a measure of:

1. the level of access and suitability of digital technologies and content available to higher education leaders, managers and administrators (in government and HEIs), to academic staff and students
2. public policies that set priorities and incentives for HEIs to embed digital practices across their core activities, and institutional and government strategies that strengthen the capability and motivation of academic staff, administrators and students to adopt digital practices.

Reaching a certain level of digital readiness in higher education – which requires large-scale access to suitable digital technologies and policies and incentives that support the use of technologies – is an important achievement in itself. However, it does not translate automatically into greater use of digital technologies, the adoption of digital practices by higher education students and staff, or the improved performance of HEIs and systems. Digital readiness also requires openness to digital innovation.

Digital practices refer to the way higher education staff (in leadership, academic and non-academic roles) and students use digital technologies in their activities and how they adapt their practices as a result of the use of digital technologies. This could include, for example, how a university teacher may re-design the components of a course, the way a course is organised or how assessments are conducted when delivering a course fully on line or in a blended format. It could also include how students may organise their study time or interact with professors and peers to obtain support in their learning. It includes the provision of learning resources for students and supports, such as career advice. Furthermore, it includes how government uses digitalisation in its management of the system – for instance, in its measurement of system performance or its resourcing policy.

Digital higher education practices considered in this project are to be understood broadly. Therefore, the terms “online learning” or “digitally-enhanced teaching and learning” are used interchangeably. These terms are also equivalent to what the European Association for Quality Assurance in Education (ENQA) refers to as “e-learning”. According to ENQA, e-learning includes fully online courses and programmes, involving both synchronous and asynchronous teaching and learning, hybrid/blended learning (designed to combine online and in-person teaching in any combination), open education resources (OER), as well as massive open online courses (MOOCs) (Huertas et al., 2018[5]).

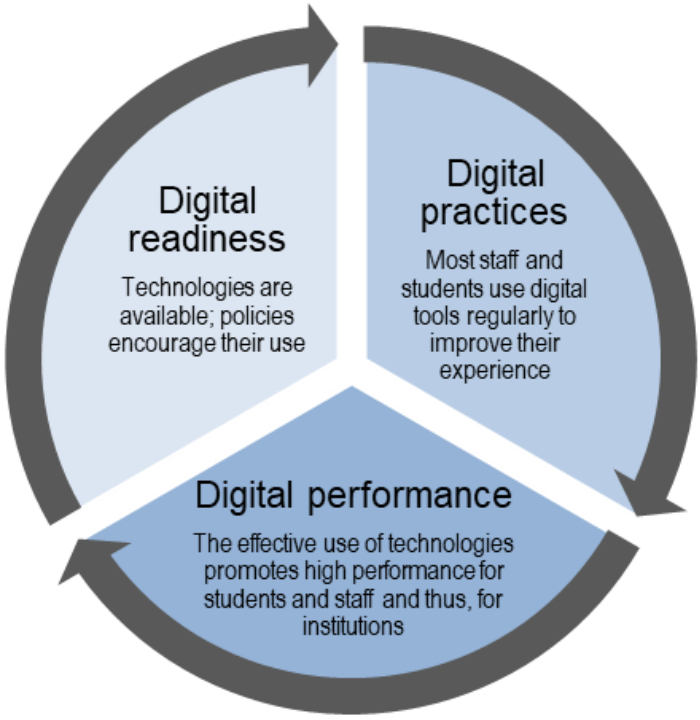
The performance of higher education is typically assessed alongside several dimensions (OECD, 2019[6]; OECD, 2020[7]). These are relevant when considering the performance of digitally provided higher education:

1. **Efficiency**: The extent to which higher education systems/institutions maximise the use of resources available to them.
2. **Quality**: The extent to which higher education systems/institutions deliver highly valued teaching and research outcomes.
3. **Access and equity**: The extent to which all qualified individuals can participate in, complete and benefit from higher education.

Link between digital readiness, practices and performance

In principle, digitally ready higher education systems and institutions where staff and students have adopted effective digital practices have the potential to improve performance in teaching and learning, research and engagement with the wider society. Figure 1.1 shows the conceptual relationships between digital readiness, digital practices and digital performance.

Figure 1.1. Linking digital readiness, practices and performance



In practice, the link between digital readiness, practices and performance is influenced by the higher education settings in which digital technologies are implemented and the ways in which they are implemented. Higher education settings include, for instance, the level and field of study, orientation and selectivity of the institution, as well as the demographic and academic profile of students. The ways in which digital technologies are implemented include, for instance, the balance between online and in-person components in a course or programme and whether digital technologies are used for some or all teaching and learning activities (e.g. lectures, small group classes, self-directed learning, assessment). It also involves the extent to which institutions and staff have carefully planned out and designed digitally-enhanced courses and programmes. This process was typically not possible under the emergency circumstances of the switch to online learning during the coronavirus (COVID-19) pandemic.

A growing body of research explores the impact of digital higher education in a variety of real-life contexts, offering insights into the types of opportunities and risks associated with digitalisation (see Box 2.1 in Chapter 2).

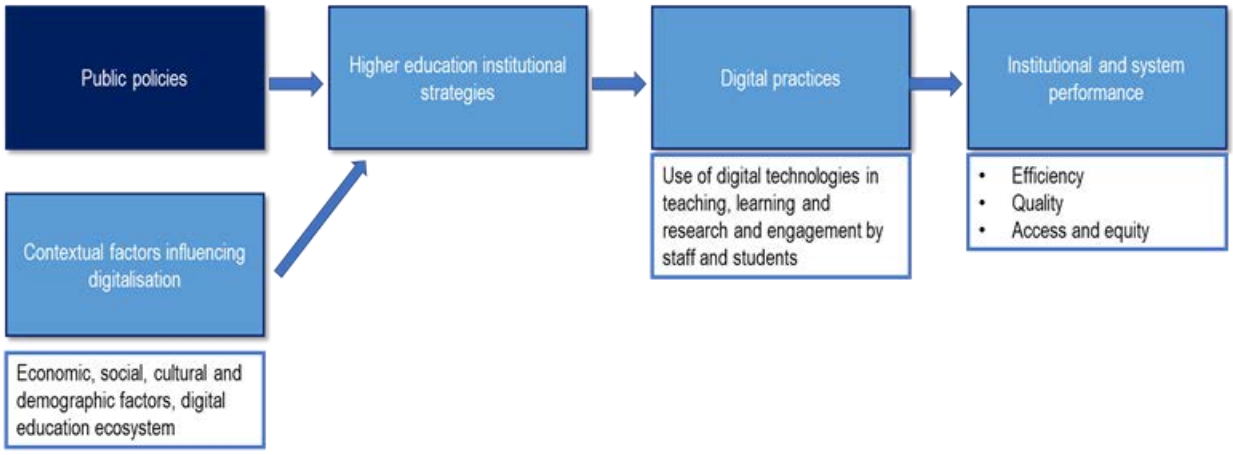
1.4. Analytical approach

This section provides a framework outlining the various factors that shape digital readiness, digital practices and digital performance in higher education. In line with the project's goals to provide policy-level recommendations, this report focuses particularly on the role of public policies in shaping the take-up of digital technologies by higher education students and staff and how digitalisation may support improved performance in higher education. While other factors are not explored in full detail in this report – whether broader economic factors (on this topic, see OECD (2021[8])) or specific institutional-level strategies – they are important to bear in mind as factors shaping digitalisation in higher education.

Factors influencing digitalisation in higher education

Many factors influence the level of digital readiness of higher education, among them the digital practices of staff and students, and the performance of digital higher education. These factors can be categorised as follows, with relationships between them illustrated in Figure 1.2.

Figure 1.2. What shapes digital readiness, practices and performance in higher education?



Contextual factors influence governments' public policy choices with respect to digitalisation in higher education, institutional strategies and the behaviours of key actors, such as higher education students and staff. These include broad economic, social, cultural and demographic factors as well as the existence and nature of a digital education ecosystem, which may include private sector companies, non-governmental organisations and other bodies with a role in digital learning.

Public policies create a framework that can enable, or impede, the digitalisation of higher education. Some of these policies are outside the scope of higher education, for instance, national infrastructure policies. Higher education policies are diverse, using the full suite of policy levers available to governments – from the creation of national targets, strategies and bodies to support digitalisation in higher education, to regulation (e.g. on quality or data protection), funding and information provided to all stakeholders about the options available to them to benefit from a digitalised higher education system.

Within the national framework, the **strategies of higher education institutions** – including institution-wide policies, supports and resources devoted to digitalising higher education – play an essential role in facilitating or impeding the diffusion of digital practices by higher education staff and students.

This project provides national-level recommendations and thus focuses primarily on public policies that the Government of Hungary may consider. At the same time, it recognises the critical importance of institutional strategies for digitalisation, for which public policies can provide a basis.

Public policies and institutional strategies to support the digitalisation of higher education

Public policies play a key role in providing support and incentives for HEIs to scale up and improve their digital practices. Institutional strategies, in turn, are critical in facilitating or hindering the adoption of digital practices among staff and students.

Table 1.1 presents the range of policy levers and institutional practices that may be used to improve digital readiness and the impact of digitalisation on higher education performance. These policies and strategies will be discussed in the Hungarian context in Chapters 2 and 3 of the report.

Table 1.1. Public policies and institutional strategies to support the digital transformation of higher education

	Government policies	Institutional strategies
National framework for digitalisation in higher education	• National strategies and objectives for the digitalisation of higher education • Publicly supported structure responsible to support and monitor the digitalisation of higher education, conduct stakeholder engagement, develop partnerships with private sector companies and conduct research into digital technologies for higher education • Level of funding dedicated to the digital transformation of higher education and allocation mechanisms (e.g. regular or targeted funding, performance funding, etc.) to incentivise digital readiness of HEIs, digital practices, and the efficiency, quality and equity of digital higher education • National collection and sharing of data on the digital readiness of higher education, the adoption of digital practices and the performance of digital higher education • Information to all HEIs, staff and students about government supports for digital equipment, teaching, research and engagement and learning in a digital environment	• Institutional strategic plan that supports the digital transformation of the institutions • Institutional governance structure to ensure the monitoring of digitalisation (e.g. role or office at senior management level dedicated to digitalisation)
Infrastructure and systems	• Publicly supported structure responsible for managing digital infrastructure and developing purchasing and procurement mechanisms, developing or adopting interoperability and data protection standards and fostering their use among HEIs, etc. • Level of higher education funding dedicated to digital infrastructure and data systems, and allocation mechanisms to incentivise cost-effective, quality and accessible infrastructure	• Institutional governance structure to manage the deployment of different technologies and avoid fragmentation, and responsible for data collection and dissemination, including on technology use by staff and students and how these data could support improving teaching and learning • Share of institutional budget allocated to accessing and/or developing digital solutions for teaching, research, and engagement as well as institutional administration/management
Teaching, research and engagement	• National platform providing access to content including micro-credentials, with the capacity to establish partnerships with education technology companies, and providing channels to collect data on staff and student use of digital technologies and convey to HEI leadership and government	• Institutional body responsible for providing support to academic staff, e.g. course design and structure, use of technologies, use of data analytics, etc.

	Government policies	Institutional strategies
	• Targeted financial supports supporting HEI staff's digital competencies, access to digital technologies and access to supports • Qualification frameworks, accreditation, degree authorisation and quality assurance rules facilitating the definition and recognition of quality online teaching • Where applicable, national policies regarding academic staff career/promotion and workload • National regulation regarding intellectual property rights and open science	• Share of institutional budget allocated to improving the digital competencies of academic staff, promoting access to technologies and the provision of supports • Institutional policies regarding pay, career/promotion and workload of academic staff promoting the adoption of digital practices by teachers and researchers • Institutional policies regarding intellectual property rights and open science (development and distribution of digital content)
Students' experience and learning	• National platform providing access to content including micro-credentials, with the capacity to establish partnerships with education technology companies, and providing channels to collect data on staff and student use of digital technologies and convey to HEI leadership and government • Targeted financial supports supporting students' digital competencies, access to digital technologies and access to supports • Qualification frameworks identifying successful learning outcomes in all formats (including o nline) and enabling students to signal skills even when acquired in fully online environments • Rules regarding credit transfer, recognition of prior learning among national institutions and internationally	• Institutional body supporting student access, engagement, success in a digital environment, including supports for conducting key curricular and extra-curricular activities in a digital environment (e.g. work-based learning, student peer mentoring, career advice, health supports, etc.) • Share of institutional budget allocated to improving the digital competencies of students, promoting access to technologies and the provision of supports (financial and non-financial) to support effective participation in digital learning • Institutional policies regarding credit transfer, recognition of prior learning and student mobility

Measuring the digitalisation of higher education at the system level

Measuring the impact of digital technologies on economies and societies poses significant challenges as it is difficult to delineate what phenomena can be considered results of a digitalisation process and what should not be considered as such. A 2020 OECD report for the G20 Digital Economy Task Force, *Roadmap toward a Common Framework for Measuring the Digital Economy*, proposes a common definition and a tiered framework to assist in developing comparable measures of the digital economy. It broadly defines the digital economy as:

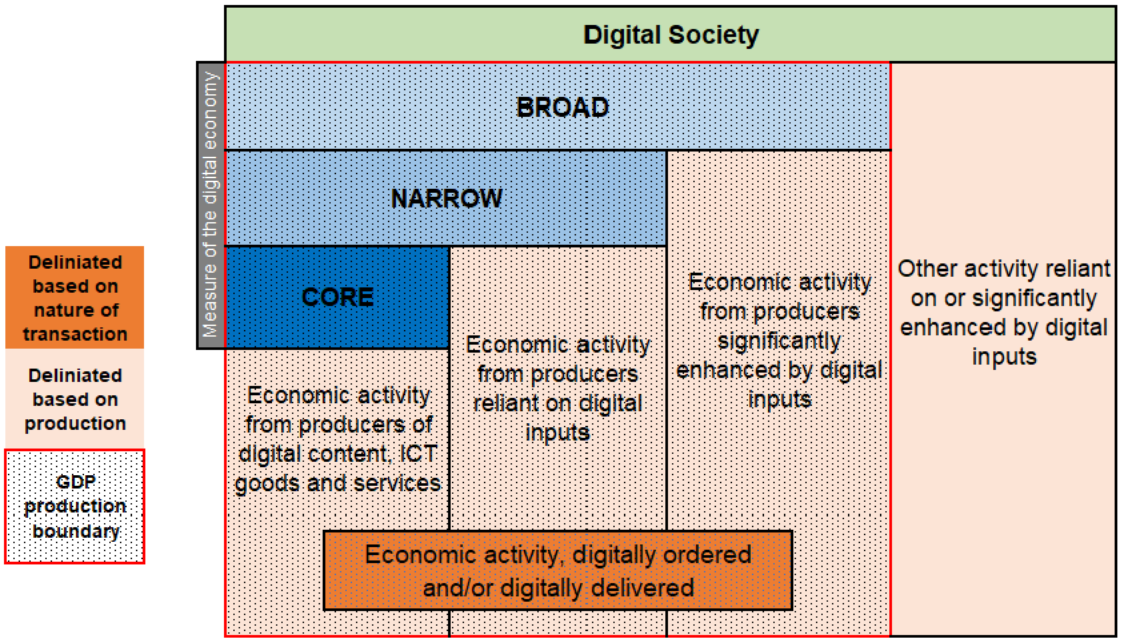
> *incorporating all economic activity reliant on or significantly enhanced by the use of digital inputs, including digital technologies, digital infrastructure, digital services and data. It refers to all producers and consumers, including government, that are utilising these digital inputs in their economic activities. (OECD, 2020, p. 35[9])*

In addition, a tiered definition, illustrated in Figure 1.3, aims to facilitate the measurement of the digital economy.

Higher education is an area that could be broadly defined as part of the digital society. It has arguably become reliant on digital inputs during the COVID-19 pandemic and has the potential to be significantly enhanced by digital inputs.

At the international level, several organisations, including the OECD and the European Commission, have developed surveys, frameworks and self-assessment tools that aim to gain an understanding of digitalisation in education, as outlined in Table 1.2. International tools primarily focus on measuring the digital skills of individuals and on evaluating the use of digital technologies in educational institutions. Few of these instruments focus on or cover higher education.

Figure 1.3. G20 tiered definition of the digital economy



Source: OECD (2020[9]), *A Roadmap Toward a Common Framework for Measuring the Digital Economy: Report for the G20 Digital Economy Task Force*, https://www.oecd.org/digital/ieconomy/roadmap-toward-a-common-framework-for-measuring-the-digital-economy.pdf.

Table 1.2. International approaches to analysing digitalisation in education

Level of education/skills	Instrument	Focus	Time/frequency/coverage
Describing and measuring digital skills (mostly school-level education)			
Frameworks	European Commission Digital Competence Framework for Citizens (DigComp)	• 5 competence areas - safety, digital content creation, communication and collaboration, problem solving, information and data literacy - as well as 21 competences, examples of use and detailed proficiency levels • A revised DigComp taking into account artificial intelligence, disinformation, and other emerging issues will be launched in 2021.	EU countries. Used for activities such as curricula review, student assessment, employability and skills strategies. At least 335 000 training courses have been developed, and 500 000 certificates were granted based on DigComp's framework.
	Digital Economy and Society Index (DESI), based on DigComp	• 5 principal policy areas, which group 37 indicators: 1) connectivity (fixed broadband take-up, fixed broadband coverage, mobile broadband and broadband prices); 2) human capital (Internet user skills and advanced skills); 3) use of Internet (citizens' use of Internet services and online transactions); 4) integration of digital technology (business digitisation and e-commerce); and 5) digital public services (e-government).	EU countries. Published annually since 2014.
	European Framework for the Digital Competence of Educators (DigCompEdu)	• Description of a digitally competent educator (across all educational levels). Includes 22 educator-specific competencies, distributed across 6 building blocks: 1) professional engagement; 2) digital resources; 3) teaching and learning; 4) assessment; 5) empowering learners; and 6) facilitating learners' digital competence. Teacher progression is assessed based on a letter-number	EU countries.

Level of education/skills	Instrument	Focus	Time/frequency/coverage
		combination as in the Common European Framework of Reference for Languages (CEFR) from A1 (Newcomer) to C2 (Pioneer).	
	Centre for the European Policy Studies' Index of Readiness for Digital Lifelong Learning	• Aims to capture the different dimensions of digital lifelong learning based on three main pillars: individual's learning outcomes, the institutions and policies involved in digital learning and the availability of digital learning.	Published in 2018.
Surveys	OECD Programme for the International Student Assessment (PISA)	• 15-year-old students' competencies in reading, math and science. • Does not directly measure digital skills but offers insights on the availability of digital technologies in schools and their use by students. • Enables analyses on the link between technology use and proficiency.	Administered since 2000 on a three-year cycle.
	International Computer and Information Literacy Survey (ICILS)	• Assesses students' computer and information skills of youth around 13 or 14 years old, i.e. to use computers to investigate, create, and communicate in order to participate effectively at home, at school, in the workplace and in the community.	Administered by the International Association for the Evaluation of Educational Achievement (IEA) in 2013, 2018 and next in 2023.
	OECD Survey of Adult Skills (a product of the Programme for the International Assessment of Adult Competencies [PIAAC])	• Proficiency of adults aged 16--64 in literacy, numeracy, and problem solving in a technology-rich environment (PS-TRE). Because PIAAC allows for the study of subgroups, such as adults with a higher education credential, it sheds some light on the digital skills (using PSE-TRE) of adults who have attained higher education compared to individuals who have not. However, PIAAC is not designed to measure the extent to which such skills are acquired during higher education, and many factors other than higher education may affect the level of digital proficiency of tertiary-educated individuals.	First round in 2011-12, 2014-15 and 2017-18 and a second cycle planned for 2022-23.
Measuring the use of digital technologies in education			
School-level and all levels of education			
Survey	OECD Teaching and Learning International Survey (TALIS)	• Use of digital technologies by teachers, the training they receive, and the training they believe they need to make better use of these technologies.	Administered in 2008, 2013 and 2018, with the next round in 2024.
Framework	European Framework for Digitally Competent Educational Organisations (DigCompOrg)	• Key aspects associated to the systematic integration of digital learning in educational organisations. It contains 74 descriptors across 8 dimensions: 1) content and curricula; 2) assessment; 3) professional development; 4) teaching and learning; 5) leadership and governance; 6) infrastructure; 7) collaboration and networking; and 8) a school-specific module.	EU countries.
Self-reflection tool for schools	Self-Reflection on Effective Learning by Fostering Innovation through Educational Technologies (SELFIE), based on DigCompOrg	• Online, free, customisable application for institutions to self-assess their digital capacity based on the DigCompOrg framework	Over 650 000 individuals in 57 countries have used this tool, and a SELFIE version for teachers is to be launched in 2021.
Higher education			
Surveys	OECD's International Survey of Scientific Authors (ISSA)	• ISSA 2 (2018) focused on: 1. the adoption of digital scientific collaboration and productivity tools throughout all stages of the scientific process 2. the digitally enabled diffusion and access to data and code, such as the practice of storing data/code in open repositories 3. the use of advanced and data-intensive digital tools to gain insights and develop predictions 4. the development of digital identity and online communication of scientific work.	Targeted authors of scientific publications whose contact information was available in a large global bibliographic database and received around 12 000 responses, providing a dataset on researchers' use of digital technologies.

Level of education/skills	Instrument	Focus	Time/frequency/coverage
	OECD's Higher Education Policy Survey (HEPS)	• HEPS 2020 focused on resourcing higher education and asked questions related to regulations and incentives that may support or hinder the provision of online learning. • HEPS 2022 will focus on the digitalisation of higher education.	First survey in 2020 generated responses from 29 countries.
Self-reflection tools for higher education institutions	OECD-EC HEInnovate self-assessment tool	• The tool focuses on entrepreneurship and innovation and includes eight dimensions, including the digital transformation and capability of institutions. The digitalisation dimension addresses: 1. how digitalisation spurs innovation and entrepreneurship 2. whether the planning and management of digital infrastructure is aligned with the vision, mission and strategy of the HEI 3. the level of the HEI's commitment to digital teaching, learning and assessment practices 4. how widely disseminated open science and open innovation activities are 5. the extent of the HEI's digital presence.	Launched in 2013 and updated since.
	DIGI-HE (based on SELFIE)	• Examines perceptions of higher education teachers, students, leaders, researchers and other staff around the use of digital technologies in learning and teaching, research and innovation, governance and management, as well as co-operation and outreach, including internationalisation.	Developed by the European University Association and a consortium of European higher education stakeholders, to be launched in 2022.

Note: A large range of digital literacy frameworks have been developed around the world, developed by public authorities, national or subnational, or by private enterprises (Kampylis, Punie and Devine, 2015[10]; UNESCO-UIS, 2018[11]). The OECD has also developed new approaches to measuring innovation in education, which includes the use of digital technologies in the classroom, by assessing the spread of innovative practices over time and across national contexts (Vincent-Lancrin et al., 2019[12]).

National data systems contain limited information that measures digital readiness, practices, and performance in higher education systems. However, governments across OECD countries have begun to develop approaches to measure digitalisation in higher education, using **national administrative data collection**, **surveys of higher education leaders, students and staff**, and **learning analytics**. Chapter 4 explores these three approaches to data collection, their benefits and drawbacks, and their use in a sample of OECD countries.

Based on this comparative analysis and a review of higher education data collection systems currently in place in Hungary, we provide suggestions about potential indicators and data sources that Hungarian authorities may consider developing. The report also identifies key steps that should be taken ahead of any data development effort, including clearly mapping the current higher education data that could be used to shed light on digitalisation (and why it is or is not used for that purpose) and carefully defining the policy purposes of new data collection on the digitalisation of higher education.

1.5. Structure of the report

The report includes three additional chapters and three annexes.

Chapter 2 provides an **overview of the digitalisation** of Hungarian higher education, first outlining key features of the Hungarian higher education system and then reviewing available information about digital readiness, practices and performance in the higher education system.

Chapter 3 reviews **current policies** relevant to the digitalisation of Hungarian higher education and provides **policy recommendations** to remove barriers to digitalisation and establish support that could help foster its further development.

Chapter 4 focuses on **the measurement of** digitalisation in Hungarian higher education. It introduces different data collection approaches and indicators used internationally to measure the digitalisation of higher education, assessing benefits and drawbacks of different approaches. It provides an overview of higher education data collection in Hungary and discusses potential future data collection and priority indicators to assess progress in the digitalisation of Hungarian higher education.

Annex A provides a summary of **stakeholder input** received during OECD interviews for the project.

Annex B provides a summary of **insights from the OECD stakeholder consultation survey** implemented as part of the project.

Annex C provides a summary of **comparative research** on digitalisation in higher education conducted to support the project's analysis and policy recommendations.

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2 The state of digitalisation of higher education in Hungary

This chapter provides an overview of the digitalisation of higher education in Hungary, first outlining key features of the Hungarian higher education system and then reviewing available information about digital readiness, practices and performance in the higher education system.

2.1. Hungary's higher education system

This section offers an overview of the state of Hungarian higher education to set out the context for the analysis provided in this report. It first looks at the profiles of Hungarian higher education institutions (HEIs). It then summarises student enrolment and graduation patterns and research capacity in Hungary.

Institutional profile, autonomy and financing

In Hungary, higher education institutions may be state owned (or, maintained), privately maintained (by business organisations, foundations, or public-interest trust foundations), or church owned. Higher education institutions are further classified as: universities, universities of applied sciences (UAS) and colleges, distinguished by 1) the number of bachelor's, master's and doctoral programmes offered; and 2) the share of teaching and research staff (employed directly or on a public service employment basis) that have a doctoral degree, offer academic student workshops, and are capable of offering some programmes in a foreign language; and 3) the features of programmes offered, for instance, whether the HEI offers dual education programmes. Foreign HEIs may also operate in Hungary if there is a bilateral agreement between the foreign government and Hungary's (Eurydice, 2021[1]). All higher education institutions, regardless of maintainer, are expected to be recognised by the state, and to fulfil the same accreditation criteria.

Across Hungary's higher education system, 43% of HEIs were maintained by the state in 2020 (see Table 2.1). In 2020, the Hungarian government began introducing new operating models in Hungarian universities, transferring a number of state-maintained universities to a new legal basis (a foundation status), involving new governance, management and employment arrangements (DSN/DHECC, 2020[2]).

Table 2.1. HEIs in Hungary by institution type and by maintainer (2020)

	University	UAS	College	Total
State	22	5	1	28
Private	2	2	7	11
Church	5	0	21	26
Total	29	7	29	65

Source: DSN/DHECC (2020[2]), *Position Paper on Digitalisation of Hungarian Higher Education.*

In 2018, most higher education students (87%) were enrolled in state-owned institutions (OECD, 2021[3]). In the 2015/16 academic year, among those in publicly funded HEIs, almost nine out of every ten students attended a university, 8% were enrolled in a university of applied sciences, and 2.5% were undertaking their degree in publicly funded colleges (OECD/European Union, 2017[4]).

The Higher Education Act of 2011 states that HEIs autonomously decide on the content and methods used in research and teaching activities. However, according to the 2017 University Autonomy Scorecard published by the European University Association (EUA), Hungarian universities have lower autonomy on organisational, financial, staffing and academic issues than many other European countries. Out of 29 European systems evaluated by the EUA in 2016, Hungarian universities ranked as follows:

- **23rd in organisational autonomy**, which is the ability of HEIs to decide independently on their internal organisation, such as their executive leadership, decision-making bodies, legal entities and internal academic structures
- **28th in financial autonomy**, which is the ability to decide independently on internal financial affairs and use funding to support institutional goals

- **22nd in staffing autonomy**, which is the ability to decide independently on human resource matters, including recruitments, salaries, dismissals and promotions
- **16th in academic autonomy**, which is the ability to decide on issues such as student admissions, academic content, quality assurance processes, the introduction of degree programmes and the language of instruction (European University Association, 2021[5]).

Examples of the limits of this autonomy include the requirement that universities comply with the Act on Public Finance and the Act on State Property, or the recent introduction of the position of chancellor in HEIs in 2014. The HEI chancellor is appointed by the Prime Minister and has wide-ranging decision-making powers regarding financial matters and staffing. This reduces the institution's ability to autonomously allocate public funding internally to hire staff or select its leadership (Eurydice, 2021[1]).

Public funding represents the majority of higher education institutional funding in Hungary (65%), although this share is below the average of EU higher education systems (73%) (OECD, 2020[6]). The state subsidy is calculated according to the number of students participating in state-subsidised programmes, with a potential top-up for institutions with high employment rates in priority sectors (Eurydice, 2021[1]). Other sources of institutional funding include various activities (e.g. research commercialisation) and student fees. However, 80% of newly admitted students in Hungarian HEIs hold a state-sponsored place and do not pay any fees to participate in their higher education programmes (MIT, 2016[7]).

Enrolment and outcomes

Admission to higher education is based on a combination of grade points from secondary school, grade points from secondary school leaving exams, and a top-up based on disadvantaged socio-economic conditions (if applicable) (Eurydice, 2021[1]). Access for all qualified students to higher education, however, remains a concern. Under-represented groups, including disadvantaged students and Roma, have meagre chances of admission (see Table 2.2). Women's tertiary attainment levels increased significantly in the last decade, continuing to outnumber men. However, employment patterns reveal one of the most significant gender gaps among OECD countries: among 25 to 34 year-olds, 94% of tertiary-educated men are employed, compared to 77% of tertiary-educated women (OECD, 2020[6]).

Hungary's share of international students in higher education is larger than the OECD average. Despite this, total enrolment in higher education is declining, and attainment among young adults ages 25-34 is below the EU and OECD average. Falling school-age cohorts have resulted in a substantial decline in the number of higher education entrants (MIT, 2016[7]) and there has been a decline in higher education enrolment rates (OECD, 2020[6]). Between the academic years 2011/12 and 2020/21, the number of higher education applicants dropped by 35%, due in part to the reduction of state-funded study places in 2012 and the tightening of admission conditions in 2020 (European Commission, 2020[8]). This decline in higher education enrolment is accompanied by a high level of attrition in Hungarian higher education, with a reported dropout rate of 30% (Table 2.2) (MIT, 2016[7]).

Table 2.2. Higher education in Hungary: Key indicators

A. Attainment and enrolment	HUN	OECD	EU23
Enrolment rate of students aged 25 or older in tertiary education (bachelor's, master's and doctoral equivalent) (2018, %)	1.4%	2.3%	2.0%
25-64 year-olds who attained tertiary education (2018, %)	25.0%	38.0%	35.0%
25-34 year-olds who attained tertiary education (2019, %)	31.0%	45.0%	44.0%
Men	25.0%	39.0%	38.0%
Women	37.0%	51.0%	51.0%
15-year-olds who are expected to attain tertiary education (2018, %)	52.0%	71.0%	67.0%
Programme pursued by first-time entrants in tertiary education (2018, %)			
Short cycle programme	9.0%	17.0%	13.0%
Bachelor's or equivalent	72.0%	77.0%	79.0%

A. Attainment and enrolment	HUN	OECD	EU23
Master's or equivalent	18.0%	6.0%	8.0%
Average age of first-time entrants (2018, %)	21	22	22
Share of international or foreign students in tertiary education (2018, %)	11.0%	6.0%	9.0%
Share of international first-time entrants (2018, %)	22.0%	10.0%	10.0%
Share of international first-time graduates (2018, %)	7.0%	9.0%	8.0%
Share of national tertiary students enrolled abroad (2018, %)	5.0%	2.0%	4.0%

B. Financial and human resources	HUN	OECD	EU28
Public expenditure from primary to tertiary education as a share of gross domestic product (GDP), after transfers between public and private sectors (2017, %)	3.30%	4.10%	3.90%
Public expenditure on tertiary education as a share of total government expenditure (2017, %)	1.70%	2.90%	2.60%
Total expenditure in tertiary education (including research and development [R&D]) as a percentage of GDP (2017, %)	0.90%	1.00%	0.90%
Total expenditure on tertiary education institutions per full-time equivalent student, by type of service (2017, USD PPP)	12 878	16 327	16 688
Of which are for core services (%)	76.00%	69.29%	65.56%
Of which are for ancillary services (%)	8.15%	4.96%	4.21%
Of which are for R&D (%)	15.85%	25.75%	30.23%
Total compensation of staff as a percentage of current expenditure in tertiary education (2017, %)	62.00%	67.00%	68.00%
National R&D spending as a % of GDP (2017, %)	1.53%	2.38%	2.03%

C. Graduation, employment and lifelong training	HUN	OECD	EU23
Employment rate, 25-34 year-olds with tertiary education (2019, %)	84.0%	85.0%	85.0%
Men	94.0%	89.0%	90.0%
Women	77.0%	81.0%	82.0%
Share of tertiary graduates in education (2018, %)	14.0%	10.0%	10.0%
Share of tertiary graduates in business and law (2018, %)	26.0%	25.0%	25.0%
Share of tertiary graduates in information and communication technology (ICT) (2018, %)	5.0%	4.0%	4.0%
Relative earnings of full-time full-year 25-64 year-old workers in all tertiary levels (2018, 100 = upper secondary school earnings)	177	154	149
Private net financial returns to tertiary education for a man (2017, USD PPP, discounted at 2%)	356 800	295 400	278 100
Private net financial returns to tertiary education for a woman (2017, USD PPP, discounted at 2%)	161 100	225 400	210 300
Annual hours of participation of 25-64 year-olds who participated in formal and/or non-formal education and training (2016)	155	131	N/A

D. Hungary-specific indicators	HUN
Number of students in publicly funded HEIs (2015/16)	220 058
Of which in publicly funded universities	196 949
Of which in publicly funded UAS	17 586
Dropout rate (2018, %)	30.0%
Among those who self-finance their studies	60.0%
Students in part-time distance education (2018, %)	6.0%
Students with a paid job while they study (2015, %)	41.0%
Students in Budapest-based HEIs (2019, %)	22.3%
Disadvantaged students admitted to higher education (2017, %)	1.4%
Roma admitted students	0.8%
Per capita financing of HEIs (2019, EUR)	EUR 410

Source: OECD (2020[6]), Education at a Glance 2020: OECD Indicators for Parts A, B and C of the table; European Commission (2019[9]), Education and Training Monitor 2019 – Hungary; MIT (2016[7])., Shifting of Gears in Higher Education – Mid-Term Policy Strategy 2016; OECD/European Union (2017[4]), Supporting Entrepreneurship and Innovation in Higher Education in Hungary for Part D of the table.

Tertiary graduates in Hungary have an employment rate and a wage premium higher than the EU average (European Commission, 2020[8]). Labour shortages are significant, particularly in sectors such as information and communication technology (ICT), economics, natural sciences and healthcare. Therefore, the 2012 decision to require financial aid beneficiaries to work for an employer in Hungary for "a period identical to the duration of the scholarship" within 20 years of their graduation is aimed at retaining more human capital in the country (Eurydice, 2021[1]).

Research

In the last decade, spending on research has risen in Hungary, with much of it driven by increases in corporate spending on research. The government aims to increase the number of researchers and the volume of research produced, create areas of research excellence, and foster links between higher education researchers and businesses (MIT, 2016[7]).

However, the government is concerned that there is an insufficient number of researchers to fill key research positions, which it attributes to issues such as: an insufficient emphasis on science, technology, engineering and mathematics (STEM) in doctoral programmes; a history of insufficient government research funding (which the government has begun to rectify); a failure by the private sector to enter into research contracts with universities (which would increase institutions' research revenue) (MIT, 2016[7]). This has led the government to identify a range of actions and objectives to enhance research, ensure its adequate financing, and expand postgraduate STEM enrolments (MIT, 2016[7]; MIT, 2021[10]).

2.2. Digitalising Hungary's higher education system

This section examines the current state of digitalisation in Hungarian higher education. It first provides a brief overview of the digitalisation of Hungary's economy and society. It then reviews three dimensions of digitalisation in higher education: digital readiness, digital practices and digital performance. Given the lack of indicators and data to quantify the performance of Hungary along these three dimensions, the following section is based on analyses conducted by government, stakeholder input received through interviews conducted by the OECD team for the project as well as several surveys.

Digitalisation in Hungary's economy and society

Hungary provides a reasonable degree of access to basic digital infrastructure, but individuals and firms tend to make limited use of digital tools (OECD, 2021[11]). The European Union's Digital Economy and Society Index (DESI) tracks the digital progress of EU member states along five key dimensions: 1) connectivity; 2) human capital; 3) use of the Internet; 4) integration of digital technology; and 5) digital public services, providing an overview of the digitalisation of EU economies and societies. In the latest DESI edition published in 2020, using data collected before the coronavirus (COVID-19) pandemic, Hungary ranked 21st among the 28 EU member states with a score of 47.5, almost 5 points lower than the EU average (European Commission, 2020[12]).

Connectivity is the only dimension in which Hungary exceeded the EU average, ranking seventh. Fast broadband coverage is now available in 90% of households (against 86% in the European Union). In addition, the country is now third in terms of its 5G readiness, following efforts of the recently formed "5G Coalition". On the other hand, mobile broadband is the lowest in the European Union: seven out of every ten people have a subscription, likely the result of above-average mobile broadband prices.

Hungary has a higher share of ICT graduates than the EU average (4.3% versus 3.6% of graduates) and approaches the EU average regarding the share of individuals employed in the ICT sector (3.7% versus 3.9% of total employment). Nonetheless, basic digital skills[1] in 2020 remained below the EU average (49% compared to 58%), and only 25% of people between the age of 16 and 74 had above-basic digital skills (the EU average was 33%). Moreover, there is a significant gender gap in ICT employment, with 0.7% of employed women working in ICT, compared to 1.4% on average in the European Union.

The use of Internet services in Hungary is broadly consistent with the EU average. Approximately 80% of the population used the Internet at least once a week (below the EU average of 85%), with usage concentrated on accessing news, music, videos and games, video calls and social networking. However, Internet use for e-learning activities is comparatively low: 7% of Internet users in Hungary have engaged

in an online course in the three months preceding the survey, against 11% on average in the European Union.

The integration of digital technology in businesses and public services is low: Hungary ranked 26th and 24th, respectively, on these dimensions. Almost six out of every ten companies have low levels of digitisation (against fewer than four out of ten on average in the European Union), and the country's high-performance computing capacity is insufficient for more advanced R&D needs. Moreover, digital public services remain incipient, with the open data maturity in Hungarian public services (i.e. index measuring incentives for, access to, quality, and impact of open data) half (32%) that of the EU average (66%).

In response, the government has prioritised digitalisation across all areas of Hungarian life. The National Digital Strategy 2021-2030 sets out a vision for increased adoption of digitalisation across a wide range of areas, with targets covering the digital skills of the population, network coverage, digitalisation of government services and adoption of digitalisation by firms (DSN/DHECC, 2020[2]). Several other government strategies aim to advance the digitalisation of Hungary's economy and society and position the country at the forefront of European efforts in this area. This includes for example the publication of a comprehensive Artificial Intelligence (AI) Strategy in 2020, which includes the creation of a number of new public organisations to implement the strategy including an AI Innovation Centre, a National Artificial Intelligence Laboratory and the National Data Asset Agency (AI Coalition/Digital Success Programme/MIT, 2020[13]).

Digital readiness in Hungarian higher education

The digitalisation of the Hungarian higher education sector is discussed below, focusing first on digital readiness. An examination of digital practices of higher education students and staff is presented, followed by an examination of digital performance (the extent to which digitalisation contributes to higher education performance). In each of these sections, Hungary's strengths are discussed first, followed by areas for improvement.

Digital readiness has two dimensions: 1) the level of access and suitability of digital technologies and content available to higher education leaders, managers and administrators (in government and HEIs), academic staff and students; and 2) public policies that set priorities and incentives for HEIs to embed digital practices across their core activities, and institutional strategies that strengthen the capability and motivation of academic staff, administrators and students to adopt digital practices.

Access and suitability of digital technologies in higher education

Digital technologies discussed in the following section include hardware and software used for teaching and learning, as well as data systems that provide information on the digitalisation of processes at HEIs.

In Hungary, most students enter higher education equipped with a range of ICT tools (with nearly all current students having personal laptops) (Digital Success Programme, 2016[14]; MIT, 2016[7]; DSN/DHECC, 2020[2]). The OECD's higher education stakeholder consultation survey undertaken in February-March 2021 as part of the present project (see Annex B for details) confirms a high level of availability of ICT tools among current higher education students. Approximately 90% of student respondents to the survey had access to an adequate computer, a mobile device and high-speed Internet. Nonetheless, the survey results show that investment in digital infrastructure remains at the top of stakeholder policy priorities; the shares of students, teachers and individuals in leadership roles at HEIs selected it as the most, or second-most, important policy area to support digitalisation among six policy areas presented (54% of students, 66% of teachers and 76% of leaders identified digital infrastructure as the top or second-most important policy area).

All Hungarian HEIs have introduced learning management systems (LMS) and virtual learning environment (VLE) systems (Digital Success Programme, 2016[14]; DSN/DHECC, 2020[2]). If widely used by teachers

and integrated with student management systems, these can be a powerful source of data for learning analytics (Guiney, 2016[15]; Georgia State University, 2018[16]). Around 85% of students and 80% of teachers who responded to the OECD's survey reported that they had sufficient access to the institution's LMS (see Annex B). Hungary also has a national higher education identity and access management system that regulates access to national databases by higher education researchers and by those responsible for the administrative data used in managing the higher education system (EDUID and EDUGAIN) (MIT, 2016[7]).

Hungary has well-developed higher education administrative data systems, most notably the Higher Education Information System (FIR), which provides a national view of the system from application for entry to higher education through to graduation. In addition, the country is innovative in linking higher education data at a unit record level to other government data systems, such as the tax and social assistance systems, to create the graduate tracking system (DSN/DHECC, 2020[2]). This has created a digital resource that provides Hungary with a powerful tool to analyse and map student performance and post-study outcomes (DSN/DHECC, 2020[2]).[2] However, it is not clear how much use is made of the graduate tracking data to measure system performance or of the LMS data to support student learning (DSN/DHECC, 2020[2]; MIT, 2021[10]). Furthermore, as will be discussed in Chapter 4, these administrative data systems currently do not provide information on the digital readiness, practices and performance in Hungarian institutions.

There are a number of additional areas in which there is scope for improvement in the nation's digital infrastructure for higher education: access to technology for all learners, access to suitable technology, and the ability of HEIs to support the effective development and use of digital infrastructure.

While many students own and use digital devices when they enter higher education, the opportunity to use those devices in their studies is limited because many HEIs do not have systems that allow students to make use of "bring your own device" (BYOD) access (and hence, to access software packages legally) (Digital Success Programme, 2016[14]; DSN/DHECC, 2020[2]). In addition, some higher education stakeholders interviewed by the OECD reported challenges in accessing digital devices and reliable Internet connections from their homes, an issue particularly relevant during the COVID-19 pandemic.

In addition, participation in Hungarian higher education by disadvantaged groups (such as Roma and those with disabilities) and by remote/regional communities is low at present (MIT, 2016[7]). It is not clear that those groups enjoy the same access to equipment and fast broadband Internet as other students. If the government succeeds in broadening access to higher education, some students from disadvantaged backgrounds would likely face problems of access to digital devices.

Some higher education stakeholders interviewed by the OECD argued that access to software subscriptions and highly specialised hardware and software could be insufficient (see Annex A). Many stakeholders described the government-centralised procurement policy (further described in Chapter 3) as an important barrier to accessing adequate technology in a timely manner, describing the procurement policy as rigid and slow to respond to new needs in institutions. In addition, a central prohibition on procurement in place for approximately four years has led to a high risk of equipment becoming obsolete (Digital Success Programme, 2016[14]; MIT, 2016[7]). Where HEIs have the freedom to procure their own digital solutions, they may do so without adequate guidance as there is no set of standards or a policy framework to guide those purchases. A further weakness is that the national shortage of high-quality ICT professionals (MIT, 2016[7]) might be limiting the ability of HEIs to manage their digital infrastructure effectively.

At the same time, some staff and students interviewed by the OECD reported confusion generated by the proliferation of available tools for digital teaching and learning, some calling for greater standardisation of digital tools. Others disagreed and advocated for flexible and customisable solutions (see Annex A). This variety of views reveals a key trade-off between standardisation and customisation and difficulty in

identifying which types of technology purchases should be a matter for the individual HEI or where they should be part of a nationwide process.

Public policies

Public policies supporting the digitalisation of higher education constitute the second component of digital readiness besides digital infrastructure. Two key government strategies support the digitalisation of higher education in Hungary: the *Magyarország Digitális Oktatási Stratégiája* (Digital Education Strategy, or DES) and the *Fokozatváltás a felsőoktatásban* (Shifting of Gears in Higher Education, henceforth "Shifting of Gears"). Both strategies provide an assessment of the current state of digitalisation of Hungarian higher education. The DES provides an assessment of strengths and weaknesses in the three areas covered in the project, outlined in Table 2.3. Shifting of Gears provides a broad overview of the state of higher education in Hungary. On the state of digitalisation of higher education, Shifting of Gears echoes the DES, noting:

- the presence of a national higher education identity and access management system, and a network backbone and sophisticated national administrative data systems
- gaps in broadband network coverage
- difficulties posed by the centralisation of information technology (IT) equipment procurement
- a shortage of skilled and qualified IT personnel
- the expectation, implicit in regulations, of face-to-face delivery
- weaknesses in IT support for students
- lack of training for instructors in online teaching.

Both strategies ran from 2016 to 2020 and had associated action plans. The strengths and limitations of these strategies and action plans are discussed in detail in the next chapter.

Table 2.3. Government assessment of digital readiness of Hungarian higher education

Strengths	Challenges
Digital infrastructure and data	
• Basic network infrastructure available across most institutions (HBONE+) and deemed to be high quality. • Most campuses have broadband access. • Almost 100% of students entering higher education have the appropriate digital equipment (laptop, smartphone, desktop computer). • Alleged openness of institutions to well-established digital solutions. • Digital authentication systems are aligned with international standards. • Growing access to scientific databases through Electronic Information Services that provide a range of subscriptions. • Data systems (e.g. FIR) are most often centrally managed, legally consistent and accessible to institutions.	• Issues with intra-institutional Wi-Fi at some institutions. • No standardisation of digital networks used across institutions. • Students resort to their own devices and social networks to share information among themselves. • Lack of integration of personal devices into educational processes and low computer-to-student ratio. • Replacement of IT infrastructure (machinery, legal software licenses) is rare, with low funding support. • Acquisition of specialised instruments and software for education and research is infrequent, and when occurring, software is rarely used. • Legal use of software is rare. • Lack of IT support for higher education institutions. • High telephony-related expenditure (absence of Voice over Internet Protocol [VoIP] systems) and poor familiarity with cloud-based technologies. • Data systems (e.g. FIR) are not integrated into day-to-day decision making at institutions.
Digital teaching, research and engagement	

Strengths	Challenges
• Significant number of institutions involved in digital content development. • Growing university-industry co-operation, especially in the ICT sector.	• Heterogeneity in the profile and role of those involved in digital content development. • Quality of digital support and materials in the classroom is heterogeneous. • Teacher competencies are insufficient to teach in digital learning environments. • Absence of internal teacher professional development programmes. • Centralised control (and incentive structure) of teaching work that rewards face-to-face activities.
Students' experience and learning	
• Requirements to engage in a digitalised world (and especially with the ICT sector) are being integrated daily into some education programmes through dedicated training courses on emerging topics of digital technology (e.g. Competence Centre at the University of Óbuda and the impact of its action on HEIs in northern Hungary). • Programmes targeting youth to learn ICT and science, technology, engineering, and mathematics (STEM) have been successful. • Career guidance / career orientation / international mobility / language-teaching services partially conducted digitally, with the support of competence centres.	• Persistence of "traditional" methodological approaches in higher education courses (lecture, seminar, practice). • Quality of digital support and materials in the classroom is heterogeneous. • Accreditation body does not recognise domestic and international online programmes. • Adult learners lack digital competencies. • Qualitative and quantitative shortage of IT personnel in the labour market (low number of applicants for training, high dropout rates). • Learning materials do no support quality e-learning (e.g. frequent use of text-heavy tools like PDF downloadable files). • Use of digital libraries is rare, and existing libraries at institutions are only partially digital. • Recognition and transfer of credits acquired in non-formal learning is rare.

Source: Compiled by the OECD team based on Digital Success Programme (2016[14]), *Digital Education Strategy of Hungary*, and Digital Success Programme (2017[17]), *Action Plan to Implement Government Decision No. 1536/2016 (X.13.) on the Digital Reform of the Public Education, Vocational Training, Higher Education and Adult Education System and on the Digital Education Strategy of Hungary*.

Digital practices

Digital practices refer to how higher education staff (in leadership, academic and non-academic roles) and students use digital technologies in their activities and how they adapt their practices as a result of the use of said technologies. This section considers digital practice in the core functions of HEIs – teaching, learning and research – and the use of digital technologies in institutional management. It also considers how the government uses digital technologies in managing and analysing Hungary's higher education system.

The use of digital technologies in teaching, learning and research

The take-up of digital tools by students and teachers

The COVID-19 pandemic has had a significant impact on the practices of students and teachers in Hungary. According to the OECD's higher education consultation survey, over 60% of student respondents indicated they used digital tools daily for class preparation and attending lectures, with around 30% doing so weekly. Around 40-50% used digital tools in accessing support from instructors and for assessment purposes at least weekly (see Annex B). Student responses indicate that online learning is viewed as beneficial for some activities and less so for others. For example, two-thirds of student respondents considered access to course and learning materials is best provided on line. In contrast, the same proportion thought small group classes, labs and collaboration is best conducted in person. Views were more split on lectures and exams – around half of student respondents indicated they thought attending large lectures and completing exams are best conducted on line. Around 50-60% believe collaboration

with other students (e.g. group work) and obtaining feedback from teachers are done best in person (Annex B).

Teachers, too, make extensive use of digital tools in their work. Three-quarters of teacher respondents reported using digital tools weekly or more often for their teaching activities, namely classroom instruction and student support. Around 35% do so weekly or more frequently when administering exams, with another 30% doing so monthly. In addition, 50-60% used digital tools weekly for research and institutional management activities (Annex B).

However, student respondents reported that teachers could improve the way they use digital tools in their work. For example, half of the students who participated in the OECD survey reported that their teachers use digital tools effectively, but 20% thought they did not. The survey also points to teachers' general preference for in-person, rather than online, teaching and learning, with around half reporting preferring in-person activities for most of their teaching and research activities, such as delivering lectures to large groups, supporting and supervising students, conducting assessments and collaborative research projects. Three-quarters reported preferring to teach small groups in person versus on line (Annex B). These findings suggest that many in the academic workforce are reluctant to embrace fully online provisions, especially as it was practised under conditions abruptly implemented due to the COVID-19 pandemic.

In addition, stakeholders interviewed by the OECD team reported a lack of innovation in pedagogy in general, not just in the take up of digital tools. They also reported the prevalence of traditional lecture-based teaching culture and insufficient focus on collaboration among instructors (see Annex A). These views are aligned with results of a survey targeting leaders of HEIs in four countries (Hungary, Ireland, the Netherlands and Poland), in the context of the OECD-HEInnovate "Supporting Entrepreneurship and Innovation in Higher Education in Hungary" project (OECD/European Union, 2017[4]). The questionnaire was conducted between June and November 2016, and 28 Hungarian HEIs took part in the study. Results suggest that Hungarian teachers resorted to lectures and other types of teacher-centred instruction more frequently than in the three other countries and used student-centred and digital tools less frequently than their international peers (Table 2.4).

Table 2.4. Prevalence of teaching practices across a sample of OECD countries (2017)

Areas	Hungary	Sample average	Ireland	Netherlands	Poland
Lectures and other types of teacher-centred instruction	3.64	3.57	3.61	3.42	3.60
Student-centred learning	3.12	3.23	3.33	3.37	2.99
Internships	3.00	3.11	2.99	3.32	3.06
Problem-based learning	2.59	2.81	2.99	2.84	2.86
Self-learning exercises using multimedia (digital learning environments)	2.65	2.76	2.78	2.74	2.86
Self-production of online lectures/courses	2.24	2.26	2.00	2.42	2.40
Usage of massive open online courses (MOOCs) or online courses	1.65	2.09	1.86	2.31	2.53

Note: Averages are calculated based on responses being coded as 1 = not used, 2 = rarely used, 3 = regularly used, and 4 = primarily used.
Source: Raw data from the survey described in OECD/European Union (2017[4]), *Supporting Entrepreneurship and Innovation in Higher Education in Hungary*, https://dx.doi.org/10.1787/9789264273344-en.

Online learning during the pandemic

The National Union of Students in Hungary conducted a survey shortly after the shift to remote emergency learning in spring 2020, reaching approximately 12 000 students from 229 disciplines at 22 HEIs mostly studying in bachelor's programmes. The survey suggested that about 40% of respondents believed that online classes could replace in-person classes. Whether students reported a preference for online versus in-person learning was associated with factors such as the quality of students' Internet connection, their satisfaction with their online experience to date, whether they studied part-time and needed the flexibility, and their programme level, with those in more advanced studies having a slightly higher preference for online learning. Student respondents also suggest that a small share of classes could not be moved on line (HÖOK, 2020[18]).

In addition, the pandemic has played an important role in making digitalisation a key priority of higher education leaders. For example, in September 2020, the Digital Higher Education Competence Centre (DHECC) developed summary results of a survey of HEIs about the establishment of digital readiness indicators in Hungary, which it shared with the OECD team. Some 54 out of the 62 institutions in the system responded to the survey. They indicated that digital learning materials were being developed at 95% of the responding institutions, 28% of institutions revised pedagogy to adapt to a digital environment, and digital literacy initiatives for students were implemented in just over half of the institutions. In addition, initiatives to support remote work of higher education staff were put in place by more than two-thirds of institutions, with asset purchases (e.g. computers, tablets, phones) comprising the vast majority of such initiatives (DSN/DHECC, 2020[19]). The OECD stakeholder consultation survey also shows that many HEIs enhanced their focus on digitalisation after the pandemic (see Annex B for details).

However, while the pandemic led to innovation in delivery, some stakeholders interviewed by the OECD have been critical of how well some institutions and some academics managed the sudden move to online delivery, with some reporting cases of notes and recorded lectures published on line with no other engagement by teachers (Annex A).

Research

Research is a core mission of HEIs. The DES discusses the access to research and scientific databases by Hungarian academics and opportunities for access to research networks through digitally-enabled networking. The DES does not comment, however, on whether researchers in Hungarian HEIs have access to advanced, digitally-enabled scientific equipment or to the large micro-data datasets that underpin much social science research in other countries. Furthermore, specialist digital tools used for research may have limited use and application; as a result, the procurement practices in Hungarian higher education may make their purchase by HEIs difficult (DSN/DHECC, 2020[2]).

The use of digital technologies in managing HEIs

The Hungarian government requires all public HEIs to use the same student information management system (NEPTUN) and ensures that private institutions' systems are interoperable with that system. This means that core data on students – including their enrolment, achievement, payments and student services – are held in consistent forms and, therefore, are readily integrated nationally into the Higher Education Information System (FIR), which provides a national view of the system, from application for entry to higher education, through to graduation (DSN/DHECC, 2020[2]).

Learning management systems, used by all HEIs, can be linked to the student administration data (Digital Success Programme, 2016[14]). While a LMS is a useful tool for higher education teachers, it also has strategic value for an institution. In particular, if all or most teachers use the LMS, then it is possible to link the LMS data to student administration data, creating the potential for the use of learner analytics at the institutional level (see Annex C) (Guiney, 2016[15]; Cardoso, Costa and Santos, 2017[20]; Bailey et al.,

2018[21]; Georgia State University, 2018[16]). However, neither the DES nor the Position Paper on Digitalisation provided to the OECD team as part of the project (DSN/DHECC, 2020[2]) discusses the take-up or potential use of learner analytics at an HEI level. This implies that the use of learner analytics at an institutional level is not the norm, potentially representing a missed opportunity.

In addition, HEIs use generic corporate systems to manage their finances and facilities, with human resource systems relatively undeveloped (DSN/DHECC, 2020[2]).

The use of digital technologies in managing the higher education system

The FIR system collates all HEI student data, from application to graduation, allowing for the creation of system-wide performance metrics. Likewise, the Database on Student Stipends (HÖSZ) collects data on state subsidies for student enrolments (DSN/DHECC, 2020[2]). These systems have the potential to provide a solid base of evidence to inform decision making on the higher education system.

Like many OECD countries, Hungary has linked administrative data from many sources, including FIR data, HÖSZ data, other education data, tax data, welfare benefits data and employment data (MIT, 2016[7]; Universities UK, 2019[22]; DSN/DHECC, 2020[2]; Stats NZ, 2020[23]). Coupled with graduate survey data, this data integration creates the opportunity for graduate tracking (DSN/DHECC, 2020[2]; MIT, 2021[10]), enabling researchers, institutions and government to map students' life courses, to assess the effectiveness of the education system in delivering outcomes for individuals and in adding value in the labour market. In Hungary, the government has created visualisations to facilitate the use of graduate tracking data (MIT, 2021[10]). However, the take-up of the research and analysis opportunity presented by this integrated dataset appears limited at present (DSN/DHECC, 2020[2]).

Digital performance

Efficiency, quality and equity

Digital performance refers to the efficiency, quality and equity of higher education in a digital environment compared to in-person education. While internationally comparative data is scarce on this topic, the research literature suggests that digitalisation presents both promise and risk, and thus has the potential to improve or worsen outcomes (see Box 2.1).

Box 2.1. Promises and risks of online learning

Researchers have examined the diversity of students' performance in digital learning environments, noting that not all learn equally well in online programmes (Xu and Jaggars, 2014[24]; Henderson, Selwyn and Aston, 2017[25]; Xu and Xu, 2019[26]). That difference is more marked for some student groups, some types of higher education, some fields of study and some aspects of the teaching process (Xu and Jaggars, 2014[24]; Bailey et al., 2015[27]; Guiney, 2016[28]).

The difference in performance may also vary by the mix of the online and face-to-face modules of courses (Guiney, 2016[28]).These include, for instance, the type of technology used, the extent of technology versus in-person components, itself dependent on the type of learning experience provided by HEIs (in particular, the prevalence of instructor-student and student-student interaction), as well as whether study fields have components that can be easily transferred into a digital learning environment (McPherson and Bacow, 2015[29]).

The use of learning analytics may benefit student success, but poses risks as well, especially to learner privacy (Daniel, 2015[30]; Davies et al., 2015[31]; Gašević et al., 2016[32]; Shelton, Hung and Lowenthal, 2017[33]; Jones, 2019[34]; Selwyn and Gašević, 2020[35]).

The costs of digital provision as compared to those of site-based instruction may be lower but are sometimes higher (Laaser, 2008[36]; Hoxby, 2014[37]; Hemelt et al., 2018[38]). The opportunity to deliver equivalent outcomes on line and in person at a lower cost has recently been demonstrated in the context of well-designed programmes in STEM fields (Chirikov et al., 2020[39]).

Blockchain technology can transform the management of learner credentials but does not address problems of trust in the quality of provision that hampers portability (Jirgensons and Kapenieks, 2018[40]).

Concerns also exist about the role of third-party providers in online education (Mintz, 2020[41]) and the risks posed to academic integrity by digital environments (Wiley, 2020[42]).

There is no information available to the OECD team that helps shed light on the extent to which online education in Hungary generates cost savings in either the delivery of teaching and learning or with respect to administrative and operational functions. Stakeholders interviewed by the OECD often pointed to the need for additional funding to ensure adequate digital infrastructure and supports for teachers and students to succeed in an online environment (Annex A).

There is also limited information available to assess quality in an online environment. For example, no metrics are available in Hungary to assess measures such as degree completion or graduate labour market outcomes of students according to different delivery modes. However, higher education stakeholders interviewed by the OECD team expressed concern about the risk of greater dropout rates in an online environment without adequate support for teachers and students (Annex A).

The OECD survey confirms the need for further support for teachers. Only about 40% of teacher respondents agreed that their institution provides them with opportunities to develop digital skills specific to their field of teaching and research (Annex B). In particular, because the pedagogy for online and in-person education differ, the material used in face-to-face teaching may require significant adaptation, which appears to have happened to a limited extent so far in Hungary (Annex A).

Furthermore, pedagogies such as teamwork, project-based work and independent work are all critical in developing the cognitive and socio-emotional skills valued in the workplace (Brunello and Schlotter, 2011[43]; Kautz et al., 2014[44]). Digital technologies can contribute to modernising pedagogies and providing students with skills relevant to the labour market as well. However, these pedagogies are not widespread in Hungarian higher education (MIT, 2016[7]).

Measures of student and teacher satisfaction with different modes of learning are more readily available through user surveys. In the OECD survey, for instance, student respondents are in general more likely to report positive impacts of online teaching and learning than teacher respondents. While over 60% of the students agree that online learning has made attending lectures and taking exams more convenient, less than 30% of the teachers shared that view. More than half of student and teacher respondents (around 50-60%) reported that the online setting has not increased student-teacher interactions and that it has not helped with the provision of more individualised feedback. While students acknowledged some positive impact of online learning – such as convenience – nearly half of them thought online learning has not made their studies more interesting, signalling a need to improve pedagogy (Annex B).

Ensuring equity in access and success in online education is an important concern of stakeholders interviewed by the OECD. They suggested that digitalising higher education, if not done carefully with a focus on ensuring strong supports for students at risk of dropping out, could exacerbate pre-existing socio-economic inequalities (Annex A). This concern is particularly prevalent for the Roma population and

disadvantaged groups overall, since disadvantaged groups are likely to lack access to commonly available digital resources and guidance for their effective use.

Opportunities to measure performance

The practice of aggregating administrative data from all institutions (to build the Higher Education Information System – FIR) creates opportunities to analyse the performance of the Hungarian higher education system. For example, the graduate tracking data is built by integrating data from HEIs with tax data, welfare benefit data and employment data. This data provides an opportunity for policy makers and educators to analyse and monitor the performance of higher education programmes and their contribution to Hungary's labour market and for prospective and current students to make informed educational and career choices. This system may also be used for administrative purposes, for example, to identify graduates who do not work in Hungary (this is relevant since the introduction in 2012 of a legislative provision requiring repayment of state financial aid for graduates not working in Hungary for a minimum duration following completion of their studies) (DSN/DHECC, 2020[2]).

In addition to these rich system-level data resources, Hungarian HEIs use LMS (whose primary purpose is to support the instructor's management of his/her teaching). An LMS is also a powerful analytical resource. If all teachers use the system, and if the data is aggregated and viewed by student (rather than by course), it provides detailed data on students' ongoing academic performance in their courses, meaning that it can be used to identify students at risk of failing in time to enable the instructor to take action (Guiney, 2016[15]; Cardoso, Costa and Santos, 2017[20]; Georgia State University, 2018[16]). However, this opportunity appears not to have been taken up widely in Hungary to date.

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Notes

1. This indicator is based on self-reported digital skills. Using the Eurostat's "Community survey on ICT usage in households by individual", individuals using the Internet during the last three months are asked whether they are able to do basic, above basic or below basic activities in four domains: information, communication, content-creation, and problem-solving. The indicator "Individuals with at least basic digital skills" measures the percentage of individuals who report having at least basic skills in these four domains.

2. Note that this fulfils one of the recommendations of the Digital Education Strategy action plan.

3 Policies to support the digitalisation of higher education in Hungary

This chapter reviews current policies relevant to the digitalisation of higher education in Hungary and provides policy recommendations to remove barriers to digitalisation and establish support that could help foster its further development.

3.1. A comprehensive reform approach is necessary

If higher education systems and institutions are to make fully effective use of digital technologies, this requires comprehensive change in how institutions are managed, how teaching and learning take place, and how research in conducted. This in turn requires comprehensive change in how governments fund, steer, and assure the quality of higher education institutions.

A strategy for the digitalisation of a higher education system is, in fact, a strategy for the transformation of a higher education system. This means that the Hungarian government needs to strengthen some of the broader higher education reforms it has considered and initiated as part of its Shifting of Gears strategy, discussed in this chapter. It also means that the implementation of a digitalisation strategy for higher education needs to be carefully sequenced and accompanied with proper incentives to drive individual behaviour and institutional action.

The successful implementation of a digitalisation strategy for higher education requires four phases of action.

1. **Setting the direction:** This means understanding the needs and experiences of higher education staff and students, defining and communicating the strategy for digitalisation and developing a plan that will deliver on the strategy. It involves including the costs of digitalisation in budgets and ensuring there are tools for measuring digitalisation and monitoring success in achieving the goals and objectives of the strategy.
2. **Building the foundation:** This means providing and funding the digital infrastructure necessary to implement the strategy, including systems that allow for data to be collected, housed, managed and analysed. It includes, but goes beyond, digital infrastructure. It means ensuring there is a reliable network and the availability of skilled people to manage and maintain the infrastructure. It includes creating policies and standards, such as the requirement for interoperability of systems, uniform data quality processes and standards, and minimum hardware standards. To get value from the additional data generated by a digitalised higher education system implies ensuring that people are employed to analyse the data and communicate the analysis findings.
3. **Developing the processes:** Effective digitalisation implies changes in teaching, learning, research and engagement. This requires changes in both incentives and capabilities. Incentive systems – the funding of institutions and the remuneration and career advancement of individuals – need to be adapted to reflect the new opportunities, and the new tasks, created by digitalisation. Increasing capabilities requires a commitment to the training and support of staff.
4. **Delivering benefits to students, graduates and employers**: Lastly, an effective digitalisation strategy requires that all actors within the higher education system – students, research consumers, employers – benefit from digitalisation. For students, this means designing academic programmes that recognise learning outcomes from digital (as well as traditional) formats. It includes enabling students to have sufficient access to the information they need to support their learning. It means allowing them to study in flexible modes and ensuring that they graduate with the digital skills that employers want and expect of graduates in the 21st century. It also includes providing support for student learning and ensuring that delivery is designed to be interesting and enjoyable, as well as instructive.

For each of these four stages, the following sections examine the current state of policy in Hungary and then outline proposed policy recommendations. The four phases apply to governments – in their oversight of the higher education system – and institutions – in defining approaches to their teaching, research and engagement. This chapter focuses on government policy, which should be developed in close collaboration with higher education institutions (HEIs).

3.2. Setting the direction: The policy framework

Current state

Public authorities are responsible for shaping the institutional landscape of higher education systems, and steering priorities and incentives for substantially autonomous HEIs in ways that encourage them to educate skilled graduates and create value for citizens and taxpayers and the students who participate in the system. Governments influence institutions' behaviour through levers such as the funding system and legislative provisions on various issues ranging from academic employment to quality assurance. They also set broad objectives against which they can monitor progress.

In Hungary, the government has made digitalisation a stated policy priority, which, while not sufficient in itself, may be a prerequisite for encouraging digitalisation in the core teaching and learning practices of HEIs. Two government strategies running from 2016-to 2020 are directly relevant to the digitalisation of higher education in Hungary. First, the Digital Education Strategy (DES) provides a context for the focus on the digitalisation of education in Hungary (Digital Success Programme, 2016[1]). Second, the Shifting of Gears in Higher Education strategy (Shifting of Gears) aims to promote the development of a higher education system responsive to economic needs, internationally attractive, and driven by competition. Action plans detailing measures the government aims to pursue accompany these strategies (MIT, 2016[2]).

The Digital Education Strategy: A digitalisation strategy

The DES was developed to support the Hungarian government's national Digital Success Programme, a wide-ranging strategy that has as its goal "the digital development of the Hungarian society and the Hungarian national economy" as an enabler of "competitiveness, growth and welfare". The government sees the digitalisation of the education system as a prerequisite for the digitalisation of society, enhancing "the competitiveness and labour market chances of the upcoming generation" (Digital Success Programme, 2016[1]).

The DES covers all parts of the Hungarian education system and aims to enable students at all levels in the education system to use digital tools and experience a digital study environment.

Higher education priorities in the DES

The DES seeks in Hungarian higher education a "standardised online digital environment" that will offer "personalised learning opportunities" delivered via "an online learning platform" where HEIs will present their teaching. In addition, HEIs will be expected to respond to employers', students', and society's digital training needs. The strategy acknowledges that digitalisation requires a change of culture and "… radical transformation of teaching-learning processes…" amounting to a "paradigm shift". However, it recognises that facilitating a culture change requires changing the system regulations governing teaching and learning (Digital Success Programme, 2016[1]).

In particular, the DES identifies the need to increase the flexibility and diversity of provision as a priority for change in the higher education system. Thus, it advises to:

- Alter the legislation that regulates forms of teaching to enable online learning, as the current legislation requires a substantial amount of in-person delivery.[1]
- Make instructional scheduling more flexible, enabling different delivery modes (such as online components, collaborative projects, etc.) to be scheduled appropriately. For example, the current regulation of the system of credits[2] prescribes the scheduling and frequency of lessons within a programme. This has the consequence of determining the number and scheduling of lessons that require physical attendance by students, with required provision of courses during the five working

days of the week and a minimum of 200 hours of contact time per semester for a full-time programme.

- Review the criteria for the performance assessment of academic staff,[3] as current policies refer to "performance of the educational and research activity … [and] …other education-related activities" but make no reference to innovation or the use of digitally enabled learning approaches. The DES notes that to deliver on a change in the expectations and culture of the teaching workforce, the Hungarian authorities should develop additional criteria relating to digital educational methodologies.
- Make the structure of programmes and the programme change process more flexible. The DES recommends that Hungarian authorities change the rules[4] relating to the structure of academic programmes with a "predetermined learning path", which makes changes subject to ministerial approval. For instance, the DES notes that it would be desirable to strengthen the powers of the "educational programme manager" in the HEI, whose role is to ensure the content of programmes remains current. It further recommends that legislation provide the basis for programme managers to have continuous responsibility for making programme changes in a timely manner, ensuring the continuing relevance of the programme of study.
- Widen existing flexibility, such as choosing to recognise prior learning (Digital Success Programme, 2016[1]).

The DES had an associated action plan that made several proposals to advance the digitalisation of higher education. The action plan recommended:

- The creation of the Digital Higher Education Competence Centre (DHECC). Now established, the DHECC is conducting projects directly related to the digital readiness of Hungarian higher education, such as two surveys of HEIs on digital higher education conducted in 2020 (DSN/DHECC, 2020[3]).
- The easing of restrictions on HEIs' procurement of information and communication technology (ICT) equipment.
- Changes to quality assurance, teacher performance review and other aspects of the current regulatory regime for higher education that currently impede the adoption of digitalisation to encourage instructors to use online channels.
- The adoption of open educational resources.
- A shift to enable students to interact with their HEIs' services digitally.
- The further development of electronic education administration services, including a linking of administrative data on higher education, in order to reduce administrative burden for HEIs, ensure students' learning paths can be traced and their certifications can be authenticated electronically, and enable better evidence for teachers and policy makers (Digital Success Programme, 2017[4]).

Challenges limiting progress on strategic goals

The DES identifies some of the most significant obstacles to achieving digitalisation in the higher education system and areas requiring change. The DES is ambitious; the scale of change envisaged is significant. Thus, the DES acknowledges that the realisation of the strategy is "some way off" and that "… digital education is developing slowly and sporadically" (Digital Success Programme, 2016[1]).

The current policy framework contains several obstacles that limit progress towards achieving the goals of the DES. With respect to funding, arrangements for part-time study remain rigid, despite improvements made in the *Korm. Rendelet a felsőoktatási intézmények alaptevékenységének finanszírozásáról* (389/2016 (XII. 2.), the Government Decree on the financing of the core activities of higher education institutions, where section 2(7) envisages all part-time students as being the equivalent 0.5 full-time students, irrespective of the actual credit load. Part-time study can be organised as "evening" or

"correspondence" education in Hungary, teaching between 30% and 50% of full-time contact hours (DSN/DHECC, 2020[5]). This contrasts with many OECD countries, in which part-time students can take variable portions of a full-time load, and study in classes alongside full-time students. In these systems, each course is assigned a weighting that reflects what portion of a year's full-time load the course comprises (for instance 0.25 or 0.125). Each individual student's load is the sum of the weightings for all of the courses in which the student is enrolled in that year, while the HEI's load for the year is the sum of the loads of the students enrolled (Australian Government, 2021[6]; New Zealand Government, 2020[7]). Using this measure of "equivalent full-time student load" enables a precise measure that broadly reflects an institution's costs in providing a course; it provides an equitable base for allocating funding, ensuring that the funding system can reimburse institutions on a pro-rata basis and support flexible provision for learners.

Accreditation criteria, such as the requirement that 75% of "core academic staff in a programme" be employed by the programme-owning university, in combination with legislative requirements regarding in-person teaching described above, result in high contact hours for students and high workloads for staff, together with a rigid and uniform programme structure (DSN/DHECC, 2020[5]). These features deter programme design that emphasises online and blended learning.

Online availability of course materials for students is irregular, and their use by students is rare. Addressing this situation is seen as a priority by the government (MIT, 2016[2]; DSN/DHECC, 2020[5]).

In sum, there are many aspects of the organisation of Hungarian HEIs that do not reinforce or align with the DES (DSN/DHECC, 2020[5]). Therefore, the DES proposes a paradigm shift in higher education, with a move to student-oriented learning (Digital Success Programme, 2016[1]). A paradigm shift will require a change in behaviour – by those in leadership roles in HEIs, by those who train higher education teachers, by individual teachers and by students. While government commitment to the development and maintenance of infrastructure is necessary for the paradigm shift the government seeks, that commitment, in itself, will not change behaviour or culture. The DES does not discuss how to manage the required change or the processes and amount of time needed for that change.

Shifting of Gears in Higher Education: A higher education strategy

The Hungarian government's higher education mid-term policy strategy, Shifting of Gears, is a key component of the policy framework in which the system operates. Given the extent of change required for digitalisation, Shifting of Gears is an important part of the digitalisation agenda in higher education.

Shifting of Gears proposes a set of goals and actions for 2016-30 that aim to transform the education, research and social development roles of higher education. The strategy also discusses horizontal issues such as institutional management, financing and priority fields of study (MIT, 2016[2]). Shifting of Gears includes a number of references to digitalisation, complementing the higher education goals of the DES.

Shifting Gears priorities

Shifting of Gears sets out the government's overarching goal for higher education as positioning the Hungarian higher education system so that it is internationally competitive and attractive, can respond to social challenges, and drives Hungary's economic success. It notes that the system faces funding pressures after 2023, leading to an expectation that HEIs will look increasingly beyond government funding for their revenue.

Its vision of the system in 2030 is that:

- **Students will be better prepared** for higher education at the point of entry, there will be greater specialisation and personalisation of learning, and instructors will be better prepared – leading to

better retention and completion rates. Shifting of Gears also foresees increased participation and success rates in higher education among the Roma community.

- **Institutions will have specialised educational profiles**; there will be clear differentiation between the role of universities and the role of Universities of Applied Sciences (UAS), with a new third-tier higher education provider: community-based higher education centres, intended to promote development in their regional communities.
- **Institutions will also have well-defined research profiles** matching their educational specialisations.
- **Programmes will be more flexible** in structure (MIT, 2016[2]).

To advance this longer-term vision, Shifting of Gears lists 56 objectives and performance targets covering education, research, service, funding as well as groups of fields of study. For instance, the strategy sets objectives for, among many other items: increasing the educational attainment of the population aged 30-34 years; increasing access to higher education; improving equity of access and achievement; and increasing the relevance of higher education to labour market needs (MIT, 2016[2]).

The government also issued a higher education action plan accompanying the strategy (the Shifting of Gears Action Plan) that incorporates, among its 56 objectives and actions, 7 objectives related to digitalisation (see Box 3.1). The government committed to monitoring progress in meeting the goals of this action plan, with a framework that comprises monitoring performance (i.e. achieving the objectives of the plan), monitoring results (i.e. observing changes in data that result from the actions in the plan) and monitoring effectiveness (i.e. monitoring the outcomes that result from the implementation of groups of interventions) (MIT, 2016[2]; MIT, 2021[8]).

Box 3.1. Shifting of Gears in Higher Education Mid-Term Policy Strategy, Action Plan 2016-2020

Objectives relevant to the digitalisation of higher education

2.1.4. Making scientific, postgraduate specialisation programmes more flexible so that HEIs will be the location of life-long learning.

2.2.4. The teaching methodology used in higher education, in the field of education innovation, should be centred on practice and student work.

2.2.5. In order to increase instructor excellence, the performance-based promotion system of instructors needs to be strengthened, and the related conditions of competitive salaries need to be created.

4.4. Creating modern informational content and providing broad access to it.

6.1.1. Increasing the volume of medical training and reinforcing, consolidating and raising the quality of the clinical education base to assist in this purpose.

6.3.2. Utilising the opportunities offered by internationalisation, reinforcing competitive, foreign language economic training programmes, primarily in master studies.

6.5.1. Continuing the renewal of teacher training, with special regard to the renewal of its content and methodology, with the application of modern, pedagogical methodology instruments.

Source: MIT (2016[2]), *Shifting of Gears in Higher Education Mid-Term Policy Strategy 2016: Action Plan 2016-2020*.

Challenges limiting progress on strategic goals

Shifting of Gears is comprehensive and ambitious. Like the DES, it provides a good summary of what needs to change if the opportunities afforded by digitalisation are to be realised. However, higher education institutional stakeholders interviewed by the OECD had limited awareness of the government strategies (see Annex A).

While the plan's actions are mostly well aligned to the objectives, it is significant that, in every case, the responsibility for action rests with government officials, rather than higher education institutions. Few objectives articulate a clear link to the institutions whose commitment to change is central to achieving many of the objectives. There are no actions that fundamentally change the structure of the incentives for HEIs or their leaders, yet incentives are essential to modifying institutional behaviour (OECD, 2020[9]). Therefore, there is a high risk that Hungary will struggle to meet the objectives within the anticipated timeframes.

The plan includes indicative funding requirements for each objective. The seven digitalisation objectives within the Shifting of Gears objectives that include references to e-learning, digitalisation or online learning have been costed by the government at HUF 50.26 billion (approximately EUR 145 million), but it is not clear what period the amount is to be spent over. Also, many components of the seven objectives are not related to digitalisation For instance, only HUF 10 billion of the HUF 15 billion linked to Objective 2.2.4 (relating to innovation in teaching) appear related to digitalisation. In Objective 2.2.5 (relating to training instructors), the e-learning component comes at no cost, while the full HUF 6.7 billion is for an international exchange programme. HEI leaders surveyed by the OECD for the project suggested that the government needs to provide additional funding for HEIs to support the development of digital infrastructure and data systems (see Annex B).

Sections of the draft monitoring report prepared by the Ministry for Innovation and Technology on the implementation of Shifting of Gears and shared with the OECD team discusses 16 of the 56 objectives and reports on actions taken and activities underway to help meet the targets (MIT, 2021[8]). However, the document reports mainly on inputs and progress towards actions, rather than on results, without evaluating the implemented actions. That may be because the monitoring focuses only on 16 of the 56 objectives or because it is still too early to observe changes in the data in response to some of the interventions. However, it is difficult to assess the strategy's impact without a more comprehensive and result-focused monitoring framework that identifies a clear set of monitoring indicators.

Proposed policy recommendations

While the DES and Shifting of Gears have both signalled the government's determination to encourage change, they need to be joined up to adequate policy measures to make them effective instruments of transformation. However, at present, higher education stakeholders interviewed by the OECD team suggested that Hungarian institutions' finance, human resources, and other administrative systems are not yet adapted to support digitalisation. In particular, the employment, professional development and career progression arrangements for academic staff appear to limit the implementation of digitalisation (Annex A).

Below are examples from international experience that Hungary could draw from, and four policy recommendations that the Hungarian government, in close collaboration with HEIs, should consider adopting as matters of high priority to advance digitalisation in the higher education system.

Understand system-wide digital practices and needs to build a supportive policy framework

In the **United Kingdom**, information on the use of digital tools for teaching and learning during the pandemic has been collected and analysed to create a ten-year vision for digitally-led higher education. This "roadmap for quality in digital engagement" draws on the experiences of thousands of higher

education teachers and students across the higher education system. It can be used to develop a system-wide understanding of how digital technologies are used in higher education, and in turn help inform institutions' digital education strategies (Maguire, Dale and Pauli, 2020[10]).

The **European Union**, through a project led by the **European University Association (EUA**), is building on a school-level tool, the Self-reflection on Effective Learning by Fostering Innovation through Educational Technologies (SELFIE) tool, adapted to higher education (DIGI-HE). A first questionnaire was developed and sent to European HEIs, providing insights on barriers limiting the take-up of digitalisation. Information from that tool can be used to gain a picture of the digital readiness of the system (Gaebel et al., 2021[11]).

In **Ireland**, the National Forum for the Enhancement of Teaching and Learning, supported by government funding, developed a comprehensive national survey of digital experiences in higher education with strong involvement of higher education stakeholders in the design and implementation of the survey. The Irish National Digital Experience Survey (INDEx) drew responses from more than 30 000 students, teachers, librarians and others across the whole system. The information drawn from the survey provided a common understanding of needs and challenges, in turn laying the ground for developing a shared vision of a digital higher education system among public authorities and higher education stakeholders (see (National Forum for the Enhancement of Teaching and Learning in Higher Education, 2020[12]), Chapter 4 and Annex A).

Relevant policy recommendations related to developing a system-wide approach to higher education digitalisation in Hungary are as follows.

Policy recommendation 1: Create mechanisms to build (and regularly revisit) an understanding of higher education staff and students' digital practices, needs and attitudes to inform policy

- Gather information from HEIs to understand how higher education staff and students use digital technologies in higher education and how public policies and institutional strategies may support or hinder digitalisation in practice from a user perspective. Such information gathering should also be used to identify good practices in digital higher education at the institutional level. For example, a survey similar to the Irish INDEx survey could be considered.
- Strengthen communication and collaboration channels between government and institutions to ensure that higher education leaders, staff and students are aware of government policies – and of the funding provided for their implementation – and enhance the take-up and impact of these policies.

Policy recommendation 2: Review the regulatory and funding framework for digitalisation in higher education to encourage institutional strategies that support the take-up of digital practices among students and staff

The government should use feedback from higher education stakeholders to develop a system change plan designed to remove obstacles to the adoption of digitally enhanced learning, make legislative or regulation changes as necessary, and use funding incentives to encourage change in particular areas. This could involve:

- restructuring the institutional funding regime to ensure it is neutral between part-time and full-time enrolment and between different modes of delivery; giving institutions flexibility on scheduling and sequencing of delivery; and rewarding high-quality teaching and learning
- reviewing the accreditation and quality assurance practices and requirements (in the legislation and rules of the Hungarian Accreditation Committee, as necessary) to ensure they are neutral between different modes of delivery; and providing guidance to institutions on how to implement internal quality assurance processes in a digital environment
- working with HEIs to set employment conditions (including salary arrangements and staff supports) for higher education teachers that encourage them to engage in professional development that cultivates skills for delivering and assessing online learning

- working with HEIs to identify where capital grants to HEIs may be necessary to strengthen institutional digital infrastructure and data systems
- working with HEIs to identify where targeted funding to HEIs may help promote specific digital actions (e.g. fund teacher training) and where financial incentives could be designed to reward teacher training and upskilling, and excellence in the delivery of digitally enhanced teaching and learning.

Support HEIs, assisting them in further developing their capacity for self-assessment and improvement

The integration of policy priorities in the strategic planning of HEIs is not always successful. To facilitate this process, in the **United Kingdom**, the Quality Assurance Agency gathered examples of successful implementation of, and good practice in, online learning during the pandemic (Quality Assurance Agency for Higher Education, 2021[13]). That synthesis summarises what was learned from the widespread adoption of digitalisation by a large number of HEIs, covering topics such as structuring fieldwork and assessment in a digital environment and using digital means to deliver theoretical content on line. Similarly, the **Irish** INDEx survey provided information on how institutions managed their digital planning (National Forum for the Enhancement of Teaching and Learning in Higher Education, 2020[12]).

Institutions in **New Zealand** were encouraged to use an e-Learning Maturity Model, which enables institutional leadership to identify what they need to do in preparing to embed digital teaching and learning in their institutional culture (Marshall, 2012[14]). These tools are essential aids for institutions in developing their digitalisation plans.

A policy recommendation related to providing guidance to HEIs to support their digitalisation planning is as follows.

Policy recommendation 3: Encourage institutions to draw on best practices, from Hungary and other countries, in planning for and rolling out the digitalisation of higher education

- Draw information from the information-gathering exercise referred to in Policy recommendation 1 to identify areas of good practice in digital teaching and learning, institutional digitalisation planning, HEIs' information systems strategic planning (ISSP), infrastructure management and applications of digitalisation in institutional management.
- Use that information on good practice to support the creation of user-led expert groups – for instance, of HEI teachers and ICT planners and managers who have successfully implemented digitally enhanced teaching and learning – to build best practice communities and act as advisors and resources for other institutions.
- Invite leading practitioners from other countries to conduct seminars and workshops for Hungarian higher education teachers.[5] Support the dissemination of best practice examples through workshops, blogs, newsletters, videos, etc. Profile best practice, for instance, through a national excellence in online teaching awards system.
- Support expert groups so they can create resources to inform HEI planning – both their strategic planning and their ISSP developments.

Strengthen the monitoring of the intended outcomes of digitalisation strategies

Any strategy needs to be monitored. To monitor digital readiness, digital practices, and digital higher education performance effectively, the government should consider collecting data from HEIs on their digitalisation initiatives and the extent of digitally enhanced teaching and learning in their academic programmes. The types of indicators that could be considered will be explored in detail in Chapter 4. In general terms, this type of data could, for instance:

- provide a picture of the take-up of digitally enhanced teaching and learning – its distribution among institutions, types of programmes and student groups
- facilitate monitoring of student achievement in different types of learning
- complement qualitative survey data and the existing monitoring of progress in achieving the goals of current government strategies.

A small number of OECD countries have successfully incorporated indicators of online learning in their higher education statistical collections. For example, in the **United States**, the National Center for Education Statistics collects data on delivery mode as part of the Integrated Postsecondary Education Data System (IPEDS) and publishes trends in take-up of online enrolment in post-secondary education (Ginder, Kelly-Reid and Mann, 2019[15]; Snyder, de Brey and Dillow, 2019[16]).

Likewise, in **New Zealand**, all courses in post-secondary education are categorised according to the extent to which they use online delivery.[6] Using that data, Guiney (2016[17]) looked at the post-secondary system in New Zealand over nine years. The study showed that the performance gap was much smaller – almost negligible – among higher education (rather than adult education) students but was larger for some student groups, including part-time students.[7] However, the study also noted that the performance gap decreased over the period of the study (2005-14), probably as teachers' and students' skills and experience grew.

While administrative data is essential to monitor progress on Hungary's digitalisation goals, it needs to be complemented by qualitative data. Change in the technology of learning that is not accompanied by a change in pedagogy (for instance, if online learning simply presents a version of traditional in-person delivery via notes and videos posted on line) is unlikely to boost learning or student performance. Therefore, monitoring progress on the strategic goals needs to include qualitative research into how online learning has been deployed. Such qualitative research would also capture examples of best practices that can then be incorporated into professional development for higher education teachers.

A relevant policy recommendation related to strengthening the monitoring of digitalisation strategies is as follows.

Policy recommendation 4: Design a plan for collecting and analysing data on digitalisation in teaching and learning

Fund an expert body to develop a data collection and analysis plan. Key steps in this plan include:

- Taking stock of the current state of administrative data collection in higher education in Hungary, identifying the policy purposes of new data collection and investigating the feasibility of adding data on the extent of online delivery to the characteristics of courses in institutional and government datasets.
- Identifying a set of indicators that would provide key information on digital readiness, practices and performance in line with government policy goals while taking into account constraints (e.g. capacity in HEI and government for collection and analysis).
- Developing strategies to ensure effective data reporting, such as clear definitions of online and hybrid learning courses and programmes (see, for instance, the work of the US National Center for Education Statistics to define categories of distance learning).
- Supporting HEIs in their data collection work.
- Working closely with policy makers and institutional leaders, design a plan for data analysis and use in public policy and institutional planning (see the example of the process used for INDEx).
- Identifying other information collection tools (e.g. student and teacher surveys, policy evaluations) to monitor the digitalisation of higher education; and co-ordinating with the work of the expert groups (see Policy recommendation 3) to gather information on the quality of the online learning on offer.

3.3. Building the foundation: Digital infrastructure and data systems

Current state

Public authorities play a crucial role in developing nationwide, high-quality, digital infrastructure that enables higher education staff and students to effectively use digital technologies for teaching, learning, research and engagement. This section reviews the strengths and limitations of several policies in Hungary, including those related to investments in, and management of, digital infrastructure and data systems and policies that regulate the purchase and use of digital technologies in higher education.

Digital infrastructure and data systems investments and management

The Hungarian government has made useful investments in the ICT infrastructure that supports the digitalisation of Hungary's economy and society, in particular through expanding broadband Wi-Fi access and developing a national high-performance computer network (Digital Success Programme, 2016[1]; DSN/DHECC, 2020[5]). This backbone network infrastructure (the HBONE+ system) provides the basic infrastructure to support the digitalisation of higher education in Hungary.

Hungary has set up the Governmental Agency for Information Technology Development (KIFÜ), replacing the National Information Infrastructure Development Institute (NIIFI). KIFÜ's mandate is to implement and ensure the quality of national and EU co-funded ICT projects, develop and operate information technology infrastructure, including high-speed Internet, and provide services related to the use of this infrastructure to educational institutions at all levels, research organisations and public organisations such as libraries (Digital Success Programme, 2016[1]; DSN/DHECC, 2020[5]; KIFÜ, 2021[18]).

However, according to higher education stakeholders interviewed by the OECD, KIFÜ plays a larger role at the school level than at the higher education level, where support is often ad hoc and project-based, despite significant needs with respect to digital infrastructure renewal and upgrading, and a lack of ICT professionals in HEIs to conduct digital infrastructure development work. Those interviewed by the OECD reported limited resources dedicated to digital infrastructure in the higher education sector and a limited ability to mobilise private actors to provide support for digital infrastructure. In addition, higher education stakeholders participating in OECD interviews did not identify KIFÜ (or NIIFI) or any other national-level body as a source of relevant support on digital infrastructure. Furthermore, despite vast knowledge and experience with the infrastructure and services available to HEIs and involvement in large-scale (including EU-level) infrastructure projects and networks, the agency has had a limited role in shaping higher education policy related to the digital transformation, in informing decision making, and in contributing to long-term planning of digital infrastructure.

Besides establishing systems and structures to provide basic digital infrastructure, the Hungarian government has recently stepped up support to increase student access to digital devices, which has become a necessity in the context of the pandemic. In particular, the government issued an interest-free Student Loan Plus in 2020, which can be used for purchasing electronic devices for up to HUF 500 000. However, only a small share of students responding to the OECD survey (approximately 5%) reported using this loan (Annex B).

With respect to data systems, Hungary has invested in an effective higher education information system (FIR), which underpins much of the government's management of the higher education system. That system also contains unit record data on higher education institution employees. The student data is linked at the unit record level to other administrative data sources, building a longitudinal picture of students' progress through higher education and into the labour market (DSN/DHECC, 2020[5]), offering a rich source of system management information. However, the system does not currently offer information on the digitalisation of higher education.

Technology purchase and use

Government authorities not only invest in digital infrastructure but also play an important role in regulating the systems and tools used by HEIs, teachers and students. As discussed in the previous chapter, the government requires all public HEIs to use the same student information management system (NEPTUN) and requires that private institutions' systems be interoperable with that system. This facilitates the feeding of core student information into the FIR system. In addition, when combined with data from learning management systems (LMS) or virtual learning environments (VLE), if used by all students and staff, this student information data can form the basis for powerful learning analytics and interventions to support student success (DSN/DHECC, 2020[5]). However, there is room for improvement in the strategic use of these systems and the data they generate.

Public authorities are also responsible[8] for the procurement of ICT equipment across the system (MIT, 2016[2]; DSN/DHECC, 2020[5]). Equipment is procured at a national scale and is standardised along technological, economic and quality indicators, and is given a fixed price. Contracts are put in place with suppliers with a medium-term horizon to ensure stability and predictability. Centralised procurement is one way to ensure that HEIs' systems are interoperable and exploit market power.

However, the policy of centralised procurement of information technology (IT) equipment – and the four-year halt on procurement (MIT, 2016[2]) – has led to delays in procurement, a point made in the DES action plan (which proposed an easing of centralised procurement). Furthermore, the centralised processes cannot respond to local and institutional needs and have created a barrier to progress (DSN/DHECC, 2020[5]). This is especially the case with small and/or specialised purchases, which need to go through the same centralised process, but may be too small to be given high priority in a national allocation system.

Stakeholder interviews conducted by the OECD revealed a tension between the simplicity of centralised procurement and the inflexibility that the centralised system produces. Interviewees expressed concerns about the delays resulting from centralisation and the lack of flexibility (especially in the procurement of specialised equipment with a small number of users). On the other hand, they also expressed concern at the risk of the proliferation of multiple types of devices that may not be interoperable with institutional standards (see Annex A).

While some areas of digital infrastructure are strongly regulated, others may need greater government guidance. For example, while many students use their own digital devices for learning, there is a need for HEIs to enable "Bring Your Own Device" (BYOD) access to their networks, including legal access to commonly used software (Digital Success Programme, 2016[1]; DSN/DHECC, 2020[5]). However, no policies are currently in place that target this area.

Another area where government regulation is particularly relevant is data protection (further discussed in Chapter 4). Interviews of institutional stakeholders revealed emerging concerns regarding the safe and effective use of increasingly granular data, such as that provided by LMS and VLE, and concerns regarding intellectual property rights' protection limiting the take-up of certain practices, such as sharing educational content or using open data repositories.

Proposed policy recommendations

The Hungarian government has taken steps to support the development of digital infrastructure supporting effective teaching and learning. However, opportunities exist in several areas to support better and more flexible access to adequate technologies and to set a regulatory framework that provides standards of operability and data protection that can improve both the ease of use of digital technologies and the trust of users – students and staff – in these technologies.

Below are three areas for analysis and possible policy development that the Hungarian government, in close collaboration with Hungarian HEIs, should consider adopting as matters of high priority as they work to advance digitalisation in the higher education system.

Reconsider the balance between central control and autonomy in IT acquisition

One of the persistent messages that arose from the OECD's investigation of digitalisation in Hungarian higher education was that the centralised procurement process for ICT equipment and systems had many advantages (especially interoperability) but that it led to rigidity and procurement delays. This is particularly problematic in cases where there is a need for relatively small purchases (such as the systems needed for research programmes), which then have to take their place in a prioritisation exercise that includes large-scale, mission-critical systems. International experience suggests that it can be just as (or more) effective to define standards for systems (including interoperability) and then to allow institutions the autonomy to purchase their own equipment. Such an approach is more likely to enable timely replacement of infrastructure (Annexes A and C).

In the **United Kingdom**, where HEIs have the autonomy to manage their own infrastructure purchases, the government and the trade association for providers of educational equipment – the British Educational Suppliers Association (BESA) – have launched a service that vets suppliers and their products. This approach can be used to ensure interoperability of systems and means that institutions can access expert advice on purchase options and exercise their right to buy with confidence and without the rigidity and delays caused by centralised purchasing (British Educational Suppliers Association, 2021[19]).

Norway operates an infrastructure procurement policy that sees some services (for instance, payroll, access, identity management and student admissions) centralised and standardised. However, systems that need to be tailored to institutions' needs and processes (such as student data and LMS/VLE) are chosen by the institution (Norwegian Ministry of Education and Research, 2018[20]).

SURF is a co-operative of higher education and research institutions in the **Netherlands** that promotes collaboration among HEIs to address their ICT and digital learning needs. Experts from member institutions help peers across the country to ensure that services offered by educational technology providers are responsive to their needs. SURF experts advise on such areas as learner analytics, digital educational resources and infrastructure (OECD, 2019[21]; SURF, 2021[22]).

A relevant policy recommendation related to reviewing the approach to procurement of ICT equipment is as follows.

Policy recommendation 5: Reconsider the centralised approach to ICT systems procurement and collaboratively develop with HEIs criteria to support well-informed digital infrastructure strategies and investments

Government should identify an existing entity with sufficient financial capacity and expertise or fund the creation of a group of experts, from relevant government ministries and agencies, HEIs and the ICT sector, to:

- Recommend decision-making criteria for deciding which systems (if any) should remain subject to centralised purchase arrangements, taking into account cost considerations, issues of scale, the level of customisation and specialisation required, as well as interoperability and standardisation considerations. The group of experts should consult on the draft criteria with institutions and other experts in Hungary and other countries with relevant experience, recommend the resulting criteria for adoption by the government and set up a regular review process to ensure criteria remain current.
- Provide advice on how best to manage system procurement under a more devolved approach while retaining the principle of interoperability of any devolved-purchase system with government

systems and with core institutional systems. This would require identifying a set of standards that digital systems would have to meet and investigating the system standards applied in other jurisdictions (such as in the United Kingdom). The expert group should draft standards for systems to be purchased by Hungarian HEIs; invite Hungarian suppliers to comment on the standards and the match of products currently in use in Hungarian HEIs to those standards; conduct a peer review of the standards with experts in and outside of Hungary; and recommend the draft standards for adoption by the government.

- Provide advice on scenarios for the ten-year costs and potential savings of enhancing the ICT infrastructure of the higher education system and potential options for reallocation of that budget between government and HEIs.

Ensure access to high-quality digital devices and support services to use devices

One of the most pressing issues facing a higher education system as it moves to a digitalised environment is ensuring equity of access to networks, hardware and software, and information to all students and staff. The quality and ease of use of the digital technologies accessible, as well as the availability of support services, are also critical to support the widespread adoption of digital practices.

A relevant policy recommendation related to ensuring access to high-quality digital devices and support services to use devices is as follows.

Policy direction 6: Consider targeted funding to expand access to hardware and software and increase the capacity of HEIs to provide support to students and staff

- Invite the group of experts (see Policy recommendation 5) to recommend a compulsory, common minimum standard for students' and teachers' own devices for use on HEI ICT networks. Such a standard should also consider the requirement for all HEIs to establish support services that help students and teachers navigate institutional ICT networks and systems.
- Work with HEIs to identify investments needed to ensure that their ICT networks allow for bring-your-own-device (BYOD) access and that they have sufficient support services available to all students and staff, consistent with a common minimum standard.
- Given the Hungarian government's ambitious equity of access goals (MIT, 2016[2]), consider the extension of the interest-free loan scheme for the purchase of IT equipment, established in May 2020 for a longer period, or alternative financing schemes, such as a targeted lease scheme or subsidised purchase scheme to provide students and teachers who are unable to use their own device with the exclusive use of a device throughout their studies or work at a given institution.

Set data policies and standards

The government has taken important steps in creating higher education data systems (FIR), the student stipends system (HÖSZ) and the graduate tracking system. However, there is scope for improvement in the use of these data systems to understand the extent and depth of digital practices in higher education, the performance of digital education versus in-person education, and to support the improvement of teaching and learning, for instance, through the use of learning analytics (discussed in the next section).

As the use of data expands rapidly in digital learning environments, standards must be set to ensure the integrity and protection of learner data. Data integrity is a growing concern in areas such as digital assessment and credentialing, for instance. At the same time, data protection and use are increasingly important as more individual-level data is collected on individuals and their behaviours through LMS/VLE systems.

This places an obligation on the government, as manager of the system, to ensure that the data is managed well and that the data standards used in those systems are appropriate – including data definitions and

formats, standards for the housing of data, publication policies and data protection standards. It is also vital to ensure that those standards are applied uniformly by HEIs.

A relevant policy recommendation related to setting data policies and standards is as follows.

Policy recommendation 7: Create data policies and standards

- Invite the group of experts (see Policy recommendation 5) to assess existing government and institutional ICT and data policies and standards; compare Hungarian approaches with the standards, policies and practices in digitally advanced EU jurisdictions; draft and/or propose amendments to policies and standards as appropriate; consult with institutions and other national and international experts, including from the IT sector, on the draft proposals and then recommend them for adoption by government and institutions; and set up a regular review process to ensure policies and standards remain current.
  - Consultation with international experts could involve, for instance, the expert group on "ethical guidelines on artificial intelligence and data usage in education and training" that will be set up by the end of 2021 as part of the European Commission's Digital Education Action Plan 2021-27 (European Commission, 2021[23]).
- Areas of investigation should include, in particular:
  - policies regarding the integrity of data in a digital learning environment
  - standards for personal data protection and use
  - standards for the sharing and use of educational and scientific content
  - data publication standards
  - standards for BYOD access.

3.4. Developing the processes: Teaching, research and engagement

Current state

The processes of teaching, learning, research and engagement form the core of higher education activities and are largely within the remit of autonomous HEIs. However, these processes are also shaped by public policies and incentives that support and motivate higher education stakeholders – especially staff – to change pedagogical practices. This section reviews how public authorities have worked to support new processes of teaching and learning adapted to a digital environment in two areas – strategic policies and targeted projects – and discusses the strengths and limitations of these initiatives. It also briefly discusses efforts at the institutional level to support a greater focus on digital teaching and learning.

Government strategies

The Hungarian government has prioritised modernising higher education teaching and learning in an online environment in both the DES and Shifting of Gears strategy. It noted the need for "the pedagogical and teaching methodology knowledge of instructors…" to increase significantly and that "educational methodology and technology must be modernised". In addition, government strategies recognise the importance of aligning the policies that shape institutional and teacher behaviour to meet the needs of digital teaching and learning (Digital Success Programme, 2016[1]; MIT, 2016[2]).

The strategies also highlight areas where improvements have occurred and that provide a basis to build on, including the stronger focus on teaching transversal skills – including digital skills – and significant activity in developing materials for online learning and pedagogy (MIT, 2016[2]; MIT, 2021[8]).

However, some of the policies and systems that motivate the behaviour of institutions and individual academics may hinder the adoption of effective adoption of digitalisation in Hungary. As discussed in the first section on the policy framework, despite a change in the funding system that recognises and caters for part-time enrolments,[9] rigidities remain regarding the system of credit and quality assurance rules that hinder the flexibility needed to help online study flourish (DSN/DHECC, 2020[5]).

With respect to the employment and upskilling of academic staff, promotion is based principally on seniority and research performance, with little account taken of teaching performance. As a result, there is little availability (and therefore low take-up) of professional development, and academic staff cannot be obliged to engage in professional development (Annex A) (DSN/DHECC, 2020[5]). The government states that the higher education workforce requires upskilling but that "… the indicators for [Hungary] …in this area are very negative" (MIT, 2016[2]).

Projects supporting teaching and learning

In addition to broad strategies, projects have been initiated as part of the Shifting of Gears strategy and action plan that indicate a move towards digitalisation in the research and innovation work of higher education in Hungary (MIT, 2021[8]). Research journals and databases form part of the centralised digital higher education resources collection. The government requires all academic research publications to be deposited in the Online Library of Hungarian Academic Works, which is then linked to the Elsevier Scopus database. This gives greater visibility to the research output of the system. Institutions also take action to expand their access to digital resources. For instance, as a member of the European Digital UniverCity (EDUC) alliance, the University of Pecs can draw on the rich digital research resources of that alliance (DSN/DHECC, 2020[5]).

In addition, Hungary takes part in international peer-learning exercises to promote pedagogical innovation in higher education. Hungary participates, for instance, in the European Union's PROFFORMANCE project, which creates opportunities to assess, benchmark and profile the performance of higher education teachers (DSN/DHECC, 2020[5]).

Despite these initiatives that support improvements in digital teaching and learning, important opportunities have not yet been exploited, particularly making analytical use of data generated by digital technologies. For example, while institutions do have LMS/VLEs, and while teachers and students reported in the OECD survey that LMS access was typically sufficient or good (Annex B), it appears that little use is made of learning analytics, which could boost the quality of learning and improve student success (Annex C) (Guiney, 2016[24]; Cardoso, Costa and Santos, 2017[25]; Georgia State University, 2018[26]). At the national level, there are detailed datasets – the Higher Education Information System, the Database on Student Stipends and the Graduate Tracking System – that enable an analysis of, and research into, the performance of institutions and the system. However, it appears that the potential of these systems has not been fully exploited for that purpose (DSN/DHECC, 2020[5]).

Increasing the frequency with which institutions develop strategies

In Hungary, higher education leaders who responded to the OECD stakeholder consultation survey reported that institutional structures dedicated to digitalisation are becoming more prevalent, with about 20% of the leader respondents noting their institution had such structure before the pandemic, and more than 30% reporting such structure having been put in place in the wake of the pandemic (Annex B). Despite progress, stakeholders interviewed by the OECD reported that many HEIs continue to lack dedicated structures equipped to provide technological and pedagogical support and that the use of such structures is uneven – with more take-up of services in settings where there is longer and deeper institutional experience with digital teaching and learning. Even where those structures exist, in the context of the growing adoption of online teaching, it is unclear they would have sufficient capacity to keep pace with increased digitalisation in higher education.

Proposed policy recommendations

Building the infrastructure, data systems, standards and policies that enable digitally enhanced teaching and learning is a critical step towards the digitalisation of higher education. However, to capitalise on that investment, Hungarian authorities can support HEIs in their work to ensure that they have the processes – and especially, the teaching and learning processes – that can take advantage of those systems and standards. Teaching in an online environment has – or should have – a different pedagogy from traditional teaching. This requires institutions to help teachers and students adapt to this new environment. While this responsibility lies primarily with HEIs, the government can play a role in providing support and incentives and in removing barriers that exist in the legal and policy framework.

Below are three areas for analysis and possible policy development that the Hungarian government, in close collaboration with Hungarian HEIs, should consider adopting as matters of high priority as they work to advance digitalisation in the higher education system.

Improve support to help academic staff engage in digital teaching

The pandemic has induced a sudden shift to digital teaching and learning, which students and staff have mostly accepted as a necessity in the emergency context. If it is to become a sustainable mode of teaching and learning, generating good learning outcomes and the satisfaction of both students and staff, it requires re-thinking how teaching and learning are done in higher education. As noted in Chapter 2, countries where higher education teaching is characterised by student-centred pedagogies rather than traditional frontal teaching tend to show higher rates of engagement in online learning. Governments in these countries often fund dedicated structures to experiment with, and scale, student-centred, digitally enhanced pedagogies in higher education.

Some OECD countries have made strides to support the expansion of online teaching and pedagogical innovation, having begun these efforts before the pandemic. For example, **Ireland**'s National Forum for the Enhancement of Teaching and Learning in Higher Education is an entity funded by the country's Higher Education Authority to lead and advise on enhancing teaching and learning in Irish higher education. The National Forum co-ordinated the design and implementation of the INDEx survey and works with the Higher Education Authority on other projects supporting pedagogy on line. In addition, it offers professional development opportunities to teachers and funds initiatives that aim to support teaching and learning enhancement. It also encourages teachers and HEIs to exchange information on teaching. During the pandemic, online teaching resources have been shared through its network (National Forum for the Enhancement of Teaching and Learning in Higher Education, 2021[27]).

In **Wales (United Kingdom)**, the government began in 2012 to provide free, centralised and universal access to classroom-focused tools and resources for all teachers and learners in the country. This platform, Hwb, encompasses over 2 800 educational resources from a wide range of providers (museums, media entities, non-governmental organisations), which are accessible for use inside and outside of class by school-level students. A pilot for a higher education equivalent is now underway (Welsh Government, 2021[28]).

At the institutional level, the KTH Royal Institute of Technology in **Sweden** introduced the Faculty Pedagogical Developer Initiative. Central to the project was the creation of the role of "pedagogical developer". Twenty-four faculty developers – academics recognised for the excellence of their teaching – were appointed. Pedagogical developers facilitate co-operation and knowledge exchange between faculty members. Participation in the initiative is now integrated into KTH's faculty professional development programme (Berglund et al., 2017[29]; Viberg and Mavroudi, 2019[30]).

A relevant policy recommendation related to improving support to help academic staff engage in digital teaching is as follows.

Policy recommendation 8: Strengthen support for higher education staff to expand the adoption of digitally enhanced, student-centred pedagogies

- Work with HEIs to investigate the prevalence and effectiveness of structures in HEIs that are dedicated to digitalisation, at the strategic governance level (e.g. digitalisation office/officer in the institutional leadership team) and at the operational level (e.g. teaching and learning office with a focus on supporting digital teaching and learning serving staff and students). This work should include consultation with the professional staff working in those structures, higher education leaders, academic staff and students.
- Consider targeted funding – matched by local institutional resources – to strengthen these structures' human and financial resources where necessary to increase their reach and impact.
- Consider strengthening the reach and visibility of a national body to conduct research and innovation in student-centred pedagogies, with a focus on digital technologies. Such body should be structured in a way that makes it highly responsive to the needs and priorities of HEIs, considering for instance the approach taken by the Irish National Forum for the Enhancement of Teaching and Learning in Higher Education, which academically-led board provides strategic guidance, oversight and leadership (National Forum for the Enhancement of Teaching and Learning in Higher Education, 2021[27]). This body would, in particular, foster collaboration among Hungarian institutions, so that HEIs with the most experience can share good practices – and the conditions for their implementation and scaling – with other HEIs. Such a body could also play a key role in collecting good practices from other countries and fostering professional networks (for example, of teaching and learning centre professionals) to ensure Hungarian higher education staff have easy access to international good practices.

Strengthen the incentives for academic staff to engage in digital teaching

Policy recommendation 2 proposed assessing a range of Hungary's existing higher education policies to provide a basis for a move to digital education and to identify and eliminate obstacles to the take-up of online teaching and learning. This included a suggestion to work with HEIs to adjust the criteria for assessing teacher performance in order to respond to the need for teachers to master online teaching. It also included a discussion of employment conditions (including salary arrangements and approaches to supporting staff) for higher education teachers so as to allow and encourage them to take on professional development that provides the skills needed for delivering and assessing online learning. These proposals address only some of the reported difficulties experienced by higher education teachers in adapting to a digital environment, as stakeholders reported that the problems with the academic profession in Hungary run deeper.

Some OECD countries have tried to improve the standing of higher education teachers and the prestige of the higher education teaching profession, for example, to increase teacher motivation to engage in pedagogical innovation.

At institutional level, such schemes operate, for instance, at the University of Edinburgh, in **Scotland (United Kingdom)** and the University of Canterbury, in **New Zealand**, where academics with a record of excellence in teaching and learning are given additional time to engage in the scholarship of teaching and learning and to share their practice with colleagues (University of Edinburgh, 2017[31]; University of Canterbury, 2021[32]).

Also, in the **United Kingdom**, higher education teachers can apply for membership to the prestigious Higher Education Academy by presenting a portfolio that demonstrates their skills and capabilities as teachers (Advance HE, 2021[33]). In 2001, the **New Zealand** government established annual tertiary teaching excellence awards, with the leading awardee each year receiving the Prime Minister's Supreme Award for Tertiary Teaching Excellence. All those who receive awards are granted membership to an academy comprised of an elite group of excellent teachers who provide expertise and advice to the

government and their colleagues. These awards gain considerable media coverage and have lent status to the teaching component of academics' roles (Ako Aotearoa, 2021[34]). Similarly, in 2017, the **Netherlands** started the Comenius Fellowship scheme, which awards competitive grants to teachers and HEIs stimulating innovation in teaching (Dutch Ministry of Education Culture and Science, 2015[35]).

A relevant policy recommendation related to strengthening the incentives for academic staff to engage in digital teaching is as follows.

Policy recommendation 9: Revise the employment framework for Hungarian higher education staff to reward quality digital teaching and identify and disseminate examples of excellent teaching

- Convene a panel of innovative teachers from Hungary and other leading countries to identify criteria for assessing teacher performance in a digital teaching and learning environment.
- Encourage the rectors of Hungary's HEIs to investigate opportunities to identify and highlight examples of excellent teaching – including excellent and innovative online teaching – and explore mechanisms for disseminating those examples across teaching staff. This could include:
  - identifying options for raising the profile and prestige of higher education teaching, such as an excellence and innovation awards system that honours excellent teachers and/or the creation of an academy of excellence (or similar grouping) hosted by the Rectors' Conference, that would provide the opportunity for awardees to promote their practice among their peers.
  - encouraging institutions to identify and honour excellent and innovative teachers among their own staff and to identify mechanisms to share their practice among their peers.
- While outside the scope of this project, the unattractive conditions of the academic profession in Hungary may hinder the development of the academic workforce and the take-up of pedagogical innovation and digital technologies among staff. Employment conditions should be reviewed to understand concerns about low remuneration levels (and claims of problematic incentives arising from low remuneration), high workloads, teachers' limited interactions with students, intellectual property protection and other matters. Depending on the results of that review, consideration could be given to developing a plan to improve the employment arrangements of academics.

Explore the potential of data to help institutions improve student success in Hungarian higher education

Hungary has extensive and well-linked data systems on higher education. Moreover, most of its institutions use LMS or VLE. However, these data resources have not been widely used to improve the experience and the success of students.

At the Lisbon University Institute (Instituto Universitário de Lisboa, ISCTE-IUL), a public university in **Portugal**, learning analytics have been used since 2016 to create a learning scorecard dashboard to monitor course performance. The dashboard draws data from the LMS and students' academic records. Students' behaviour within the LMS is monitored on several dimensions, including student engagement, responsibility and collaboration. Students can use the dashboard to assess their performance while teachers have granular feedback on class performance (Cardoso, Costa and Santos, 2017[25]).

At Georgia State University in the **United States**, predictive analytics have been used since 2012 to follow student performance. Over 40 000 students are assessed for a wide range of risk factors every day, including if they have learning issues critical for future coursework that need to be addressed to minimise the risk of failure. Early intervention is a priority – alerts are sent to both students and faculty when risks are identified, and one-on-one meetings are scheduled to help the student improve. In other words, predictive analytics lead to prescriptive actions designed to reduce the risk of failure. The results demonstrate both a decrease of more than a semester in average time to degree and an improvement in attainment for disadvantaged students (Georgia State University, 2018[26]; Georgia State University, 2021[36]).

Bailey et al. (2018[37]) present six case studies from the **United States**[10] where institutions have used a shift to online learning to gather information drawn from their own administrative systems, their online learning records and their LMS, to improve student success.

A relevant policy recommendation related to exploring the potential of data to help institutions improve student success in Hungarian higher education is as follows.

Policy recommendation 10: Explore the potential of using learner analytics to lift learner success

- Encourage HEIs to ensure that there is high (if not universal) take-up and use of LMS/VLEs by their academic staff in order to broaden the base of learner data in the system, creating a robust platform for the introduction of learner analytics.
- Promote peer learning by inviting successful international practitioners of learner analytics to come to Hungary to demonstrate their systems and approaches to implementation.[11] Also, encourage institutions to identify staff interested in developing learner analytics to engage with practitioners and visit institutions abroad that have implemented learner analytics successfully.
- Encourage HEIs to identify staff who might be seen as champions for learner analytics and who can help advance its take-up across the system.

3.5. Delivering benefits to users: Students, graduates and employers

Current state

To be effective, digitalisation strategies of government and HEIs need to deliver results to students, graduates, and to employers who hire those graduates. This section places special emphasis on student access to digital technologies, their experience with digital learning and their digital skills, highlighting both strengths and weaknesses in these areas.

Access to technologies and digital skills

The OECD survey conducted for this project confirms the extent of the shift to online learning in the face of the COVID-19 pandemic, as close to all respondents reported that their work had migrated on line (see Annex B). There are good institutional-level examples of responses to the pandemic that forced academics to adopt online learning with little notice or preparation time. Some of those cases were initiated pre-COVID but provided examples of what is possible (DSN/DHECC, 2020[5]).

Hungarian students, by and large, enter universities with expectations of flexible, engaging delivery of teaching (Annex A). Most current entrants to higher education also have their own digital devices, with 93% reporting that they have access to an adequate (or better) computer (Annex B); the Digital Education Strategy states that “almost 100% of students entering higher education have the appropriate digital equipment (laptop, smartphone, desktop computer).” Furthermore, the great majority of students responding to the OECD survey (90%) stated that they had adequate Internet access. In addition, most (90%) had a mobile device (Annex B). Further, there is a significant body of knowledge resources available on line – including the Online Library of Hungarian Academic Works, which is integrated with the global publications database Scopus (DSN/DHECC, 2020[5]). These are important tools needed for digital education and research.

However, students in many institutions cannot connect to the institutional IT network and therefore do not have legal access to software packages (Digital Success Programme, 2016[1]; DSN/DHECC, 2020[5]). In addition, a lack of standardisation of software within institutions means that students need to change software depending on which activity or course they are engaging with (Annex A).

The digital skills of students entering higher education are an important factor shaping their ability to use digital technologies effectively. Students' widespread access to digital devices and adequate Internet connection, plus the fact that the use of ICT equipment at schools in Hungary is above the median for OECD countries (OECD, 2019[38]), imply that many students enter higher education with reasonable basic digital skills (DSN/DHECC, 2020[5]).

However, the participation rate in Hungarian higher education is relatively low, compared with other OECD countries (OECD, 2020[39]), especially among disadvantaged groups such as Roma, those with disabilities, and those who are disadvantaged as a result of regional factors (MIT, 2016[2]; DSN/DHECC, 2020[5]; MIT, 2021[8]). In addition to facing barriers due to poorer school achievement and socio-economic challenges, students from under-represented groups in higher education may not have access to digital devices or suitable broadband at home (Annex A) and may have lower exposure to digital devices than other higher education entrants. Therefore, as Hungary expands higher education access, the share of entrants with adequate access to devices and digital skills may decrease.

Student learning experience

The student experience in an online environment is shaped in large part by pedagogical approaches that are prevalent in the country: both national and international analysis suggests that there is a need to modernise pedagogical practices and enhance the labour market relevance of higher education teaching in Hungary, regardless of the delivery mode (MIT, 2016[2]; OECD, 2021[40]).

Students interviewed by the OECD reported mixed experiences with online teaching (Annex A). While they recognised the success of their HEIs and teachers to switch rapidly to online teaching, some expressed concerns about the difficulty of staying engaged in the online environment. The OECD survey confirms these views: the majority of students who responded to the OECD survey found online learning more convenient than in person (more than 60%), but a large share (45%) noted that it was less interesting than in person (Annex B), raising questions about whether their teachers were using digital tools as well as they might. Furthermore, as discussed previously, the unexploited potential of learning analytics suggest that more could be done to support student success and limit the risk of higher dropout rates in an online environment, mentioned by many stakeholders interviewed by the OECD (Annex A).

There was also minimal discussion through OECD interviews of the new learning opportunities that digital technologies provide. These include, for instance, the development of micro-credentials, which are short, modular learning units that can help learners gain new skills to improve their labour market opportunities or help them advance in their educational pathways. Digital technologies, in particular, facilitate the delivery, and take-up, of such credentials, with a large share of micro-credentials focusing on skills in demand in the labour market, such as digital skills (Kato, Galán-Muros and Weko, 2020[41]). However, the limited discussion of these topics may suggest these are yet to emerge as a tangible opportunity provided by digital learning in Hungary.

Proposed policy recommendations

Several policy recommendations provided in this report support the delivery of good outcomes for learners, graduates and employers. This includes Policy recommendations 5 and 6, which aim to enhance the capacity of institutions to make strategic decisions regarding digital infrastructure and effectively acquire the digital tools needed to support digital teaching and learning. Policy recommendation 10 proposes that Hungarian HEIs explore the potential of using learning analytics to improve learner success. Finally, Policy recommendations 2, 8 and 9 aim to ensure that the higher education policy framework facilitates the expansion of digitally enhanced teaching and learning and the support and incentives for higher education teachers to engage in innovative, student-centred pedagogies in a digital environment.

In addition, one of the crucial challenges facing the Hungarian system is to improve access to, and participation and success in, higher education. While those issues are broader than the question of digitalisation, they cannot be wholly separated. Unless accompanied by adequate support, further digitalisation is likely to exacerbate existing disparities in access and success in higher education; and those from disadvantaged groups are more likely to lack good access to digital devices, resources and skills that will be increasingly needed to succeed as the higher education system becomes more digitally enabled.

Below are two areas for analysis and possible policy development that the Hungarian government, in close collaboration with Hungarian HEIs, should consider adopting as matters of high priority as they work to advance digitalisation in the higher education system.

Use data to conduct analysis on equity of access and success in digital higher education

Given the rich national education datasets that Hungary has, the issue of accessibility can and should be explored to identify the source of disparities. For instance, it is useful to further explore how disparity of access is affected by regional factors, socio-economic factors and school achievement factors and whether disparities in school achievement are exacerbated by ICT availability, access and use. Further to such analysis, Hungary could explore how to use digital technologies and learning analytics to support the students who enrol in higher education but may be at risk of dropping out, especially in a digital environment.

In addition, there is scope for Hungary to leverage the opportunities of digital technologies to enhance learning opportunities for all learners. This is increasingly relevant in a digitalised economy where labour market needs – and skills needs – change rapidly and require workers to regularly update their skills. In some OECD jurisdictions, for instance, **Finland** or **Ontario (Canada)**, online one-stop campuses have been created to facilitate access of learners of all ages to recognised, credit-bearing learning opportunities (see Annex C).

Two further areas of work for consideration by the Hungarian authorities that focus on equity of access and success in digital higher education are as follows.

Policy recommendation 11: Engage in analysis and research into problems of access to higher education among some groups and develop interventions to enhance equity of access

- Develop a plan for analysis of the country's national education and other data to identify groups with poor access to higher education and ICT resources (such as digital devices and fast broadband).
- Develop school-level interventions aimed at lifting the aspirations of those groups, providing them with learning and other supports, raising their school achievement and helping them move into higher education with adequate skill levels and learning support, and therefore, with a reasonable chance of success.
- Develop higher education level interventions making use of digital technologies and learning analytics to provide students with behavioural incentives to engage with digital teaching and learning.

It was also proposed in Policy recommendation 4 that the government design a plan to collect data on students' take-up of and achievement in online learning. The following policy direction sets out a longer-term objective, once effective data collection and analysis systems are in place.

Policy recommendation 12: Analyse patterns of students' take-up of and achievement in online learning

- Once data on digitally enhanced teaching and learning are collected (see Policy recommendation 4), analyse the data to identify patterns of take-up by:

  - type of institution (for example, identify institutions or types or regions of institutions that are less inclined to offer online learning)
  - type of programme (for example, level, field of study, full-time/part-time)
  - type of student (for instance, demographic and other background characteristics).
- Conduct the same type of analysis to determine how success in online learning compares with traditional in-person delivery.
- Complement those analyses with survey data and other data on what parts of the delivery cycle (theory, practical and fieldwork, assessments, etc.) are being digitalised.
- Monitor trends over time to assess how well online learning is being implemented across the higher education system.

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Notes

1. See Section 26 of Act CCIV of 2011 (Higher Education Act).
2. See Government Decree No. 87/2015 of 9 April 2015 on the implementation of certain provisions of Act CCIV of 2011 on national higher education.
3. See Government Decree No. 395/2015 of 12 December 2015 on implementing Act XXXIII of 1992 on the legal status of public service employees.
4. These are defined in Government Decree 139/2015 of 9 June 2015.
5. This could be arranged through the international exchange schemes run by the Tempus Foundation.
6. Similar to the US National Center for Education Statistics data collection approach, courses in New Zealand are assigned to one of four groups according to the extent of use of online approaches – from wholly online, two levels of partial online and wholly in person (New Zealand Ministry of Education and Tertiary Education Commission, 2020[43]).
7. In an Australian study, Bailey et al. (2015[42]) found that a specific mode of study provided may benefit one student but hinder another.
8. Under Government Decree No. 168/2004 (V.25) and the 2015 CXLIII. Law on Public Procurement.
9. Under Government Decree No. 89/2016 (XII. 2.) on the financing of the core activities of HEIs.
10. Rio Salado College, Arizona State University, Houston Community College, Kentucky Community and Technical College System and University of Central Florida, as well as Georgia State University.
11. This could be done, for instance, as part of academic exchange programmes supported by the Tempus Foundation.

4 Measuring the digitalisation of higher education in Hungary

This chapter focuses on approaches to measure the digitalisation of higher education in Hungary. It first introduces different data collection approaches and indicators used internationally to measure the digital transformation in higher education, assessing the benefits and drawbacks of different approaches. It then provides an overview of higher education data collection in Hungary and discusses potential future data collection and priority indicators to assess progress in the digitalisation of Hungarian higher education.

4.1. Challenges in measuring the digitalisation of higher education

The coronavirus (COVID-19) pandemic has accelerated the pace of digitalisation in higher education worldwide. However, data that could help obtain a nuanced understanding of how much and what type of digitalisation is taking place in higher education are rarely collected in a consistent manner at an institutional or national level.

Several factors may contribute to the lack of data in this area:

- **Low policy priority until recently**: Digital higher education, while it has existed for decades, has long represented a small share of total higher education enrolments across OECD countries. It has often been a means to reach students not able to attend higher education institutions (HEIs) in person due to geographic, time or personal constraints. In the **United States**, one country that has data on online enrolments, it has often developed in non-selective, often private, HEIs (see for instance (Xu and Xu, 2019[1]). Digital higher education has therefore not been a priority of governments requiring data to be collected and reported by publicly funded HEIs.
- **Difficulty developing definitions of digital higher education**: The institutional autonomy and academic freedom characteristic of higher education systems in most OECD countries – in contrast to public school systems – means that digitalisation takes a wide variety of forms in higher education. Identifying what course, programme or learning module counts as "e-learning" or "digitally enhanced teaching and learning", for instance, varies considerably across and within both countries and HEIs. The concept of digital enhancement is not binary: a course can use digital tools as an add-on to traditional in-person delivery (for instance, making materials and videos of lectures available on line); or as an essential component of delivery (such as making some parts of the delivery and assessment available only on line); or making all aspects of the course available on line (so there is no in-person component at all). These differences are important to take into account in the design of a measurement system (Guiney, 2016[2]; Ifenthaler, 2021[3]), but entail costs to ensure rigorous definition development, data collection, categorisation and reporting.
- **Need for data collection tools that help understand user practices**: Understanding digitalisation in higher education involves not just measuring inputs that characterise digital readiness (e.g. access to hardware and software) but also the uses of digital technologies by students and staff. As discussed later in this chapter, these tools are often surveys that can involve significant development costs, data quality issues and a high compliance burden for respondents.

These factors make it difficult to quantify in a comparable manner at an institutional or system level the *amount* of e-learning or digitally enhanced teaching and learning that takes place. Furthermore, this diversity makes it challenging to measure the *efficiency, quality and equity* of digitally enhanced teaching and learning, which require adapting higher education data collection to this diverse and fast-changing type of teaching and learning provision.

At the same time, digital higher education involves new measurement opportunities. This is because digital teaching and learning practices generate a large amount of detailed data that, coupled with student outcomes data, can generate rich insights into student weaknesses and strengths and support student success. In particular, if instructors design their courses to make central use of a learning management system (LMS) or virtual learning environment (VLE), the system will generate a record of the transactions of each student with the course components (Ifenthaler, 2012[4]). The data generated in the LMS/VLE creates an opportunity for *learning analytics*, which is the use of that data – often in conjunction with other sources of student data – to track a student's engagement with learning.

Despite the challenges to measure the digitalisation of higher education, some governments and HEIs across OECD countries have developed methods to monitor the provision of digitally enhanced teaching

and learning. Three key methods for measuring the digitalisation of higher education include administrative data collection, surveys of higher education students and staff, and the use of learning analytics.

The following sections look at these three methods in turn, discussing the data collection approach and indicators they generate and their benefits and drawbacks. While not discussed in this chapter, it should be noted that other methods, such as interviews and focus groups with users of digital technologies in HEIs, also offer rich qualitative data that are important to the understanding of the level of digitalisation at the institutional and system levels.

A final section provides a summary table of the three methods, discusses the benefits of combining the three methods to obtain a deeper understanding of digitalisation in higher education and discusses common issues, such as data privacy and use.

4.2. National administrative data systems

Data collection approach and indicators

Administrative data on higher education is the data an institution collects to manage its processes (for instance, of enrolment, assessment and completion), students, staff, academic programmes, research, finances and physical assets. Administrative data is housed in the institution's databases and is processed by its systems – such as its student management system, finance system and asset management system.

Most of an institution's data on students, staff and academic processes will be held at unit-record level; each individual student is assigned an identifier, with the databases holding data that enable the identification of and communication with the student, his or her demographic characteristics, academic history, as well as what classes he or she is taking and the results of assessments in those classes. This sort of data is used for critical administrative functions, such as generating class lists, recording grades, producing result notices and academic transcripts, and establishing entitlements to graduate. Likewise, staff data are held at the unit-record level and are used to populate the payroll system, etc.

To manage a higher education system – to run its funding system, inform policy, and monitor the system's performance and quality – governments require institutions to submit extracts or summaries of each institution's administrative data. Governments typically specify the form of the data it collects and the fields on which it requires data, and institutions will be obliged to ensure that the data they collect from students is sufficient to enable them to complete the government's data collection.

As a result, administrative data collected at the institutional level is consolidated to create a national administrative dataset. The collection of HEI administrative data by the government is usually done in one of two possible ways – by uploading an extract from the *unit-record* data or by collections of *aggregated* or summary data (Box 4.1).

Box 4.1. Two approaches to collecting national administrative data: Unit-level and aggregated

Public authorities in OECD countries take different approaches to collecting higher education administrative data at the national level. Government unit-record data on enrolments and completions, courses and programmes are routine in **Australia** (Australian Government, 2021[5]), **New Zealand** (New Zealand Ministry of Education, 2021[6]) and the **United Kingdom** (HESA, 2021[7]), as well as **Hungary** (DSN/DHECC, 2020[8]). In the **United States**, aggregated data is collected by the federal government agency, the National Center for Education Statistics (NCES), in the Integrated Postsecondary Education Data System (IPEDS) collection (NCES, 2021[9]).

A national unit-record data collection requires all institutions to manage their data in ways that fit the government's data model. This can impose high costs on smaller institutions. It can also create concerns about data privacy. The **United States** has a long-standing ban on federal collection of unit-level higher education data motivated primarily by privacy concerns (Miller and Shedd, 2019[10]). However, many US states do collect unit-record data on students enrolled in public higher education institutions (SHEEO, 2021[11]).

However, a unit-record dataset allows analysts the flexibility to look at any combination of variables. It also allows for the use of more advanced statistical modelling techniques to establish the statistical significance of the relationship between variables – for instance, which factors are significantly related to the probability of completing a higher education programme.

Given the challenges of defining digital higher education, collecting administrative data on the digitalisation of higher education is difficult, particularly at the national level. However, some countries do require HEIs to report administrative data that shed light on the provision of digital higher education at a system-wide level. The indicators collected typically help provide a picture of the scale of digital provision, in terms of institutional provision (number of courses, programmes, fields and levels of study) and student participation (enrolment, completion, student demographics).

In the **United States**, the National Center for Education Statistics manages the Integrated Postsecondary Data System (IPEDS), a national database that collects data on a wide array of indicators enabling a detailed understanding of the US higher education system. IPEDS collects data through institutional surveys covering the following topics: institutional characteristics, completions, 12-month enrolment, student financial aid, graduation rates, 200% graduation rates, admissions, outcome measures, fall enrolment, finance, human resources and academic libraries (NCES, 2021[12]). IPEDS also collects data on distance education, defined as:

> *education that uses one or more types of technology to deliver instruction to students who are separated from the instructor and to support regular and substantive interaction between the students and the instructor synchronously or asynchronously. The following types of technology may be used for distance instruction: Internet; satellite or wireless communication; and audio and video conferencing. (NCES, 2021[13])*

Courses and programmes offered by HEIs are only considered distance education if all instructional components can be completed remotely. As a result, degree programmes that offer a blend of in-person and online instruction are not classified as distance education by IPEDS. However, IPEDS does track whether distance education programmes have non-instructional onsite components, e.g. orientation for new students or testing. Table 4.1, adapted from the IPEDS website, outlines the distance education data indicators collected by IPEDS.

Table 4.1. Overview of distance education data collection in IPEDS

Survey component	Collection period	Data coverage period	Distance education (DE) courses	Distance education programmes	Data collected
Institutional characteristics (IC)	Fall	Current academic year	Yes	Yes	Captures whether institutions offer DE courses and/or programmes for undergraduate and graduate students and whether all programmes are offered exclusively via DE
12-month enrolment (E12)	Fall	1 July-30 June (prior year)	Yes	No	Captures the number of students enrolled in DE courses over 12-month period
Fall enrolment (FE)	Spring	Institutions' official fall	Yes	No	Captures the number of students enrolled in DE courses in the fall term and, of the students enrolled exclusively via DE, the number located in various geographic categories

Survey component	Collection period	Data coverage period	Distance education (DE) courses	Distance education programmes	Data collected
		reporting period			
Completions	Fall	1 July-30 June (prior year)	No	Yes	Captures whether all, some or none of the programmes within each CIP code and award level can be completed entirely via DE and whether certain DE programmes have onsite components (non-instructional components such as orientation or testing, do not exclude a course from being classified as DE).

Note: CIP code refers to the Classification of Instructional Programs and is the coding system for different programme types an institution offers.
Source: NCES (2021[13]), *Distance Education in IPEDS*, https://nces.ed.gov/ipeds/use-the-data/distance-education-in-ipeds.

In addition to distance education (DE) data, IPEDS collects data on institutions' digital/electronic library resources, including the number of digital/online books, databases, media and serials. While IPEDS distance education does not track digital practices (use of digital technology by students and staff), library resource data is one measure of digital readiness, as it covers the availability of digital resources. The 12-month enrolment in distance education has only been added in the most recent academic year, however, and therefore longitudinal data series are not yet available. The other three elements are presented from 2012 in individual, institutional data profiles.

The IPEDS collection does not count the number of students enrolled in DE who complete or pass courses or programmes, meaning there is no comparative data on completions in DE and other delivery modes.

In **Australia** and the **United Kingdom**, where institutions supply unit-record data to government agencies (Australian Government, 2021[5]; HESA, 2021[7]), data on delivery mode make it possible to report on pass rates in distance education.

In **New Zealand**, the Single Data Return (SDR) system collects data from HEIs on their programmes and courses and on each student's enrolment and completion of courses and programmes to generate a detailed view of the system. Courses are categorised by the academic department responsible for delivery of the course on whether they have elements of e-learning and, if so, the extent of the e-learning – whether the online components are optional add-ons, or essential and significant, or if the course is delivered wholly on line (New Zealand Ministry of Education, 2021[6]). However, there is some uncertainty as to whether the definitions in the SDR manual of those categories are precise and detailed enough to ensure that institutions apply them in a uniform and consistent manner.

This approach enables analysis of the degree to which institutions are making use of online teaching, differences between different programmes in their uptake of online delivery, the proportion and characteristics of students studying on line and, significantly, how the pass rates of students differ between fully online, partly online and fully in-person delivery, controlling for student demographic characteristics, level and field of study and other variables (Guiney, 2016[2]).

The examples from the United States and New Zealand show that the indicators produced through administrative data systems enable a country to estimate the extent of the take-up of digitalisation, with more granularity in the cases of systems enabling unit-level data collection.

Advantages and limitations of national administrative data systems

In most cases, administrative data systems cover the whole of the higher education system, counting every enrolment and every completion in every HEI. Therefore, unlike survey data, there is no margin of error (or sample error) and no sample bias in administrative data. Because it is an essential component of the management of the system, administrative data is collected to a consistent standard, with the core

variables unchanging from year to year. This provides continuity. It also creates the opportunity for government to link administrative data on higher education to data from other sources (such as labour market data) to provide for deeper analysis of the system's performance.

The purpose of administrative data is efficient management of an entity or system. It is factual data that derive from administrative transactions, also called events. In a higher education institution, the administrative data on transactions such as enrolment, fees payment and passing of courses is critical for the running of the institution. It also has considerable analytical value, for instance, enabling the institution to look at how different groups of its student population perform. However, such analysis is necessarily limited because while it can show that one group of students performs at a lower level than other groups, its ability to explain why is limited. The variables in the administrative dataset will not normally include items that give insight into attitudes, experiences and judgements.

The varying capacity levels of HEIs providing data is also an important consideration. In some instances, the task of reporting data to public authorities may fall to institutional staff members undertaking a wide range of tasks who do not have prior training or experience with administrative data collection and reporting, operating within small organisations with limited resources. Therefore, balancing and reducing as much as possible the reporting burden for institutions is an important lesson learnt from countries with complex administrative data systems, such as the United States.

Furthermore, the quality of administrative data may vary between fields; fields perceived by the institutions as important for their own institutional management purposes and those used by the government for its system management are likely to be best maintained.

The long-standing problem of defining and categorising courses according to their online content, as discussed previously, may have been exacerbated by the pandemic. The switch to online learning during the pandemic has given rise to growing interest in hybrid learning – combining online and in-person elements – even after in-person instruction becomes possible again. If most courses incorporate online components, distinguishing courses delivered fully or partly on line is likely to become more difficult to do. Near universal adoption of online delivery makes the question of how well digitalisation has occurred more significant than the question of whether digitalisation has occurred.

4.3. Surveys

Data collection approach and indicators

In some higher education systems, nationwide surveys are used as an important data collection instrument to complement other data sources on higher education. Surveys are often conducted to obtain a nuanced understanding of the experience of higher education students, graduates and employers, which helps calibrate public policies and institutional strategies according to the feedback of the key "users" of the higher education system.

Some systems regularly conduct student and graduate surveys to examine their higher education experience and satisfaction, as in **Denmark** and **Hungary** (Danish Ministry of Higher Education and Science, 2020[14]; Educational Authority, 2020[15]). Other systems, such as **Australia** and the **United Kingdom**, use surveys to collect feedback from employers and local stakeholders on the relevance of higher education (Australian Government, 2020[16]; UK Department for Education, 2020[17]).

These surveys may be census style, where every student and staff member is invited to participate, or may have representative samples of the targeted groups. While administrative data are collected and managed by HEIs and public authorities, survey data may be collected by other higher education stakeholders (e.g. student and teacher unions) and private companies, in addition to HEIs and public authorities.

Some countries opt for using surveys to collect evidence on the digital transformation in higher education. For example, in **Ireland**, the National Forum for the Enhancement of Teaching and Learning in Higher Education (National Forum) conducted the Irish National Digital Experience (INDEx) survey in 2019 (National Forum, 2020[18]). INDEx was a system-wide survey conducted in 32 higher education institutions (including 7 Irish universities, 12 institutes of technology and 13 private colleges/other higher education institutions), representing 96% of the entire higher education sector in Ireland. According to experts involved in the survey interviewed by the OECD team, the results have been used at the institutional and policy level to consider new approaches to support the effective use of digitalisation in higher education. A second round of the survey is currently under discussion.

The INDEx survey covered a broad range of questions about digital readiness, practices, and performance, from student and staff activities and experience in using technologies to digital infrastructure. In addition, it dealt with attitudes and preferences regarding digital learning and assessment.

Most of the INDEx survey questions were adapted from an existing survey – the Digital Experience Insights (DEI) survey used in higher education institutions in Australia, New Zealand and the United Kingdom (Beetham, Newman and Knight, 2019[19]; Jisc, 2020[20]), with the responses from students and teachers in those countries presented alongside the Irish results. Table 4.2 includes examples of internationally comparable indicators for students and "staff who teach" that have been highlighted in INDEx summary communications material.

Table 4.2. Selected internationally comparable INDEx and DEI findings

Theme	Students	Staff who teach
1. Digital teaching and learning practices	• Percentage that regularly accessed VLE • Percentage that agreed online assessments were delivered and managed well	• Percentage that regularly used VLE as part or all of their delivery • Percentage that agreed the institutional online system for marking and feedback was easy to use
2. Digital infrastructure	• Percentage that had access to recorded lectures • Percentage that had access to reliable Wi-Fi	• Percentage that had access to lecture capture whenever needed • Percentage that had access to reliable Wi-Fi whenever needed
3. Digital skills development and support	• Percentage that had access to Internet-based skills training • Percentage that agreed they had regular opportunities to review and update digital skills	• Percentage that had access to Internet-based skills training • Percentage that agreed they had regular opportunities to review and update digital skills
4. Digital environment and culture	• Percentage that agreed their institution protected their data privacy • Percentage that agreed they had the opportunity to be involved in decisions about digital services	• Percentage that agreed they were informed about their responsibilities on how to manage learner data securely • Percentage that agreed they had the opportunity to be involved in decisions about digital services
5. Attitudes to digital	• Percentage that rated the quality of institutional digital provision as above average • Percentage that rated the quality of digital teaching and learning on their course as above average	• Percentage that rated the quality of institutional digital provision as above average • Percentage that rated the institutional support to develop digital aspects of the role as above average

Note: International benchmarking is enabled by the use of the DEI survey, which is run in the United Kingdom (for students and staff) and in several universities in Australia and New Zealand (for students only) (Beetham, Newman and Knight, 2019[19]; Jisc, 2020[20]).
Source: National Forum (2020[18]), *Irish National Digital Experience (INDEx) Survey: Findings from students and staff who teach in higher education*, https://hub.teachingandlearning.ie/resource/irish-national-digital-experience-index-survey-findings-from-students-and-staff-who-teach-in-higher-education/.

Advantages and limitations of survey data

While rich administrative data gives a clear and comprehensive view of a higher education institution (or, in the case of the national administrative data collection, of the whole of the higher education system), it cannot provide a nuanced understanding of the practices and experiences of key higher education stakeholders – students and staff. For instance, administrative data can provide information about whether a student passed a course, but it is blind to a range of possible explanatory information – for instance, the person's experience of, or satisfaction with, the programme; whether the person is from a family where higher education is the norm and an expectation; or whether the person was in employment concurrently with study. That deeper exploration of students' backgrounds, attitudes and motivations and their experiences of and responses to the study environment is best managed through a survey.

At the same time, survey data is self-reported, and some questions require the respondent to make evaluative judgements. Responses may not fully reflect respondents' behaviours or experiences – they are impacted by memory and social context, meaning that there is a risk that two individuals with identical experiences of digitalisation and similar attitudes may respond differently to the same question (OECD, 2019[21]). In addition, surveys do not capture every member of the survey population; as a result, they will have sample error and the risk of non-response bias. Furthermore, there is the possibility of sample bias, where the response is more likely to occur from some groups in the survey population whose experience is different from the norm. There are means of mitigating the risk of sample bias, especially if the survey population is created using a robust sample frame (Statistics Canada, 2021[22]).

4.4. Learning analytics

Data collection approach and indicators

"Learning analytics" – or "educational analytics" – are defined as:

> *the use, assessment, elicitation and analysis of static and dynamic information about learners and learning environments, for the near real-time modelling, prediction and optimisation of learning processes, and learning environments, as well as for educational decision making. (Ifenthaler, 2015, p. 447[23])*

Learning analytics is receiving much attention as a promising tool to support student success, and a number of HEIs have used these systems to reduce failure rates, especially among disadvantaged groups. For instance, at Georgia State University (**United States**), predictive analytics have been used since 2012 to follow student performance. Over 40 000 students are assessed for a wide range of risk factors every day, and alerts are sent to both students and faculty when risks are identified, followed by one-on-one meetings to help the student improve. The results demonstrate both a decrease of more than a semester in average time to degree and an improvement in attainment for disadvantaged students (Georgia State University, 2018[24]; Georgia State University, 2021[25]). Similarly, at Purdue University, predictive analytics, plus the provision of support for those identified as at risk of failing, led to measurable improvement in pass rates. The same approach has been used in many universities in the **United Kingdom** and **Australia** (Sclater, Peasgood and Mullan, 2016[26]).

Meta-analyses show that using learning analytics can be successful in improving student pass rates, in particular among disadvantaged students, although with differences in extent according to the field of study, institution and other contextual factors (Ifenthaler and Widanapathirana, 2014[27]; Sclater, Peasgood and Mullan, 2016[26]; Wise and Cui, 2018[28]; Ifenthaler and Yau, 2020[29]).

Learning analytics can also be used for other purposes in HEIs – for instance, to compare courses and cohorts of learners and analyse attrition and track enrolments. But, most importantly, learning analytics is a tool that can be used to evaluate (and improve) pedagogical models (Wise and Jung, 2019[30]).

Data used in learning analytics are often derived from the use of learning management systems or virtual learning environments by students and staff. While LMS/VLE data are usually focused on a particular course, it is possible to link an individual student's LMS/VLE data from all of his/her courses to get a view of the student's engagement and progress across the whole of his/her programme of study. Furthermore, if used widely across an HEI, a LMS/VLE system can provide measures of how engaged students are in their learning and can be used by teachers to identify student difficulties or shape pedagogical decisions.

LMS and VLE systems provide data on the use of digital technologies by students and teachers and on their types of engagement with the digital technologies. The types of indicators that can be derived from learning analytics are diverse and include:

- Student scores, pass rates, retention.
- Student activity (also called transactions or events), such as student engagement measured through a login or the opening of a document/viewing of a video, the use of a chat room, the time spent in viewing or reading, including times at which student attention drops, the taking of a quiz and the submission of an assessment. These are examples of *non-reactive* data that can be mined from an LMS/VLE and that are available in near-real-time.
- Students' opinions, for example, through satisfaction surveys embedded in LMS/VLE systems (these types of data are also referred to as *reactive data*).

LMS/VLE data can be linked to administrative data held by the HEI, such as data on students' demographics, prior educational achievement and entitlements, and/or to other institutional data, such as data drawn from responses to student surveys. Linking such data can help with targeted student support interventions, as discussed above. Furthermore, such data-linking processes can be automated so that deep analysis can be performed and results communicated to students and instructors promptly, at a relatively low cost.

While primarily focused on supporting student success, learning analytics data can provide a wealth of information on student behaviours, engagement and satisfaction with digitally enhanced higher education, which, combined with data on student success, holds significant potential to shed light on both the digital practices of students (and of staff who use LMS/VLE systems) and on the digital performance of higher education.

Advantages and limitations of learning analytics data

Learning analytics has some of the characteristics of administrative data in that it records transactions and events during a student's study of a course. The data can be used to create measures of student engagement with digitally enhanced teaching and learning. It can also incorporate surveys (allowing for the creation of measures of learners' experience and satisfaction with online learning). In addition, it creates the opportunity to develop proxy measures of the effectiveness of digitalisation through comparing student achievement – such as completion rates or assessment outcomes – across different study modes (controlling for factors like prior educational achievement).

While learning analytics data contains elements of the two other forms of data – administrative and survey data – it differs from those two other forms in that it draws from LMS/VLE data specific to a course. It can, however, be aggregated in some circumstances. An institution that wants to exploit the potential of learning analytics for the purpose of improving learner success needs to ensure high levels of take-up of the LMS/VLE across the HEI so as to generate comprehensive learning analytics data. While students may be required to use the LMS/VLE by teachers, some teachers are reluctant to use all of the functionality of these systems and, in some cases, to use the LMS/VLE at all (Weaver, Spratt and Nair, 2008[31]). In addition, the richness, complexity and volume of the data generated in an LMS/VLE may make it a challenge to analyse and use for decision-making purposes (DSN/DHECC, 2020[8]).

A further issue with learning analytics data, which is recorded at the course level, is that it depends on each instructor's requirements regarding LMS/VLE use. This is determined in part by the teacher's confidence, interest and capability in using these systems and in part by the nature of the field of study and course material. This may make it difficult for an institution to establish a base configuration for its LMS/VLE rich enough to enable LMS/VLE data to be aggregated to create meaningful indicators of engagement, experience and effectiveness. However, the Georgia State University example (referred to earlier) is just one example where an institution has been able to demonstrate what can be done (Georgia State University, 2018[24]).

If a country wants to use data analytics nationally to create national measures, it needs wide take-up in all institutions, and it needs to create a consensus among institutions on the configuration of diverse systems so that each institution produces data sufficiently comparable to allow for aggregation.

4.5. Summary, complementarity and common issues

The section that follows provides two summary tables of the preceding discussion:

- Table 4.3 provides a summary of the types of indicators on the digitalisation of higher education that may be generated by national administrative data systems (using IEPDS as an example), surveys (using INDEx as an example) and learning analytics.
- Table 4.4 compares the strengths and weaknesses of administrative, survey and learning analytics data and incorporates some comments on potential costs, ease of implementation and repeatability of data.

It then discusses the value of using the three approaches in a complementary manner to obtain a rich understanding of the digitalisation of higher education. Finally, it closes with a discussion of data privacy and use concerns, which are relevant for all data collection approaches.

Summary of administrative, survey and learning analytics data

Table 4.3. Digitalisation indicators generated by administrative, survey and learning analytics data

Digitalisation aspect	Existing indicator type	Areas for growth
Administrative data (Example: The United States' IPEDS)		
Digital readiness	Digital library holdings may be seen as a form of digital readiness indicator (availability of technology).	Two areas for growth are: • A move to a unit-record student data system would allow for greater detail in the analysis of online education and allow for online education performance to be analysed, controlling for demographic and study-related factors. • A move to collect additional data on digital transformation that can be captured through existing administrative data processes, e.g. asking institutions to report on the usage of an LMS/VLE would be useful. These growth areas must be measured against the additional administrative burden and cost that it would require from HEIs.
Digital practices	Data on the enrolment of students in online delivery (proxied by distance education) and the course types that an institution provides through online education.	
Performance in digital higher education	IPEDS does not directly capture data on the performance of distance education or other digital indicators, though some correlational insights can be drawn for institutions substantially engaged in distance education delivery.	
Survey data (Example: Ireland's INDEx)		
Digital readiness	Data are captured on the current use of technology by staff and students and on potential barriers (such as access to devices, levels of skills and knowledge, as well as provision of essential infrastructure).	While future fielding of the INDEx survey is not confirmed, interest in the Irish higher education sector is high. The impact of COVID-19 will have a significant impact on the results from any future survey. Continued stakeholder discussion of findings will likely lead to the identification of opportunities for further development. One limitation to the current survey is that institutional results are not published, which limits some of the potential insights, e.g. it is not possible to compare survey outcomes to institutional resources or directly compare institutional approaches and outcomes. However, the fact that data are available to HEIs privately is already resulting in policy changes.
Digital practices	Data are captured on the use of technologies by staff and students, including the use of a LMS/VLE, the design of course content for online delivery, and the use of tools such as mobile applications and "gamification" of learning.	
Performance in digital higher education	Quality and equity can be evaluated by: • assessing equity in areas such as device and service access by a demographic analysis • responses to queries regarding the quality of digital services (e.g. ease of use of the LMS/VLE). However, INDEx data is not released at an institutional level, so there are limitations (e.g. comparing HEI spending against responses on the quality of service would help to gauge efficiency).	

Learning analytics		
Digital readiness	Adoption and use of LMS/VLE systems is an indicator of digital readiness. LMS/VLEs provide data on student and staff engagement (e.g. number of courses using LMS/VLEs, students active on LMS/VLE).	Learning analytics is a primary area for growth in higher education private-sector data. However, the utilisation of the full potential of learning analytics among institutions using LMS/VLEs and SIS appears limited, particularly in Europe. Learning analytics (and in particular predictive factors) is an opportunity to improve student outcomes, the design of programmes and pedagogical approaches, as well as the overall quality of higher education. Data privacy, ownership, and appropriate-use regulations and concerns need to be addressed. A further area for growth is the possibility of aggregating learning analytics data from multiple institutions to inform system-wide higher education policy. This will require significant investment both in the development of system-wide data infrastructure, agreement on and specification of common measures, interoperability between proprietary systems, and the engagement and buy-in of higher education stakeholders.
Digital practices	LMS/VLEs and student information system (SIS) systems together track a range of digital behaviours, such as the use of digital resources, e.g: • uploads and downloads • interactions with online discussions • staff practices and usage of the LMS/VLE.	
Performance in digital higher education	LMS/VLEs can capture student experiences on the quality of education delivered by embedding surveys as part of the LMS/VLE. Linking LMS/VLE data to SIS data allows for data mining and statistical analysis to: • identify risk factors for academic failure • evaluate the performance of pedagogical approaches • analyse aspects of equity and efficiency.	

Table 4.4. Comparing the strengths and weaknesses of administrative, survey and learning analytics data

	Administrative data	Survey data	Learning analytics data
Description	Administrative data reports on transactions or events (such as enrolment and completion), so it can be used to report on participation and success in online learning. It can give a view of how much online learning occurs, how many students and teachers participate, pass rates in online learning as opposed to other forms of delivery. It cannot report on how engaged students are with online learning or on their experience of online learning.	Survey data can report on how students (and teachers) experience online learning and their satisfaction with it.	Learning analytics reports on transactions, such as logins, use of chat rooms, time spent reading/viewing material, assessment, etc. It can incorporate surveys. It can look at participation in online learning, engagement with it, success in it, and its effectiveness.
Coverage	Comprehensive: every student is counted. Administrative data on staff is separate from data on students. Administrative data is collected at the institutional level and nationally.	Student and staff surveys can be complementary – asking how each used/experienced the same tools. There can be census-style surveys, where every student/staff member is invited to participate, or the creation of a sample frame leading to a survey of representative samples of students and teachers. Surveys can be used at the institutional level or across groups of institutions (for instance, institutions in the United Kingdom, Australia and New Zealand can opt to take the DEI survey), or nationally, like the INDEx survey in Ireland.	The data originates at course level, where it is comprehensive. However, in some HEIs, teachers are free not to use the LMS/VLE or not to use some of its functions. This means that the learning analytics data may not be comprehensive at an institutional level in some institutions. To aggregate LMS/VLE data at the institutional level, the LMS/VLE must be configured to produce common data elements, with teachers free to use additional features of the LMS/VLE if they wish. It may be difficult to develop a national view of engagement with online learning through learning analytics, given HEI autonomy in most jurisdictions.
Frequency and timing	The frequency of collection of administrative data depends on the business cycle of HEIs (and, in the case of national data, of government requirements). It is usually repeated annually (or more frequently).	Surveys can be repeated at regular cycles, annually or less frequently.	LMS/VLE data can be analysed annually, each semester or more frequently. There is the opportunity to automate the reports that the LMS/VLE produces at the course and institutional levels.
Compliance burden	Any change in the specification of administrative data requires a long lead-in time as institutions need to arrange for its collection at enrolment time and may need to modify their student information management systems. This imposes a high compliance burden on HEIs. This applies whether the change is initiated at the institutional or national level. The burden on students is relatively slight.	Surveys are likely to impose relatively low compliance burdens on HEIs. If the survey is repeated frequently and is a census-style survey, then there is a compliance burden on respondents that could lead to lower response rates in the medium term.	Setting up, configuring and using LMS/VLE systems imposes a relatively slight burden on HEIs, staff and students. However, generating high-quality learning analytics data – aggregating data on a student across all of his/her courses, linking LMS/VLE data to the institution's core administrative data, developing and programming the production of indicators and dashboards and aggregation of data across an institution's courses – can be burdensome. Reports can be automated, however, so the data generation burden can lessen once the setup is complete.

	Administrative data	Survey data	Learning analytics data
Cost and flexibility	The cost of managing administrative data – institutionally and nationally – is high. The cost is especially high if all HEIs have to supply unit-record data. The cost of change is high if the change involves adding a new variable, especially if the programming of the student management system changes. A change in the national administrative data collection, however, involves a low cost if the collection is of aggregated data and if there are no new variables. The cost of change makes administrative data relatively inflexible.	The cost of designing surveys, setting them up in survey administration software, piloting, launching a survey, monitoring responses, promoting responses and analysis of data is high. Surveys can be modified for subsequent iterations relatively easily and at relatively low cost.	The cost of a LMS/VLE is high. There is a high cost in configuring and developing the reporting needed for the development of learning analytics. The ongoing cost of learning analytics is relatively low. The complexity of the development of rich learning analytics data means that modifying the system may be costly.
Data quality and reliability	Administrative data give high levels of certainty as long as data quality is managed well. Data have high quality and are recorded in a consistent manner between individuals but cover only events/transactions (such as enrolments, completions and fees payment), not judgements, assessments or evaluations. Questions about response rate and sample bias do not arise.	Surveys always have sample error and non-response bias. However, if the survey is large enough, well designed, and implemented well, these are relatively slight. There is a risk of sample bias. Also, survey data rely on self-reporting and the evaluative judgement of respondents. So, two individuals with identical experiences could describe the experience differently.	As long as the measures and indicators are rich and well-designed and if the take-up of the LMS/VLE by teachers is high, the data is likely to have high levels of certainty.
Relevance and impact	Administrative data collections are designed to capture what occurs, but the important qualitative variables are likely to not be present – attitudes, motivations, experiences.	Surveys can explore qualitative background variables and can look at attitudes to digital tools. In addition, they can take behavioural and evaluative perspectives, such as looking at what tools were used, how they were used, and how well they worked. They can look at how well students and teachers were supported in their use of digital tools.	As long as the configuration and data mining behind the reporting are well designed, the learning analytics data can provide highly relevant and timely insights into students' learning behaviours and outcomes.
Longitudinal potential, i.e. the potential to track change at an individual student level over time	Institutional administrative data on students and staff are necessarily longitudinal, given the business needs of institutions. National administrative data cannot be made longitudinal if collected as aggregated data but can be used to create time series and cross-sectional analyses. National administrative data collected at the unit-record level can be used for longitudinal analysis if there is a personal identifier (such as a national student number) or through probabilistic matching of students between different years' datasets.	Survey data are usually used for cross-sectional analysis. It is possible to create a longitudinal view by returning to the same survey population (or to a sample drawn from that population) over several years.	These data, like institutional administrative data, are longitudinal.

	Administrative data	Survey data	Learning analytics data
Overall challenges and weaknesses	Cannot report on matters like the experience of or satisfaction with digitalised learning. The pandemic has reduced the value of administrative data measures (because most courses now have a substantial online component, reducing the ability to differentiate between courses). A national unit-record collection imposes high costs on smaller HEIs. The cost of change – especially if it involves adding a new variable – is high. This reduces the flexibility of administrative data.	Survey data has a level of uncertainty deriving from sample error, especially if the number of responses is low. Online surveys implemented through standard, commercially available survey software may be less expensive than administrative data. However, survey design, piloting, monitoring responses, promoting responses and analysis of data carries high costs.	The main challenges are: • to ensure that most, if not all, instructors in an institution use the LMS/VLE • to develop a LMS/VLE configuration that ensures the collection of a common core of data that is uniform across all courses in an institution, without denying early adopters the opportunity to exploit the advanced features of the LMS/VLE • to develop the links between the LMS/VLE data from all the institution's courses and to the institutional administrative dataset that allows for rich data analytics. It is very complex to move to a national collection based on LMS/VLE data.

Complementarity of administrative, survey and learning analytics data

Administrative data, survey data and learning analytics data can be viewed as complementary, rather than alternative sources of data to shed light on the digitalisation of higher education. For example, administrative data can provide information about higher education activity but cannot shed light on the way students experience their courses and programmes – one of the important dimensions of the quality of higher education, including in a digital environment. On the other hand, survey data can provide rich data on experiences and satisfaction, while learning analytics create an opportunity to observe student learning practices.

Administrative data are comprehensive – there is no sample error or sample bias. On the other hand, survey data require students to make interpretations and judgements (which may mean there are differences between individuals in the way they describe identical experiences), involves sample error, and may contain sample bias. Learning analytics require a significant breadth and depth of LMS/VLE usage in order to generate useful data for analysis.

The differing strengths and weaknesses of the three types of data mean that they can be used to complement each other. For example, there would be value in data reporting that gives a profile of the use of online learning across an institution (or nationally) drawn from administrative data, alongside the results of a survey that explores student and teachers' experience of online learning and learning analytics that provide insight on students' learning practices.

Another way administrative, survey and learning analytics data can be complementary is in dealing with additional information requirements. For example, adding a new variable to a national administrative data collection can be very costly, as all HEIs must undertake expensive programming of their student information management systems. That means that it is worth adding a new variable only if the government is certain that the new variable is needed for the long term. If not, and if there is a national survey, it is relatively less expensive to use that survey to explore the additional data. If learning analytics are widely used, these can also incorporate surveys.

Data privacy and use

The issue of privacy has been a concern for any kind of data collection in the last decades. In the case of administrative data, HEIs are responsible for managing data within national and supranational data protection standards – such as the European Union's General Data Protection Regulation (European Commission, 2021[32]) or the privacy and data protection legislation in the relevant jurisdiction. If an institution contracts out the housing and management of its administrative data, it must ensure that the contractor maintains those standards. Institutions have an obligation to keep data secure and to control access to the data, releasing only what is necessary to administer their work and to comply with national and legal reporting obligations. Institutions need to be explicit in disclosing to students what they will use the data for and who it could be shared with, and if so, which variables, for what purpose and in what form. Governments must also comply with such standards if they collect unit-record administrative data.

As with administrative data, survey owners are also responsible for managing the data they gather within national data protection standards. They, too, have an obligation to keep data secure, and if they contract out the management of the survey, they need to require the contractor to comply with those standards. Again, as with administrative data, those conducting a survey need to be explicit in disclosing to respondents the purpose of the data collection and how the data will be used and to whom it will be disclosed. Surveys that allow respondents to decline to respond to a given question while completing the rest of the questionnaire offer a greater level of privacy.

Learning analytics data represent a subset of institutional data and need to be subject to the same privacy and management standards as other HEI data. Data security and privacy may require further investment to ensure that legal and ethical standards are met (Jones, 2019[33]; Ochoa, Knight and Wise, 2020[34]).

Further, learning analytics relies on algorithmic processing that builds on the choices and judgements of the designer and on statistical generalisations that may "lose sight of" context and unmeasured variables (such as traits, attitudes and motivations) (Wise and Cui, 2018[28]). These concerns mean that those who develop the learning analytics systems need to be aware of the limitations, while follow-up interventions such as those used at Georgia State University need to be designed in a way that prompts thought and discussion by the student and advisor (Georgia State University, 2018[24]; Wise and Jung, 2019[30]).

4.6. Higher education data collection in Hungary and considerations for the development of indicators

Data collection in Hungarian higher education

Higher education data

In Hungary, system-level higher education data collection has increased in recent years, in particular through the expansion of the administrative data system and the use of surveys of students and HEIs. However, while most HEIs use a learning management system, surveys and studies indicate that learning analytics are infrequently used (DSN/DHECC, 2020[8]).

With regard to administrative data, several public databases store extensive higher education data. The **Higher Education Database and Information System** (FIR) is a national registry containing the majority of administrative data on Hungarian higher education. It is managed by the Educational Authority (OH) and includes, for example:

- data on HEIs and their programme offerings, such as the number of HEIs by type and the number of study programmes by level
- unit-record data on students and their mode of enrolment and staff by types of contract, such as their characteristics (gender, nationality, etc.) and registration status (full-time/part-time)
- data on digital infrastructure at HEIs, such as the number of computers and access to the Internet.

The FIR was established following the implementation of the 2011 CCIV Higher Education Act as a national database for higher education. Before the development of FIR, HEIs submitted administrative data to several data collectors, such as the National Health Insurance Fund, the Hungarian State Treasury and the Central Administration of National Pension Insurance, while students and staff participated in ad hoc surveys (Educational Authority, 2018[35]). Hungarian HEIs are obliged to provide data to the FIR system, which public authorities use to manage the higher education system. For example, state funding to higher education relies to a large extent on FIR data (DSN/DHECC, 2021[36]).

The **Database on Student Stipends** (HÖSZ) holds financial data on students whose studies are fully or partially covered by state support. The **Online Library of Hungarian Academic Works** (MTMT) also stores information on academic publications and is connected to a global citation database, Scopus (DSN/DHECC, 2021[36]). In addition, the **Adult Education Reporting System** (FAR) keeps a list of short, non-degree education programmes (Adult Education Reporting System, 2021[37]).

Furthermore, OH administers the **Graduate Career Tracking System** (DPR), which combines survey data on graduate labour market outcomes with administrative data (from FIR, HÖSZ, the National Tax and Customs Administration, the National Health Insurance Fund, and the Ministry for Innovation and Technology [MIT]) (Educational Authority, 2020[15]).

Public HEIs use the **NEPTUN** student information system (SIS), while private institutions are free to select a SIS of their choice. In addition, HEIs use **information management systems** to collect and store data

concerning institutional management, such as financial and human resources management. HEIs also submit an **institutional development plan** to MIT, in which they set goals for the next five years.

Hungarian HEIs use the **LMS/VLE** of their choice – many of them using Moodle or Blackboard (both widely used systems internationally) or the Hungarian system CourseGarden (DSN/DHECC, 2021[36]).

Data on the digitalisation of higher education

While data systems described above offer comprehensive information to support higher education policy making and institutional planning and management, data collection concerning the digitalisation of higher education appears limited (DSN/DHECC, 2020[8]). FIR data on study programmes, for instance, do not refer to modes of delivery, i.e. whether instruction is on line, hybrid, or in person.

Current evidence on digital transformation in higher education is mainly collected through ad hoc surveys in Hungary. The National Union of Students in Hungary conducted **a student survey** shortly after the transition to emergency remote learning in spring 2020. More than 17 000 students participated (12 000 student responses were used in the analysis), with a majority of undergraduate students responding. Students were asked to provide their views on their online education experiences, including their level of satisfaction with online learning and preference between online and in-person settings (HÖOK, 2020[38]).

The Ministry for Innovation and Technology commissioned **two surveys on digital higher education** in the fall of 2020, administered by the Digital Higher Education Competence Centre. The first survey was carried out in September 2020 and sought institutional leaders' views on factors determining HEIs' level of digitalisation, including external factors (e.g. students' digital skills) and internal factors (e.g. access to digital infrastructure at an HEI, teachers' digital skills, etc.), with a view to identifying ways to monitor digitalisation in Hungarian education. The participating institutions were also asked to share their digitalisation practices (e.g. creation of digital content, e-learning support services, updating of pedagogical methodologies, digital dissemination of research outputs). The second survey was conducted in November 2020 to collect data on access to digital infrastructure at Hungarian HEIs, such as high-speed Internet access and the availability of digital tools. For both surveys, responses were collected from over 85% of all accredited institutions (DSN/DHECC, 2021[36]).

In addition, the OECD conducted a **higher education stakeholder consultation survey** in February-March 2021 as part of the present project to obtain information about digital practices from higher education students and staff. Completed responses were submitted by over 1 000 higher education stakeholders (629 students, 354 teachers, 38 leaders, 3 policy makers, 5 staff from non-governmental organisations and private companies, and 10 others). The survey asked about the access to and use of digital infrastructure and data systems and about students' and teachers' experiences of digitally enhanced teaching and learning. It also collected stakeholders' views on public policies and institutional practices supporting the digital transformation of higher education (Annex B).

Those surveys shed important light on the current digital readiness and digital practices of Hungarian higher education. However, data on digital performance remains limited. For example, the OECD survey asked about students' and teachers' satisfaction with online teaching and learning. However, its data are provided based on the experience of "emergency" remote learning and may not accurately present the performance of digital higher education in Hungary.

The use of learning analytics, while taking place in some institutions, does not seem to be widespread in Hungarian higher education. However, the wide use of LMS/VLE creates a source of data, which, in conjunction with the SIS data, provide the opportunity to create rich information on digital practices and performances. With the pandemic having led to greater use of LMS/VLE in Hungary, the potential value of learning analytics in the Hungarian higher education system has grown. According to the OECD survey, while around 40% of student respondents reported having access to LMS or VLE before the pandemic, an

additional 40% reported getting access to these tools since the start of the pandemic. The survey also shows that two-thirds of student respondents reported having used a LMS/VLE at least weekly (44% daily and 25% weekly) at the time of the survey (February-March 2021) (see Annex B).

As noted in the previous section of this chapter, administrative data, self-reported data from surveys and trace data from LMS/VLEs have different advantages and drawbacks. While administrative data presents the advantage of reliability and broad coverage, it is not as timely or as rich as learning analytics data. Administrative data covers mainly transactions or "events" and does not give information on students' or teachers' experience of digitalisation or on the quality and effectiveness of digitalisation. Survey data helps understand the behaviours and motivations of students and teachers but is self-reported and comes with sample error. Trace data from LMS/VLE is data that is generated by the real-time use of digital technologies, such as the opening of a document or time spent on a webpage. This data offers reliable accounts of digital technology use, but it can only be analysed when students and teachers regularly use LMS/VLE. Combining different methods is thus the most promising approach to assess the digital transformation of Hungarian higher education.

Options for further data development

Defining the purpose of data collection

Evidence on digital readiness – infrastructure and policies that maximise the take-up of digital technologies in higher education – and on the digital practices of students and staff in HEIs is important to understand the scale, pace and effectiveness of digitalisation in the Hungarian system.

Evidence on digital performance – on the equity, quality and efficiency of digital higher education – is needed to monitor whether digital higher education is designed and delivered in a way that maximises the benefits of digital technologies in higher education while mitigating its risks. The benefits of digitalisation can be considerable – from greater access to diverse and flexible learning options to the individualisation of learning and the development of more effective data-informed teaching methods. But there are also important risks: in particular, disadvantaged students are at risk of falling further behind because they may lack adequate equipment and learning attitudes to do well in an online environment.

As Hungary considers new data development to monitor the digital transformation of higher education, it needs to clearly identify the:

- purpose of new data (examples of potential goals and the types of indicators that might be most relevant are illustrated in Table 4.5)
- level at which data is needed, be this at a system, institution, course or student level
- data collection methods most suited for the purpose, given different advantages and drawbacks of each method
- possibility of collecting the new data as an add-on to the existing extensive data collections
- trade-offs between the benefits of new data collection and the burden of establishing data specifications and developing collection and reporting processes
- ways in which HEIs are incentivised (or required) to collect and report data
- capacity in both HEIs and government to develop adequate data systems
- capacity in both HEIs and government to utilise the data for the purpose they have identified.

Table 4.5. Potential purposes of data collection and potential types of indicators

Potential purposes	Potential types of indicators
Inform public policies and institutional strategies	
Inform digital infrastructure policies • *At national level*: Consideration of broadband infrastructure, capital expenses for digital infrastructure and equipment, investments in the creation of digital content, the purchase of digital equipment, research and development (R&D) policies regarding the use of advanced digital technologies in higher education • *At HEI level*: Consideration of budget for digital infrastructure and equipment, governance structure to manage the identification of needs and purchasing of equipment	• Quantitative indicators on infrastructure, student and teacher access to suitable digital infrastructure and content, and student and teacher use of digital technologies in their studies/work • Qualitative information about HEI leaders' perceived challenges and opportunities related to digital infrastructure
Inform policies on digitally enhanced higher education offerings • *At national level*: Consideration of legislation/regulation/quality assurance requirements on the structure/content of courses and programmes, funding policies promoting the development of digitally enhanced courses/programmes and other learning opportunities • *At HEI level*: Consideration of institutional strategies and investments regarding the offerings of digitally enhanced courses/programmes and other learning opportunities	• Qualitative information about the existence of public policies and institutional strategies supporting digitally enhanced higher education offerings • Quantitative indicators on the supply of digitally enhanced courses, programmes and other learning opportunities
Inform policies related to digitally enhanced teaching, research and engagement • *At national level*: Consideration of legislation/regulations/quality assurance requirements related to the profiles, careers and work of teaching staff, policies regarding professional development, institutional funding promoting the development of pedagogical practices adapted to the digital environment, provision of financial supports to teachers to participate in digital skills training programmes • *At HEI level*: Consideration of institutional strategies related to the profiles, careers and work of teaching staff, policies regarding professional development	• Qualitative information about the existence of public policies and institutional strategies supporting digitally enhanced teaching, research and engagement • Quantitative indicators on the use of digital technology and reported satisfaction by higher education staff • Quantitative and qualitative indicators on the quality and effectiveness of digital courses (including how students perform in digitalised courses, relative to others, and related to background variables, and measures of student engagement) • Quantitative and qualitative information about the barriers to technology take-up among higher education staff and their views on opportunities for improvement
Inform policies related to digitally enhanced learning • *At national level*: Consideration of institutional funding to HEIs supporting investments in student supports, provision of student financial supports to participate in digitally enhanced courses/programmes and other learning opportunities (e.g. alternative credentials) • *At HEI level*: Consideration of the provision of academic/career/personal advising provided in a digital environment	• Qualitative information about the existence of public policies and institutional strategies supporting digitally enhanced learning • Quantitative indicators on the use of digital technology and reported satisfaction by higher education students • Quantitative and qualitative indicators on the quality and effectiveness of digital courses • Quantitative and qualitative information about the barriers to technology take-up among higher education students and their views on opportunities for improvement
Inform teacher and student practices	
Inform teachers of students' practices and outcomes to provide targeted student support and/or adjust their own pedagogical practices	• Quantitative data on students' learning practices, learning outcomes (e.g. retention, pass rates, grades) and teachers' pedagogical practices • Quantitative and qualitative indicators on the quality and effectiveness of digital courses • Qualitative information about barriers to teaching and learning performance in a digital environment according to both teachers and students
Inform students about their own learning practices and outcomes to foster self-awareness and improvement	

Strengthening data use

One key challenge facing Hungary as it considers collecting data on the digitalisation of higher education is its capacity to use this data.

While Hungary's national data on higher education is already very rich, the use of data in policy evaluation and policy research is limited. Even at the institutional level, the use of data to support decision making appears "rare and undeveloped". Hungary is taking steps to manage and derive value from the large datasets it holds – specifically through the creation in 2020 of the National Data Asset Agency (DSN/DHECC, 2020[8]). However, plans for new higher education data collection should specifically outline how data use could be extended, identifying current gaps limiting the use of data, and the support (including human and financial resources) needed both at the national and institutional levels to make better use of data.

Building on existing data

Hungary's comprehensive approach to higher education data collection is based on the FIR, which is set up in legislation. Links also exist between the collection and reporting of data by HEIs and public funding through the HEIs' institutional development plans that draw on FIR data and other data provided by the HEI.

Adding digitalisation-related indicators to the current administrative data system could offer rich evidence on digitalisation of higher education at a national level, noting, however, that with the increase in the uptake of online learning resulting from the pandemic, some of which may continue in future, particular attention will need to be paid to providing clear definitions of what constitutes digitally enhanced teaching and learning.

The benefits of this approach would need to be considered in light of the feasibility of introducing new variables into a complex data collection system, possibly requiring changes in all HEIs' student management systems. The technical feasibility and the human and financial resources implications of such an approach should be considered carefully. Immediate costs should also be assessed against the long-term benefits of regular administrative data collection. The policy levers that the government intends to employ to incentivise HEIs to collect and report this data must also be identified.

Regular system-wide surveys of higher education students and staff would be important tools to collect qualitative information on the perspectives of students and teachers on online teaching and learning experiences and monitor change over time. Here too, the costs and benefits should be carefully weighed. The option to build upon existing, regular surveys of current or recent students (e.g. annual survey of graduates' labour market outcomes) could be explored to minimise the costs of creating new survey tools. International experience in the area of student and staff surveys should also be considered (e.g. Ireland, Denmark and Australia). In addition, the experience of the National Union of Students and the Digital Higher Education Competence Centre, which implemented surveys focused on digitalisation in 2020, should provide insights into approaches to surveying HEI leaders as well as students to monitor progress in digital teaching and learning. It would also be important to gather views from higher education staff, who are key actors in the digitalisation – its scale and depth – of higher education in Hungary, as discussed in Chapters 2 and 3 of this report.

Learning analytics may be a rich source of data to complement system-level administrative and survey data by providing data on the use of digital tools and student learning outcomes. The wide variation in the use of learning analytics between and within HEIs suggests, however, that learning analytics may be primarily a source of information for individuals and departments/faculties within HEIs who use these systems, and at the institutional level for HEIs that use them broadly. Thus, obtaining a system-level picture would require broad usage of LMS/VLE systems within and across Hungarian HEIs. It would also require consensus on the types of data to be collected and an agreement by all HEIs to configure their LMS/VLE

to collect that information (without constraining the ability of expert users of the LMS/VLE to extract deeper, richer data of value for their [and their institution's] practices).

Several approaches would need to be pursued to encourage the use of learning analytics in Hungary. This includes clear standards that HEIs can use as they work with providers of LMS/VLE (whether external or in-house) to protect student data and clarify its uses. It also includes ensuring that academic and professional staff have the skills to make use of learning analytics and identifying the incentives that drive individuals and HEIs in using learning analytics. Finally, insights from HEIs and systems where learning analytics have developed the most internationally would be important for Hungary to consider.

Research may also be commissioned to better understand the use of learning analytics at present in Hungary, to understand the current state of learning analytics use, barriers to their further take-up, and opportunities to increase use. For example, **Australia** and **Germany** have been successful over the past decade in supporting the digitalisation of HEIs through research and development grants, which produced empirical evidence and helped change pedagogical practices using digital technologies at individual institutions.

Combining data sources may also offer important insights. Taking Hungary's Graduate Career Tracking System (DPR) as a model, the combination of administrative and survey data may offer a solid evidence base for Hungarian digital higher education.

It would also be important to consider how data collected could support several levels of analysis. For example, indicators developed to provide a national view of digital readiness, practices and performance in Hungarian higher education may be designed to permit the reporting of data nationwide, and per HEI, to inform national-level policy making. HEI-specific indicators may also be envisioned by HEI themselves, based on their areas of interest.

Potential indicators for Hungary

Given the broad scope of digitalisation in higher education discussed in this report, a number of indicators could be relevant to measure the digitalisation of higher education in Hungary.

To assist the Hungarian government and higher education stakeholders in monitoring the digitalisation of higher education, a preliminary list of 30 potential indicators that can be used to measure progress over time at the institutional and national level have been compiled. The list is presented in three tables:

- Table 4.6 contains digital readiness indicators.
- Table 4.7 contains indicators on digital practices.
- Table 4.8 contains indicators of digital performance.

The possible indicators were developed: 1) based on the analytical framework developed for the project that considers digital readiness as well as digital practices and digital performance; 2) building on international experience; and 3) taking Hungary's current data systems into account.

The indicators have been designed:

- to establish a baseline index of the state of digitalisation at a national level and then to measure progress over time
- to provide a measure of each institution's situation in a way that can be aggregated to provide a national view
- to compare progress in digitalisation in different parts of the higher education sector (either between HEIs or HEI groups or in types of programmes) in Hungary
- by making a link, where possible, to indicators used internationally, to provide a basis for comparison with other countries' state of digitalisation.

Indicators have only been proposed where it is likely that they can be populated at relatively low cost. However, some of the measures will depend on a national survey of higher education students and teachers that can explore the state of digitalisation. That survey would need to be developed and run to establish the baseline and then administered at regular intervals to measure change over time. Other indicators – for instance, those that look into outcomes for graduates – would need a detailed analysis of existing national administrative data. Some indicators would require the use of learning management system data.

Publication of the results of the indicator set should be accompanied by a clear, descriptive summary of the state of the alignment between Hungary's higher education policy framework and the needs of a digitalised higher education system.

Such a summary needs to address some of the most important issues identified in Chapters 2 and 3 as hindering the adoption of digitalisation. This would mean:

- ensuring the funding system is neutral between online and in-person delivery and that it supports the development of the capabilities of students and staff
- ensuring that the funding system provides support for digital equipment, teaching, research, and engagement and learning in a digital environment
- ensuring the accreditation and quality assurance practices and requirements are neutral between online and in-person delivery
- identifying the criteria for assessing teacher performance to respond to the need for teachers to master digitally enhanced teaching
- setting employment conditions for higher education teachers that allow and encourage them to take on professional development that provides the skills needed for delivering and assessing online learning
- ensuring transfer of credit arrangements are neutral between prior learning obtained via online learning and in-person
- providing information about government support for innovations, such as micro-credentials, open educational resources and open science.

In addition to listing the possible indicators, the tables contain comments, based on information available to the OECD team, on potential data sources that may be considered in Hungary to collect data on these indicators.

The list is deliberately extensive and aims to be a starting point as Hungary's public authorities and higher education stakeholders begin the development of a system to monitor the digital transformation in the nation's higher education system.

Notes on indicators tables

1. The possible indicators are designed to be recorded at an institutional level in a way that allows aggregation to give an indicator of the progress towards digitalisation of higher education across Hungary.
2. Where appropriate, the indicators have been designed to align with the Irish INDEx survey. Wherever possible, the questions have been phrased in a way that means that they could be answered in other OECD countries.
3. Indicators that could be populated only through complex interrogation of systems (for instance, questions about the percentage of operational expenditure devoted to supporting online delivery) have been avoided.

4. Indicators that look at the enrolment and completion of students should be reported disaggregated by student characteristics (e.g. gender and regional or socio-economic grouping) and also by study characteristics (level and field of study) to ensure that differences are not misattributed to online status, when the driving factor may be student-linked or course-linked.
5. As noted earlier, categorising courses and programmes will pose particular challenges in a post-pandemic context where "fully on line", "partially on line" (blended or hybrid) or "fully in person" may no longer be granular enough to understand the types of courses and programmes provided, as online learning is becoming an increasingly prevalent component of most programmes, and possibly courses. A proposed approach in the following indicators is to use four categories, rather than three, as follows:
   a. **Courses**: The variable considered is time spent on line as part of a student's "total theoretical study time", which could include both synchronous and asynchronous course-related activities. Such an approach would require departments or individual faculty members to make determinations of the course online status and for these to be recorded in the HEI's data systems. The four categories could be: a) 50% or more of the student's total theoretical study time is to be spent on line; b) 26-49% on line; c) 1-25% on line; or d) fully in person. Indicators A4, C1 and C2 use this proposed categorisation.
   b. **Programmes**: The variable considered is the share of courses a student takes according to the course online status, as discussed above. Because students may have the option to complete the same programme using a different mix of online, blended and in-person courses, the extent to which a programme is on line or in person is a characteristic of the student's enrolment rather than of the programme itself (i.e. two students in the same programme could select different courses and hence, have a different online profile).

      A categorisation of student enrolment in a programme could follow a similar logic as for courses, such as: a) 50% or more of the student's courses were either blended or fully on line; b) 26-49% blended or fully on line; c) 1-25% blended or fully on line; or d) fully in person. This requires the HEI's data systems to have clear definitions to record each course in these delivery mode categories, as proposed above. Indicators C3 and C4, which relate to time to completion and to attrition (both of which are programme measures), use this categorisation.
6. Three indicators (C5, C6, C8) relate to labour market outcomes. They will require analysis of microdata held in the DPR database. Given that labour market outcomes are dependent on programme characteristics (especially level and field of study) and, possibly on student characteristics (e.g. gender and regional or socio-economic grouping), data on C5 (employment rates), C6 (earnings premium for graduates in employment) and C8 (graduates reporting trust in the credibility of their credential) also need to be reported by student characteristics, and by study characteristics (level and field of study), as well as by the categorisation of enrolment (as in Point 5 above) according to the extent the student has taken online courses as part of his/her programme.

Table 4.6. Potential indicators to measure the digital readiness of Hungarian higher education

Sub-domains	Indicators	Potential data collection approaches				Comment
		Admin data	Survey data	Learning analytics	Other	
Access to digital tools and content	A1. Percentage of students and staff that have access to reliable Wi-Fi whenever it is needed: a) at the HEI b) outside the HEI		X			INDEx Q13. Administrative data can supply information about the availability of Wi-Fi but not about reliability.
	A2. Percentage of students and staff that have access to hardware and software essential for online teaching and learning and research: a) provided by the HEI b) personally owned or provided by a third party		X			
	A3. Percentage of students and staff that have access whenever needed to digital learning and teaching content (e.g. recorded lectures, online course materials, e-journals and e-books)		X			This indicator summarises content from INDEx Q13. There may be an argument for breaking this indicator down by type of content, as in INDEx.
	A4. Percentage of courses available fully on line and in a blended format (using categories outlined in indicator C1)	X				While this comes from administrative data in some OECD countries, it may need to be collected via a survey of HEIs, unless the NEPTUN and FIR systems are modified to collect it. If not, for aggregation, the actual numbers will need to be supplied, not simply the percentages.
Financial and human resources dedicated to digital infrastructure and systems	A5. Institutional capital expenditure on digital infrastructure as a percentage of total capital expenditure	X	X		X	While these indicators ask only for ratios/percentages, if the government wants to get an aggregated view, it will be necessary for HEIs to supply to the government the actual numbers (e.g. the value of all capital expenditure and the value of digital infrastructure capital expenditure), not just percentages, because percentages/ratios cannot be added.
	A6. Ratio of full-time equivalent (FTE) professional staff supporting users of information and communication technology (ICT) systems to total FTE staff	X				Estimates of time spent on ICT support may be complex for HEIs to do.

Table 4.7. Potential indicators to measure the digital practices of Hungarian higher education

Sub-domains	Indicators	Potential data collection approaches				Comment
		Admin data	Survey data	Learning analytics	Other	
Use of digital tools by students and teachers	B1. Percentage of students/staff reporting using digital technologies for teaching/learning, by type of technology (computer, mobile, etc.)		X	X		INDEx Q11
	B2. Percentage of students accessing LMS/VLE weekly or more frequently, in their own learning time, by purpose of accessing the LMS/VLE		X	X		INDEx Q12, Q18
	B3. Percentage of students/staff regularly accessing non-educational technologies to support teaching and learning (e.g. videoconferencing software, social media), by type of technology		X	X		
	B4. Percentage of students/staff reporting regularly accessing digital educational resources, in their own learning time, by type of resource		X	X		INDEx Q17
	B5. Percentage of students/staff reporting regular use of academic and other supports to facilitate online teaching and learning, research and engagement, by type of support		X	X		
	B6. Percentage of staff participating in an international professional development opportunity on line (e.g. sabbatical, etc.)	X	X			
Institutional digital environment and culture	B7. Percentage of students who agreed their institution protected their data privacy		X			INDEx Q14.5, Q19.4
	B8. Percentage of staff who agreed they were informed about their responsibilities on how to manage learner data securely		X			
	B9. Percentage of students/staff who agreed they had the opportunity to be involved in decisions about digital services		X			INDEx Q20.5
	B10. Percentage of students reporting satisfaction with the learning experience in online, blended and in-person formats		X			INDEx Q21, Q20.1-20.4, Q24
	B11. Percentage of staff reporting job satisfaction, in online, blended and in-person formats		X			
Digital skills	B12. Self-reported level of digital skills by students and staff		X			
	B13. Students' assessment of the digital skills of staff / staff's assessment of students' digital skills		X			
	B14. Percentage of students/staff reporting regular use of opportunities to review and update digital skills		X			INDEx Q20.2

Table 4.8. Potential indicators to measure the digital performance of Hungarian higher education

Sub-domains	Indicators	Potential data collection approaches				Comment
		Admin data	Survey data	Learning analytics	Other	
Access and equity	C1. Percentage of students enrolled in courses that involve a share of study time on line, by student characteristics and course characteristics (level/field of study). Course categories could be categorised as: a) 50%+ of study time on line b) 26-49% of study time on line c) 1-25% of study time on line d) Fully in person	X				This would require each course's status to be recoded in NEPTUN.
	C2. Rates of course completion according to course categories (see Indicator C1), by student characteristics and course characteristics (level/field of study)	X		X		
	C3. Ratio of time-to-completion/minimum time-to-completion, by student enrolment type a) 50%+ blended or fully on line b) 26-49% blended or fully on line c) 1-25% blended or fully on line d) Fully in person Present results by student characteristics and by programme characteristics (e.g. level/field of study)	X		X		This is a programme-level question. Because being in a fully online, blended or in-person course is a characteristic of the student's enrolment in most cases (rather than of the programme), answering a programme-level question involves categorising students/graduates by the extent to which their enrolment over the whole programme is on line, blended or in person. To create this variable, the HEI's student information system (SIS) will need to have recorded the extent to which each course is on line (see indicator C1).
	C4. Rates of attrition after one year by enrolment type (see Indicator C3), student characteristics and programme characteristics	X		X		
Quality	C5. Employment rates of graduates by enrolment type (see Indicator C3), student characteristics and programme characteristics	X	X			Employment outcomes data requires data mining of the DPR graduate tracking system and applying an Enrolment Type variable (see Indicator C3). Graduates need to be categorised by their enrolment type and the results shown by student characteristics (e.g. demographic characteristics, regional characteristics, etc.) as well as by programme characteristics (especially level and field of study).
	C6. Earnings premium of graduates (compared to upper secondary graduates) by enrolment type (see Indicator C3), student characteristics and programme characteristics	X				

Sub-domains	Indicators	Potential data collection approaches				Comment
		Admin data	Survey data	Learning analytics	Other	
	C7. Percentage of students reporting satisfaction with the knowledge and skills they obtained through online, blended or in-person instruction		X			INDEx Q19, 21
Quality	C8, Percentage of graduates reporting trust in the credibility of their credential obtained by enrolment type (see Indicator C3) student characteristics and programme characteristics	X	X			Uses DPR survey data
	C9. Percentage of academic staff reporting trust with assessment, in online, blended and in-person formats		X			
	C10. Percentage of employers reporting satisfaction with the quality of graduates from online, blended or in-person programmes		X			

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Annex A. Summary of stakeholder engagement

As part of the European Commission-Hungary-OECD project "Supporting the Digital Transformation of Higher Education in Hungary", the OECD conducted virtual interviews, roundtable discussions and an international expert meeting with a wide range of stakeholders in the Hungarian higher education system. This annex provides a summary of the input received during these activities.

Stakeholder interviews – September/October 2020

The Hungarian Ministry for Innovation and Technology (MIT) identified 29 key stakeholders, representing 25 bodies in the higher education system, who were invited to participate in stakeholder interviews with the OECD. Of these, 26 individuals from 21 institutions (see Table A.1.) accepted the invitation and were interviewed from 21 September to 13 October 2020.

The interviewees can be grouped into the following categories:

1. **Policy makers**: Senior government officials responsible for developing Hungarian higher education policy
2. **Government agencies**: Agencies that play a policy development or implementation role in areas relevant to higher education
3. **Supporting bodies**: Bodies outside of the public administration that play a key role in, among others, shaping the quality, financial support and structure of the higher education system's activities, actors and institutions
4. **Student representatives** from both undergraduate and graduate programmes
5. **Representatives from higher education institutions** (HEIs), in the vast majority, institutional leaders and heads of the teaching and learning research centres at each university
6. **Non-profit and private entities** engaged in supporting specific components of the higher education ecosystem (e.g. internationalisation, teaching and learning).

All interviewees received an interview guide containing guiding questions to prepare for the discussion with the OECD team. None of the interviews was recorded, to encourage open and frank conversations. The OECD conducted the interviews, and European Commission's Directorate-General for Structural Reform Support (DG REFORM) and MIT representatives were invited to attend the interviews as observers.

The sections that follow present key findings organised according to the questions posed to participants in the interview guide.

Challenges in the Hungarian higher education system

Interviews began by asking all participants to comment on general challenges facing Hungarian higher education. Interviewees identified several key issues, presented below.

Declining enrolment, changing expectations, and growing competition place significant pressure on HEIs

Consistent with an ageing Hungarian society, higher education enrolments have generally been decreasing since 2005 (apart from a slight increase in the last year). Despite the significant share of foreigners enrolled in Hungarian higher education, which helps to counterbalance brain drain and provides financial resources to institutions, the ability to attract international students is under strain due to increased international competition for students in higher education.

Some stakeholders noted that distance has become less of a barrier for students to access labour market-relevant degrees and that individuals look for flexible learning opportunities more often during their careers. They suggested that while opportunities exist to attract new types of learners, these require institutions to adapt in a swift and targeted way. At the same time, they suggested that programme and institutional prestige remain key in attracting students and that remaining attractive is tough for many institutions. The number of English-taught and double degree programmes as well as the level of pedagogical innovation, which could bolster the profile of institutions, are insufficient, according to some interviewees. A few stakeholders also stressed that the high number of HEIs in the country has fostered competition rather than collaboration, while also lowering quality as institutions compete for students.

The teaching profession is viewed as unattractive, and institutions as insufficiently focused on aligning programmes with labour market needs

The management of human and financial resources in HEIs, such as hiring and procurement processes, were described by many interviewees as bureaucratic and inflexible. The change of the governance model of HEIs to a foundation status is expected to help address some of these challenges and was received with prudent optimism by several stakeholders. Flexibility, efficiency (especially in human and financial resource management), and a more diversified pool of funding (e.g. through commercialisation opportunities) were noted as potential benefits of this new status, given how underfunded the sector is, according to many interviewees. However, some stakeholders warned that poor managerial skills and the possibility of contentious decision-making processes between existing and new leaders might dissipate efficiency gains. Some stakeholders highlighted that insufficient information was available about the change of governance model.

Almost all stakeholders reported the low remuneration of higher education teachers as a major issue. They highlighted that a limited number of graduates consider a career in academia, as teachers often need to hold multiple jobs (inside or outside HEIs) or opt for an alternative career in the private sector where more attractive conditions are offered. Career progression was also reported as problematic. The criteria for promotion are viewed as limited, with seniority and status (e.g. being a member of the Hungarian Academy of Sciences) being valued while teaching quality was not, for example. These factors, combined, were reported by many stakeholders to contribute to the low social perception of academic teaching.

The absence of labour market considerations in the design and delivery of higher education programmes was also a widely shared concern. Many interviewees pointed to shortages in key fields of study (e.g. science, technology, engineering, mathematics [STEM]), a burdensome programme approval process, and the lack of structured co-operation between HEIs and employers as evidence of this problem. The alignment of programmes and pedagogies with labour market needs (e.g. project-based work), a greater focus on transversal skills, and more lifelong learning opportunities were some of the areas where many stakeholders would like to see improvements.

Students struggle to prepare for, access and complete higher education

Access to higher education continues to be a concern, according to some stakeholders. Despite recent reforms to make higher education more accessible, for example by promoting access for under-represented groups (i.e. those with disabilities, minorities) and the provision of government financial support to most admitted students, several stakeholders reported that a significant share of students still has to balance study and work obligations. In addition, according to some interviewees, the retention in

and completion of higher education by students from under-represented groups are insufficiently monitored, and these groups are insufficiently supported during their studies.

The wage premium of tertiary education graduates in Hungary, which is above the OECD average, was reported as motivating enrolment in higher education. Yet, the dropout rate remains high, and some stakeholders deemed the preparedness of admitted students insufficient to complete higher education and enter the labour market.

The state of digitalisation of Hungarian higher education

Interviewees converged on a generally positive impression of the response of the Hungarian higher education system to the coronavirus (COVID-19) pandemic. Yet, there was also agreement among stakeholders that digitalisation of the higher education system needs improvement, and that the pandemic provides an opportunity to understand how more and better digitalisation can be achieved.

Low motivation and insufficient skills of academic staff, administrative staff and students to use digital technologies hampers progress

Many interviewees agreed that teachers have few incentives to either acquire digital skills or to teach in the digital environment, given that professional development is not considered in the promotion process, and that teacher pay is based on the number of in-person contact hours. According to some stakeholders, because dedicated support structures for digital teaching are not widely available, teaching staff have very heterogeneous levels of preparedness and knowledge of digital methodologies, and many remain hesitant to adopt digital practices.

Some interviewees identified the absence of pedagogical innovation and collaboration in general – not just with respect to digitalisation – as an impediment to the higher education system's ability to deal with new questions in the digital world (on assessment and academic integrity, intellectual property or privacy, for example) and to the wider adoption of digital practices. Stakeholders were almost unanimous in this diagnosis. While effective in supporting the continuity of learning, the switch to online learning in the spring of 2020 was seen as suboptimal, as lectures were often recorded as if taught in person and notes published on line without further engagement on the part of the teaching staff. Some stakeholders highlighted the contrast between student expectations of an engaging, flexible and high-quality learning experience, with the rudimentary digital skills of many academic teachers and students.

Fragmentation, lack of expert support and low co-ordination creates an uneven level of digitalisation within and between institutions

Most stakeholders agreed that basic digital infrastructure is generally available in Hungary due to recent investments in broadband access and essential hardware for classrooms and libraries (laptops, databases). Almost all interviewees, however, described the digital infrastructure of HEIs as fragmented, with different platforms and tools being adopted within and across HEIs, without a framework or expert advice guiding those decisions. For most stakeholders, the absence of a co-ordinated approach, in which a single platform is used by the whole higher education system, limits the opportunities for collaboration, interoperability and economies of scale. At the same time, others identified insufficient access to specialised software and valued the opportunity of staff to choose systems suiting their needs. In addition, the centralised public procurement system was widely described as burdensome and ineffective in responding to institutions' information and communication technology (ICT) infrastructure and equipment needs within a reasonable amount of time.

A clear policy framework sustained by adequate funding is needed to enhance adoption of and effectiveness in using digital tools

Stakeholders generally welcomed recent policy efforts in promoting a digitalisation-oriented agenda. However, many interviewees admitted their lack of understanding of the impact of past policies and of the

vision, priorities and governance of existing strategies on digitalisation, and that it would be important that higher education policies clearly identify digitalisation as a priority focus. Some stakeholders noted that it is hard for many in the higher education ecosystem to grasp how digitalisation can be beneficial for their pedagogical or administrative needs. Others noted the importance of improving support structures in HEIs to help staff become more familiar with digital tools, their use and their implementation.

Some stakeholders also highlighted the importance of ensuring that broad policy tools support the digitalisation agenda. They highlighted, for instance, the value of more strategic use of available funds, especially European Union (EU) structural funds, more systematic monitoring and a better articulation of strategies across educational cycles, as useful to strengthen digitalisation in higher education.

Opinions were divided as to how to stimulate further uptake of digital practices in higher education. Most interviewees advocated for an incentive-based approach, while a few argued that only centrally imposed requirements and oversight could lead to progress (e.g. requiring digitalisation-oriented actions in the development plan submitted by each HEI). Many stakeholders agreed that state funding should continue to invest significantly in the sector, but some interviewees pointed to the private sector as a funding source whose role should increase (e.g. through third-mission activities).

Benefits of digitalisation

Digitalisation may boost access, quality and the labour market relevance of higher education

Many stakeholders underscored the potential of digitalisation in strengthening digital skills and other labour market-relevant skills (e.g. transversal skills) if HEIs harness digital tools to modernise their programme offering and teaching methodologies to better match training needs (e.g. project-based work, on-the-job training). Stakeholders often suggested that the digital environment also holds the potential to provide more individualised support and expand access to high-quality study materials, as well as informal, flexible learning opportunities, especially for groups who face barriers in accessing higher education, such as cost, work and family duties or distance.

Administrative and managerial duties are expected to be more efficient, and active collaboration and data-driven decision making to be facilitated

Some stakeholders highlighted the prospect of more efficient and flexible use of time, including in student-teacher interaction, staff meetings and reduction in travel. A few interviewees were also optimistic about potential cost savings, especially in support functions and teacher contact hours, if a more paperless administration and hybrid teaching methods became the norm. Many stakeholders emphasised how digitalisation may open new possibilities to collaborate both at the domestic and global levels as well as to collect more granular data to strengthen decision-making processes within HEIs and in government.

Risks of digitalisation

Learning quality may deteriorate if staff and students are not supported, engaged, and safe

Most stakeholders emphasised that some features of in-person teaching, such as student engagement, personalised support and teacher mentoring, are vital for a good learning experience and should be preserved in a digital environment. Many interviewees expressed concerns that low pedagogical planning and engagement (e.g. re-using the same, outdated materials), as well as student isolation, may lead to a deterioration in learning outcomes unless proper incentives and support structures are created. Some stakeholders noted that security concerns might heighten the level of discomfort experienced by staff and students on line, reporting, for instance, that some institutions struggled to implement practices compliant with the General Data Protection Regulation (GDPR).

Widening inequalities and poor strategic planning may diminish the benefits of a more digitalised higher education

Many stakeholders reported that digital teaching and learning can be a challenge for many students and families, especially those who cannot afford stable Internet connectivity and efficient digital devices, or lack basic digital skills to learn and interact on line. Some suggested that while social interaction is critical to student development, it is largely missing in an online environment. Many stakeholders described digitalisation as potentially reinforcing the gap between higher- and lower-performing students, and between more and less advantaged students. They also noted that it might increase dropout rates, given the uneven availability of resources to support both staff and students across HEIs.

A few stakeholders warned against using digitalisation as a cost-saving tool that they thought could harm an already underfunded sector, noting that quality in higher education is costly to preserve. They suggested that, as digitalisation will require significant, sustained, additional efforts, these must be adequately funded. If not, stakeholders expressed concerns that the system's resources would be under severe pressure, generating inefficiencies and significant stakeholder pushback. In fact, according to some stakeholders, it is important not to interpret what they see as an adequate pandemic response as a "digitally-ready" higher education system. These interviewees suggested that the rapid obsolescence of technology and the evolving needs of institutions, staff and students require both long-term and flexible planning.

Digital infrastructure

Stakeholders interviewed by the OECD broadly agreed that basic digital infrastructure, such as broadband Internet, computers and access to learning management systems (LMS), is generally available across HEIs. Yet, they suggested that challenges remain in several areas.

Progress on digital infrastructure is limited by rigid procurement processes

Centralised procurement processes, albeit considered to be well functioning by policy makers, were viewed as a key barrier by many higher education stakeholders, which described the procedure as lengthy, burdensome and unresponsive to needs in a reasonable time. Instead of relying on state approval to purchase relevant equipment, often of low monetary value, a few stakeholders suggested that greater autonomy at the HEI level – either by shifting its governance towards a foundation-like status or adopting strict performance metrics around purchasing – could be more effective mechanisms.

Investment in digital infrastructure has fulfilled basic needs, but gaps in access remain

Stakeholders agreed that institutions are generally equipped with basic digital infrastructure (laptops, connectivity), especially regarding administrative functions. Yet, the reality is heterogeneous across institutions. A few interviewees reported that they still experience shortages in critical teaching tools (e.g. software subscriptions, interactive boards), which leads them to resort to leasing equipment or using personal devices. Other stakeholders noted that, even if mostly available at HEIs, basic infrastructure is not accessible to all households, especially those less privileged. Many interviewees suggested that funding needs for digital infrastructure are likely to remain significant, given current underfunding and the cost of maintaining and renewing digital infrastructure, some of which may quickly become obsolete as new technologies and tools develop.

An efficient approach to purchasing digital equipment based on user needs is necessary

Stakeholders reported that there is a wide range of digital solutions available to staff and students, but the absence of a policy framework and expert advice to help institutional leaders make decisions around digital infrastructure has led to a fragmented and inefficient use of digital tools. Many stakeholders reported how different tools were adopted even within the same HEI, generating inefficiencies, as students and staff needed to change software within their own institution to participate in different courses or activities. For many interviewees, efforts should be devoted to aggregating these fragmented efforts into a single, standardised solution to be adopted across the board.

For this purpose, a few interviewees highlighted that: 1) user needs, which must be better understood, should guide purchasing decisions; 2) one-off, project-based investments should be replaced by longer-term, sustainable programmes on digital infrastructure; and 3) there should be staff in each HEI able to develop and manage digital infrastructure and to support teachers and professional staff in using that infrastructure. Several stakeholders suggested that there are currently untapped opportunities to leverage the Hungarian ICT sector, described as well developed, to improve digital learning infrastructure in higher education.

Digitally enhanced teaching and learning, research and engagement

In general, stakeholders were hopeful regarding the promise of digitalisation. Past and future challenges around digital teaching and learning in Hungary were outlined along three main lines.

Teaching career prospects and pay do not incentivise digital practices

There was ample consensus among stakeholders on how the teaching career is not in line with the goals of a digitalised higher education system. Promotion of academic staff is driven by scientometric indicators and seniority, rather than by metrics reflecting a balance between digital and in-person teaching, teaching quality and professional development. Pay is low and uncompetitive with private-sector salaries, especially for recent graduates.

Based on the number of contact hours and the salary guidelines of public-sector careers, teachers often need to hold multiple jobs to earn enough income (except for fields of study with research income). There are no incentives to engage in digital teaching, and pedagogical innovation and assessments of teaching quality are absent from the teaching career. Yet, despite challenges of measuring quality and workload in a digital setting, many stakeholders argue that this is important to develop adequate incentives for teaching staff, which are critical to generate change.

Undervaluing professional development and collaboration harms digital readiness

Almost all interviewees stressed that many teaching staff are reluctant to engage with the digital transformation of higher education. According to many stakeholders, this is because many teachers have yet to realise the wide range of pedagogical and administrative benefits of digital tools. The lack of training around teaching methodologies and the use of digital infrastructure (including for teaching assistants, whose training is reported as mostly focused on administrative rather than pedagogical tasks) may help explain, according to many interviewees, why digitalisation is undervalued by academic staff. However, some stakeholders cautioned against mandatory, centrally imposed training requirements.

Many stakeholders described the teaching culture in higher education as traditional and insufficiently focused on collaboration and professional development. The absence of a requirement for pedagogical training among higher education teachers (unlike other educational cycles) and the hierarchical teaching culture were noted by a few interviewees as particularly counterproductive in the digital environment where peer learning is critical. Some stakeholders suggested that concerns around intellectual property rights for digital content may also help explain the reluctance of staff to engage in digital teaching and research. Other interviewees advocated that, instead, open access to materials and tools should be the key principle to facilitate collaboration.

The learning experience can be enhanced if adequate supports help improve teaching quality and student engagement

According to many stakeholders, the sudden shift to online learning in spring 2020 revealed particular challenges for HEIs in providing student support, ensuring academic integrity and conducting assessments in a digital environment. Many interviewees also emphasised that a high-quality experience on line has a range of key features, including: 1) good study materials; 2) flexible, individualised learning paths; and 3) attributes from in-person teaching, such as active student engagement. While there was broad agreement

that a quality online experience looks different depending on the field of study, stakeholders interviewed agreed that Hungarian higher education is still far from consistently providing high-quality online learning experiences.

Many interviewees stated that the high number of digital tools available to teachers and students has been counterproductive for teaching and learning. Many highlighted that the lack of co-ordination in developing and/or acquiring these tools, together with the insufficient expert support in HEIs and nationwide to help with the use of these tools, have slowed down adoption by academic staff and students. A majority of stakeholders interviewed proposed that some standardisation of digital tools and the support of well-resourced teaching and learning centres are promising avenues to facilitate the transition to a digital higher education system.

Learning processes and outputs

Educational attainment may increase if programmes are more flexible, individualised and articulated with labour market partners

Student expectations and employer needs are changing. For most stakeholders, learning opportunities focused on labour-market-relevant areas, but also with flexible schedules, tailored learning paths and of shorter duration, are increasingly in demand. Yet, according to many interviewees, the programme offering in Hungarian higher education is still lagging in this respect. One possible explanation may be the excessive length and burden of programme approval and quality assurance processes, which some stakeholders recommended simplifying.

Digitalisation can strengthen digital skills and facilitate the acquisition of labour-market-relevant competencies through novel methodologies

All interviewees described the digitalisation of higher education as a key opportunity to bolster the digital skills of students as well as academic and administrative staff. A few stakeholders also noted they expect the introduction of new pedagogies, which digital tools can facilitate (e.g. project-based work, independent study) to stimulate the development of labour-market-relevant (e.g. transversal) skills. Some interviewees suggested that the introduction of digital skills courses across higher education programmes and an assessment of digital skills upon entry and graduation from higher education would help improve digital readiness for all students and graduates.

Alignment with priority fields of study and a broader engagement of labour market actors can increase the relevance of higher education

According to many stakeholders, shortages in priority fields, such as teaching and STEM, should be tackled by aligning higher education degrees with labour market needs. Yet, for some interviewees, labour market actors can contribute to the higher education sector more widely. Examples of further collaboration cited by stakeholders include higher education-industry co-operation in specific research fields, employer-financed training in labour-market-relevant areas and the further commercialisation of research outputs. Digitalisation can also be helpful, according to some stakeholders, in providing further tools through which economic actors and HEIs can engage. This can include identifying job opportunities and matching graduates to jobs, co-designing courses or sharing information about activities of HEIs and labour market actors that may be of mutual interest.

Institutional roundtables – January 2021

Following the initial set of interviews with a range of higher education stakeholders, the OECD organised institutional roundtables with a diverse group of representatives from Hungarian HEIs. The MIT, in close collaboration with the Hungarian Rectors' Conference, selected nine institutions to participate in the

roundtables. The goal was to select a sample of institutions that could represent the diversity of the Hungarian higher education system, in terms of size, location (e.g. urban/rural), orientation (research/teaching), status (e.g. public, private, church-related, foundation status) and level of digitalisation (i.e. at different stages of their digital development).

Each institution was then asked to nominate a delegation, comprising one member from each of the following categories: 1) institutional management; 2) academic staff; 3) professional staff in charge of digital infrastructure, teaching and learning; and 4) students.

Thus, 36 people, representing 9 institutions in the Hungarian higher education system, were invited to participate in this process. Of this, 35 individuals from the 9 institutions (see Table A.1.) accepted the invitation and took part in their respective roundtable between 20 and 22 January 2021.

All representatives received an information note providing context about the event and a list of guiding questions to prepare for the roundtables. A preparatory webinar took place on 14 January 2021 to provide participants with an overview of the project, of the stakeholder input collected so far, as well as of the goals, logistics and discussion questions of the roundtables. The webinar was attended by 43 participants.

The institutional roundtables were not recorded, to encourage open and frank conversations. The OECD conducted the interviews, and representatives from the European Commission's DG-REFORM and MIT were invited to attend as observers.

The sections that follow present key findings organised according to the questions posed to participants in the information note.

Policy framework

Participants were asked to reflect on the policies and strategies shaping digitalisation at their institution, including any policy barriers, as well as on the channels and actors contributing to the consideration of stakeholder needs in the design and implementation of digitalisation policies and practices at institutional and national levels.

Uneven levels of preparedness across the system and concerns around the sustainability of recently adopted practices may hamper long-term digitalisation

All participants noted that the COVID-19 pandemic bolstered most of the existing digitally-oriented practices in Hungarian higher education. This sudden push met some scepticism and low capacity in some institutions but was received positively in other institutions. Stakeholders indicated that HEIs with pre-existing experience and intentional focus on digitalisation coped better with the many requirements of digital teaching and learning.

Notwithstanding, most participants recognised that institutions and staff still lack the necessary levels of preparedness (skills, funding, access to infrastructure) to build the well-digitalised higher education system Hungary needs. Many individuals reported concerns regarding the sustainability of the policies and practices currently being adopted to develop a more digitalised higher education system, especially whether the facilitating environment (e.g. additional funding) would fade in a post-pandemic environment.

Multiple barriers, from financial to regulatory, slow the pace of the digital transformation of Hungarian higher education

Many participants underscored the need for a different regulatory framework, namely one that recognises blended learning and replaces contact hours with a more adequate measure for both teaching workload and student credits.

Some described the current policy framework as disproportionately centralised (e.g. student admissions), rigid (e.g. procurement) and unresponsive to the new challenges faced by HEIs (e.g. delivering more flexible, shorter learning opportunities). One stakeholder disagreed, describing the existing regulatory

frame as more flexible than many imagine, as evidenced by the existence of distance learning for over a decade, but still recognised the need for more flexibility to be introduced.

On the other hand, issues around equipment purchasing, such as shortages in equipment supply, lack of funding, a limited pool of suppliers (which seems to impact the quality of available solutions), were reported by many stakeholders. A few of them also stressed that financial limitations at the institutional level could be more easily mitigated if an adequate long-term strategy on digitalisation were in place to guide decision making.

Communication with policy makers is limited, while existing national strategies are often not reflected in institutional practices

While many participants were aware of national strategies currently in place on digitalisation and higher education, these same stakeholders underscored that only a few people (often those with decision-making power in the institution) are aware of their existence, intents and impact. According to some participants, the digitalisation of higher education has also been less prominent in the policy agenda than the digital transformation of other cycles of education.

There seems to have been a limited take-up of nationwide strategies at institutions. Few stakeholders reported having institutional-specific plans on digitalisation, most of which emerged post-pandemic or were developed several years ago and only targeted traditional distance learning. In the view of several participants, it is individual staff's motivation and initiatives – through their ideas, projects and collaboration – that are currently driving the digital transformation of the system. A few stakeholders emphasised that actions at the EU or international level (e.g. the European Universities Initiative) provide an opportunity to work collaboratively and adopt new practices on issues that have not yet received significant attention domestically (e.g. credit recognition of digital courses, virtual mobility, joint programmes).

Many stakeholders noted the existence of formal bodies (existing bodies, consultative bodies) to communicate with the government but noted these channels do not always seem adequate to exchange on fast-changing issues relevant to digitalisation. In the instances where stakeholders reported being consulted outside of these structures, they noted that these consultations focused on operational rather than strategic issues. However, some institutions noted that membership in institutional structures, such as student unions or academic councils, can provide useful opportunities to communicate with government authorities on various issues, including digitalisation.

Digital infrastructure and data systems

Institutional representatives shared their experiences when it comes to accessing, using, developing and managing digital infrastructure at their institutions. The quality and quantity of available dedicated support, the balance between customisation and standardisation, and procurement were a particular focus of the discussions.

Access to digital infrastructure and support and motivation to use digital tools is uneven

Most stakeholders agreed that basic digital infrastructure is generally available at institutions, despite some gaps remaining in rural areas and at state-owned institutions. However, several staff members and students noted a lack of access to specialised software (rarely bought by students individually, given its cost), as well as a lack of digital devices and reliable Internet at home, where they also need to fulfil their academic responsibilities. Supply shortages conditioned access at the beginning of the pandemic, and organisations such as student unions have mobilised their own resources to support those lacking the necessary tools.

While some stakeholders emphasised that adoption depends on the extent to which one can use digital tools (besides having them), others stressed that without the necessary infrastructure, there is no chance

to ensure equitable access to opportunities. For example, at one institution, the academic staff's contractual relationship with the institution (e.g. permanent versus temporary contract) conditions the set of digital tools they are provided to perform their duties.

Participants from several institutions recognised they have some specialised support to use digital tools for teaching and learning. Yet, across the three roundtables, the support available was reported to be of varying quality and quantity.

In addition, many participants highlighted how resistance to the adoption of digital tools is still prevalent among some staff and students, and most digital practices have been championed by a limited number of highly dedicated people. Some stakeholders regretted that interaction between academic and professional staff is still limited, and feedback on infrastructure is rarely sought, or, if collected, often takes place as a one-off exercise.

Choosing, procuring and scaling-up remain key challenges in dealing with infrastructure

There is a significant variety of institutional models for digital infrastructure management. Some institutions have centralised, institution-wide offices; others have established dedicated centres at the department level; and a few have created different teams depending on whether support was intended to address hardware or software, technical or learning-oriented questions. One institution formed a working group on digital education to advise institutional leaders on digital transformation (including infrastructure), while another one set up communities of practice to promote intra-institutional collaboration. Another institution invited digitally competent professors to (voluntarily) join a committee on digital infrastructure to provide support to their peers, without being rewarded for the additional workload it represented.

Most participants underscored the ineffectiveness of the procurement process – particularly the delays, limited range of suppliers and the bureaucratic burden of the process – as well as the funding limitations to purchase the necessary infrastructure, which they fear may heighten after the pandemic is under control.

The balance between customisation and standardisation, as well as what and how many tools to make available at an institution – whether for distinct or similar purposes – have been approached differently across the Hungarian higher education system. Some institutions believe in the importance of letting teaching staff choose the tools they prefer and think that, with adequate co-ordination and an informed assessment of usefulness (conducted by local staff), a wide range of tools can be helpful. Others prefer to choose one limited set of tools and push for adoption across the whole institution, in order to lighten the burden of having to work across multiple tools. Notwithstanding, even institutions favouring a limited number of tools view the imposition of government-led restrictions (e.g. mandating the adoption of specific tools, limiting the set of tools available in the government-mediated procurement process) negatively.

Most participants reported that, at the outset of the pandemic, institutions struggled with the scale of their digital tools, largely insufficient to store data (e.g. from online assessments) and sustain peak demand for services (e.g. streaming lectures, accessing a video conferencing platform). Cloud services became the preferred option by many, but it took several months for some institutions to meet their needs. Institutions that had been focusing on digitalisation for some time, namely funding infrastructure, building up capacity and piloting new methodologies (for distance learning, for example), had a smoother transition.

Digitally enhanced teaching, research, and engagement

Participants took stock of their recent experiences with digital teaching and identified what they deemed to be the most and least effective practices in this regard. They noted that weaknesses in digital teaching were often the result of insufficient pedagogical and professional development of teaching staff, and disproportionate workload without adequate (financial and non-financial) compensation.

Experiences with digital teaching are mixed

Institutions whose representatives participated in the roundtables have distinct experiences with digital teaching. A few have been working on digitalisation for several years, while others still struggle in accessing and using digital tools. Some participants felt teaching quality has deteriorated with digital tools, in part due to the lack of interaction between students and staff. Other participants noted that staff had managed to adapt reasonably well, increasing the number and diversity of teaching materials. Those with positive experiences valued the greater flexibility of digital teaching and learning, such as saving travel time and the opportunity to review recorded classes at one's own pace.

Many participants spoke in favour of further blended/hybrid instruction in the future as an alternative to fully in-person or fully remote instruction. While the development of hybrid programmes did not seem to be particularly bureaucratic according to participants, academics and leaders feared, respectively, their pay may reduce, and their institutional budgets shrink, if blended programmes keep being approved without a change in the legal rules that tie budgets to the number of in-person contact hours between staff and students.

Both pedagogical and legislative changes are needed, in tandem, to boost digitalisation

Hungarian higher education relies heavily on frontal teaching, as many highlighted during roundtables. The majority of stakeholders called for a shift towards active learning, which, among other things, will require new criteria, instead of contact hours, for staff pay and student credit, to take into account the additional workload involved by the greater individualisation of teaching practices. The majority of participants agreed that financial (e.g. rewarding content creation) and non-financial incentives (e.g. recognition of staff professional development for promotion) may be effective in increasing teaching quality and engagement in digital teaching. However, some academic representatives noted that incentives might be insufficient due to the low intrinsic motivation of some teaching staff to engage in improving the quality of teaching and the use of digital technologies in teaching, suggesting mandatory requirements may in some cases be necessary to change behaviours.

Many participants highlighted student assessment as the most challenging component of teaching and learning to manage in an online setting, given the high expectations to uphold learning outcomes but a generalised absence of clear guidelines on how to preserve academic integrity. Several participants indicated a preference for keeping assessments in person. More broadly, the majority of stakeholders were sceptical that digital tools could fully replace in-person teaching, especially in applied fields of study, with the exception of cases where digital technologies were already relatively integrated (e.g. in the field of design).

The digital transformation of Hungarian higher education can only be successful with strong capacity building and stakeholder buy-in

Participating stakeholders reported that the resistance to digitalisation is likely to increase, as new pedagogical approaches will be necessary to deliver quality digital teaching and learning, and higher education pedagogical practices have undergone little change in Hungary, remaining largely focused on frontal teaching and learning in particular. Even if new and more digital resources and tools were to become available, many participants emphasised that capacity building is key to ensure the adoption of new resources.

Most representatives reported significant heterogeneity in the digital proficiency of staff. They noted that specialised support is available but cannot be provided in most institutions at the scale and with the sophistication needed. Access to digital content and databases also remains limited (as it used to be before the pandemic, during which many experienced a limited period of open access made available as a crisis-response measure by publishers).

Despite the promise of greater efficiency, several instructors and students reported that they take longer to fulfil their duties when using digital tools, leading some institutions to report greater stress and mental health issues in their communities.

Taken together, these elements negatively impact the ability of teachers to plan teaching activities (e.g. schedules, syllabuses, content) and engage in high-quality digital teaching.

Learning processes and outputs

The roundtable discussions shed light on how digital learning requires new attitudes and competencies, such as time management and self-discipline, but has also not been successful to date in delivering on highly appreciated dimensions of the traditional in-person learning experience, such as in-class engagement, collaboration and social life.

Digitalisation offers new opportunities but has not fulfilled its promise to provide a more complete and effective digital learning experience to students

Most participating stakeholders agreed on the most and least effective dimensions of digital learning. Several participants appreciated the increased access, number and diversity of skill development opportunities and resources available to institutions through digital channels, as well as the flexibility which adult learners who juggle family, professional and academic duties may have in a digital environment. Highly praised aspects included asynchronous access to recorded classes, the expansion of learning opportunities (e.g. massive open online courses, MOOCs) and the increase of schedule flexibility.

However, low peer-to-peer collaboration and in-class student engagement, decreasing motivation to finish (or even start) their degree, additional workload from a proliferation of assignments, and the mixed quality of digital teaching practices were described as still prevalent in Hungarian higher education.

The majority of institutions recognised weaknesses in responding to these novel challenges. Time management, self-motivation and online etiquette are skills that most institutions do not yet provide support on, often because they lack the expertise to do so. According to participants, students were asked to take on new responsibilities they were not ready for (e.g. study independently) or to manage time-zone differences, leading many to disengage or only complete minimum requirements, and some to find the support available insufficient and their learning experience unsatisfactory. Mental health services were reported to be limited, of small scale, rarely used and low priority for decision makers.

In addition, many participants expressed concerns about the effectiveness of digital tools to teach practical fields of study and facilitate on-the-job training, for which institutions and companies cannot find a digital equivalent of sufficiently high quality to replace in-person learning.

The impact of digitalisation on the quality of learning outcomes is viewed as uncertain

While aware of the potential of digital tools for learning, some academics noted that students struggle to use data collected in LMS and feedback provided on line to improve their learning. On the other hand, some students reported they are wrongfully perceived as digital natives, which generates unrealistic expectations, and are viewed as not motivated when the lack of motivation is usually a result of the format of digital learning. Concerns were expressed about the sense of a loss of privacy by students, due to monitoring mechanisms, especially during examinations.

Given the extent to which a student's personality and his/her access to reliable digital infrastructure determines his/her engagement in digital learning, several participating leaders and staff members recognised that they have an important role to play in ensuring students are provided with equal opportunities. Yet, although many recognised that one-to-one interactions and small group classes would be more effective for some students than larger-scale formats, participants noted that such individualised support and pedagogy is limited as the workload associated is disproportionate and not rewarded.

A few institutions have, nonetheless, found creative ways to improve the learning experience and support to students. Some have used digital tools, such as text messages to nudge students about deadlines and MOOCs to teach online study methodologies, while at others, staff have asked a student in each class to be their point of contact and report on challenges being faced by the student body.

Group-specific views

With their peers, participants had an opportunity to reflect on the plenary discussions, highlight areas of agreement and disagreement, and identify dimensions that, albeit not discussed until that point, would be of relevance to the project and the digital transformation of Hungarian higher education.

Leaders feel their institutions are not sufficiently well equipped to deal with the emerging challenges of digitalisation

Several representatives advocated for greater financial resources. Some leaders of private institutions feel their resource pool is extremely limited, with no access to state funds and difficulties in obtaining EU funds. Others felt they do not have enough resources to invest in specialised support services or to reward teachers proportionately to their workload. At least one institution in a priority field of study (as identified in the country's mid-term policy strategy) expressed concerns about how their enrolment is disproportionately high compared to the resources they are given to manage programmes in "priority fields of study".

For some leaders, changes in the maintainer of a higher education institution may increase the institution's ability to attract financing, as currently considered in the "model change" process, but it is their view that competitiveness can only be attained if the policy framework changes more broadly. Pedagogy and digitalisation, for example, would be, in the view of some leaders, important areas to consider in conjunction with the change of maintainer, but so far, they have been put aside as second-order issues. Several representatives cautioned against broad strategies with extensive lists of actions that are most often centralised. Many also referred to the need for better incentive systems that reward teaching quality as much as research outputs.

Some leaders emphasised the role of digitalisation in bolstering skill development, including digital literacy that should be developed at educational institutions, but also within society at large. A few individuals reiterated, however, that they felt ill-equipped to assess what skills have greater or lesser labour market relevance in Hungary. A few leaders highlighted the importance of learning analytics as a promising tool to evaluate students' progress but raised concerns about the associated data protection challenges, which they do not feel capable of tackling given the absence of guidance in the existing legal framework. Notwithstanding, there was no consensus on whether binding (regulation) or non-binding solutions (a recommendation) would be best suited to manage this issue.

Teachers call for pedagogical training and better working conditions to ensure a successful digital transformation

All academic participants recognised the decreasing appeal of a teaching career. Among the key challenges noted were:

1. low pay, especially compared to the private sector, and given increasing workloads
2. a promotion system based on seniority and research outputs that does not evaluate or consider the quality of teaching or the development of teaching content
3. the inability to dismiss in the event of poor teaching performance
4. the lack of incentives to engage with digital tools
5. difficulties in balancing teaching and research responsibilities.

Many individuals called for a better balance between top-down and bottom-up initiatives. In particular, most participating academics regretted the insufficiency of efforts to ensure the buy-in of staff. They referenced, for example, limited initiatives to seek their views, explain the goals of a given initiative, or provide more time for the implementation of new reforms. Some academics indicated that they viewed institutional leaders as the most important actor in generating change, at both institutional and national levels (e.g. to revise curricula, prioritise digitalisation, strengthen staff evaluation). Some representatives suggested that

government efforts could focus more on creating a supportive environment for HEIs rather than imposing mandatory initiatives, which should help ensure that ongoing reforms can be sustainable.

With regard to their teaching experience, many academics recognised that, albeit not currently required, pedagogical skills should be developed and rewarded, as is the case in other educational cycles where continuous professional development (based on a specific credit system) became the norm. Feedback collected by academics on their teaching practices has been mixed at best, according to some faculty, and online assessment remains an area where many academics think work needs to be done. A few teachers also underscored how, when learning outcomes (*Képzési és kimeneti követelmények*, or KKK) have not yet been defined for a given field of study, the launch of a new academic programme may take two to four years, which is deemed as lengthy and ill-suited for the system to adjust to fast-changing needs.

Existing regulatory barriers and limited installed capacity push professional staff to focus on scoping the tools and methods to be used on line

For some professional staff, the COVID-19 pandemic represented the opportunity to bring about changes they had tried to advocate for in the past, but which were not supported by sufficient funding or political will to make happen. Some participants described their preference for tools that are open access or that the institution already subscribed to (e.g. Microsoft Teams). Many of them helped institutional leaders select a narrow (yet diverse and useful) set of tools, recognising their own limitations as support staff to assist at a time of increased demand. Based on their own experience and recent institutional surveys, some representatives reported that support is most often sought to conceptualise new teaching methodologies, assessments, and ways to collaborate.

In line with the plenary discussions, many professional staff members stressed their negative assessment of the current procurement process. For some participants, the fact that a staff member has no visibility on the process as soon as the request is submitted generates many inefficiencies. Others believe free or in-house developed tools can be as fit for purpose as commercially procured ones. A few participants underscored the vast resources spent by institutions to expand their legal departments to deal with procurement and the preference of some teachers to use their own resources rather than wait weeks or months for a centrally procured tool they need.

Internationalisation was another issue that received particular attention, especially at one roundtable. A few participants highlighted the need to adapt the criteria governing financial support for student and staff participation in mobility to a virtual mobility scenario (still incipient in Hungary). Some noted the significant value for institutional competitiveness of an expanded educational offering where international students can choose where to study, staying abroad (despite being in different time zones) or moving to Hungary, depending on their preferences.

Students are worried about the lower quality of their online learning experiences and outcomes

Among student participants, there was a general concern about the deterioration of the quality of learning outcomes in a digital environment. For some students, this comes as a result of, among other things, low teacher motivation, as they struggled to achieve their teaching goals on line and viewed the current state related to the pandemic as transitory. Others felt teachers and leaders trust students less on line than they did in person, as evidenced by a disproportionate focus on preserving academic integrity or the belief that students become passive as they do not engage in class. Some felt that their challenges in having to adapt to new requirements and the burden caused by a proliferation of digital tools were not adequately taken into account. Many admitted the increased number of potential distractions, the struggle to teach the practical aspects of certain fields of study effectively, and the inability to interact with peers and teachers as important drawbacks of digital learning, which generate frustration and a decrease in the perceived quality of higher education.

However, participants had mixed views on what mode of learning was most effective and stressed how these views might vary between undergraduate and graduate students. On the one hand, hybrid teaching

was reported to allow for more social interaction, but during the pandemic, students were required to return home right after their in-person class, creating schedule issues, forcing students to choose between missing the in-person or the online class scheduled immediately after. On the other hand, some participants noted that fully remote instruction allows them to better manage family and work responsibilities, but is ineffective in ensuring learning outcomes are achieved for practical fields of study.

Student discussions also identified several areas for further work. In particular, some students highlighted teacher training as an important priority due to what they perceived as significant heterogeneity in the digital skills of teaching staff and the quality of learning materials being provided. A few participants pointed out the increased difficulties of students with learning disabilities on line; others noted the need to account for different learning styles when designing pedagogical approaches; and some highlighted the large potential (that they viewed as vastly untapped in Hungary) of digital tools for targeted skill development.

International expert meeting – 7 July 2021

As part of the project's work on monitoring the digitalisation of higher education, the OECD organised an international expert meeting focused on indicators, data and methods to measure digitalisation in higher education. The expert meeting, held on 7 July 2021, was designed to support interactive discussions between national and international experts. It was attended by 55 participants, including Hungarian higher education experts and stakeholders, international experts, and policy makers from other countries invited as observers (see Table A.1).

The sections that follow present key insights from the meeting presentations and discussions.

Measuring and supporting digital readiness

Recent surveys of Hungarian HEIs provide valuable insights on enablers and barriers to digitalisation and on access to digital infrastructure in Hungarian higher education

In September 2020, the MIT commissioned a survey of HEIs as part of the Digital Success Programme, which the Digital Higher Education Competence Centre carried out. The survey was intended to assist with the design of a national indicator system of digital maturity. Of the 63 state-recognised HEIs, 54 completed the survey. Data collection focused on factors determining the level of digitalisation of HEIs and on the institutional use of digitalisation-related policies. The results revealed that almost all HEIs reported that the COVID-19 pandemic strongly accelerated the development of digital curricula, and changes to pedagogical methods, with many HEIs reporting the provision of digital skills development programmes for students, digitalised study materials for students and the development of digital institutional management processes. However, very few HEIs indicated that they invested in the modernisation of digital infrastructure.

In November 2020, the MIT commissioned a second survey of HEIs as part of the Digital Success Programme, which the Digital Higher Education Competence Centre again carried out. The second survey aimed to assess the state of digital infrastructure within Hungarian HEIs. Of the 63 state-recognised HEIs, 55 completed the survey. The survey revealed the strengths and weaknesses of HEI digital infrastructure. While high-speed Internet access was generally reported to be good and there were increases in the number of LMS users as a result of the pandemic, many HEIs reported insufficient quantity and quality of digital equipment supporting digital teaching and learning (e.g. digital devices, rooms suited for mediating education and interactive tools). The survey also pointed to high levels of disparity with respect to digital infrastructure and digital readiness between large HEIs in the capital region and/or private HEIs on the one hand, and smaller, rural HEIs, on the other.

The two surveys served as a basis for the Hungarian government to define domains and priorities to improve the digital maturity of HEIs. Drawing on a model of digital maturity developed in Croatia, the following domains were identified as requiring action, in order of priority: 1) leadership planning and

management; 2) learning and teaching; 3) ICT culture; 4) ICT resources and infrastructure; and 5) the use of data for learning analytics.

Inter-HEI collaboration helps monitor and support the digital readiness of HEIs

In the Netherlands, SURF is an ICT co-operative whose members are education and research institutions. It gathers more than 100 Dutch HEIs in its members' council. It operates on an annual budget of approximately EUR 200 million from membership fees and national and EU subsidies that support innovative projects and infrastructure development.

SURF plays a key role in guaranteeing high-quality digital infrastructure and promoting flexible educational opportunities. SURF monitors digital infrastructure practices and readiness of HEIs on a two-year cycle, highlighting, for instance, the types of technologies institutions use. A survey conducted by SURF revealed that HEIs relied on, on average, 14.3 software applications in 2020, with Microsoft 365, Osiris, Microsoft Teams, FeedbackFruits and Blackboard being the most widely used. In addition, SURF negotiates commercial contracts with leading technology companies, allowing its members to benefit from reduced costs. Moreover, SURF provides collaborative services to its members, facilitating the take-up of lifelong learning through a system of recognition of learning called EduBadges and supports the development of open educational resources through a system called EduSources.

Several barriers prevent the effectiveness of Hungarian digital higher education

Stakeholder participating in the meeting noted that several barriers hinder the digitalisation of higher education in Hungary. They noted that Hungarian students pursue very different types of study programmes, without common groupings of courses such as majors or minors, for instance, which may lead to highly distinct study experiences, and experiences with or attitudes to digital technologies.

Moreover, academic staff in Hungary are not required to undergo regular, compulsory training in their workplace, and therefore largely depend on occasional training and personal experience to acquire or update skills, including those needed for digitally enhance teaching and learning. The pandemic revealed that students, while proficient at consuming digital content, found it difficult to learn and collaborate in a digital environment, and some of them lack the digital equipment needed for effective online learning and participation.

Many Hungarian HEIs also appear sceptical about the benefits of collaboration between HEIs. For instance, many HEIs responding to a survey conducted by the Digital Success Programme generally agreed on the need for each HEI to have its own laboratory to determine the content of its courses, signalling that Hungarian HEIs are not yet ready for collaboration in that area. Moreover, some institutional stakeholders pointed to the over-reliance of European HEIs on non-European market leaders for their digital infrastructure as another challenge, advocating for the development of stronger European technology companies.

There is an opportunity for governments to incentivise teachers to share their educational content as part of a broader open educational resources strategy

The Netherlands has pursued several approaches to promote the sharing of digital educational resources. Digital materials are often shared among active teacher communities, who are often easily convinced to share their materials on the EduSources platform maintained by SURF. At the same time, there is also a need to encourage the use of such resources. To this end, SURF developed a policy to increase the use of shared materials addressed to the Rectors' Conference and the Ministry of Education, Culture and Science in order to encourage educational institutions and teachers to use the EduSources platform. While rewards for quality research remain more developed than for quality teaching, SURF aims to reward the making and sharing of educational content as an incentive for teachers. Although the Netherlands has high-quality technology supporting the creation and use of open educational resources, cultural barriers remain among the teaching community to further develop and use these resources.

Compulsory training for teachers can support the digitalisation of higher education

Although the Hungarian government does not require compulsory training for teachers, leading HEIs have tried to incentivise teachers to engage in training through other means. Private HEIs have notably been implementing compulsory training, including technical and pedagogical support, for some years.

The Netherlands requires higher education teachers to complete a short compulsory training programme entitled the University Teaching Qualification, developed by the Dutch Association of Universities (VSNU). Areas of competence improvement are identified collaboratively and have notably included supports to develop personalised learning, improve teachers' skills and shift toward a more blended learning curriculum. In addition, the Netherlands generally benefits from good levels of knowledge sharing between teachers to improve the digital learning and teaching experience.

Measuring and supporting digital practices and digital performance

The increased use of ICT and artificial intelligence (AI) can support the data-driven transformation of HEIs

A presentation from a senior leader from the Budapest University of Technology and Economics highlighted how expanding the use of advanced digital technologies could expand the value HEIs create for the Hungarian economy and society, stressing the importance for institutions to adopt an entrepreneurial mindset to make use of these technologies. To assess the digital transformation of HEIs, indicators would be important to develop to assess the use of technology in teaching, research, development and innovation (RDI), the development of "smart", technology-enabled campuses, and the strategic utilisation of data generated by digital technologies to support all missions of HEIs.

Regarding teaching and learning, for instance, AI-based learning analytics can provide unique insights into the relationship between different sets of data, such as student entrance scores, socio-economic background, exam grades and dropout rates, enabling HEIs to predict the completion rates of students. These analyses allow HEIs to implement measures fostering student success, such as student "warning systems" and tutoring for those more likely to drop out. In addition, sentiment analysis provides insights into students' opinions about courses, which can be used to improve the curriculum.

HEIs can also develop their innovation ecosystem by supporting student innovation through venture capital funds and start-up incubation programmes. Campus digitalisation can be achieved by deploying 5G, with fully programmable devices allowing for system-wide and device-level data collection and measurement.

Digitalisation can improve the competitiveness of HEIs through improved learning and teaching quality, the internationalisation of PhD students and of academic teachers, and the development of entrepreneurial courses. There is also an opportunity to leverage digitalisation to further develop multidisciplinary and inter-HEI collaboration to better address global challenges such as sustainable development.

Online learning can improve student learning conditions by providing flexibility

Hungarian HEIs that had prior experience with online teaching and learning transitioned to fully online teaching relatively smoothly during the COVID-19 pandemic. In the case of Kodolányi János University, the use of Moodle for learning management and course materials, and Microsoft Teams for online streaming of classes, allowed for the effective monitoring of online teaching and learning as both applications provided data on teachers' and students' presence and activity. Surveys were conducted to assess the quality of students' equipment and of the technical help received. Students who responded expressed largely positive views about online learning, many of them valuing the flexibility it provides to students who have jobs or pursue artistic or sports activities. In one survey, a minority of students (15%) preferred in-person teaching and learning, and 45% preferred hybrid education.

A national, comprehensive survey of digital higher education provides valuable insights into student and staff perceptions and expectations

The Irish National Digital Experience (INDEx) survey, developed by the National Forum for the Enhancement of Teaching and Learning, a sector-led organisation, was conducted across all Irish HEIs from October to December 2019. The survey covered both institutional and individual digital capabilities, providing valuable insights into the digital practices of higher education students and staff before the pandemic.

Teaching staff – 70% of whom had never taught on line before the pandemic – welcomed interactive and collaborative digital tools to support their teaching. Students reported using a wide range of digital tools to support their learning, many of them appreciating the flexibility offered by online learning to fit learning into their lives, while many also reported digital learning as enjoyable. Students identified the access to a reliable Wi-Fi connection, the consistent use of the virtual learning environment and the availability of lecture recordings (the latter of which they found currently underdeveloped) – as the three priority areas for their HEI to focus on. Although students generally agreed on the importance of digital skills for their chosen careers, less than half agreed that their courses prepared them for the digital workspace.

Data privacy appeared to be a concern for students – who did not know how their data was used and protected by their HEI, and for staff – who lacked training in secure data management. Similarly, students and staff generally felt left out of HEIs' decisions regarding digital services.

Conducting a survey at the national level and involving all parties – HEI leaders, students and staff – fostered inclusion, non-partisanship and dialogue among all HEI stakeholders. The main drivers of success for this project included, in particular: 1) the timing of the survey; 2) offering opportunities for HEIs to provide input at all stages of the survey, which generated HEI leadership buy-in; 3) a focus on institutional needs, notably by allowing each HEI to ask five additional HEI-specific questions; 4) access to institutional data in real-time, providing instant feedback for HEIs; and 5) student-staff partnerships.

Learning analytics can support HEIs in measuring and improving teaching and learning performance

Learning analytics have significant potential to help HEIs understand learning practices and improve outcomes. They provide summative, real-time and predictive data that can inform learning design, teaching and learning, as well as HEI governance and organisation. HEIs in the United States, the United Kingdom and Australia, in particular, are early adopters of learning analytics.

Studies have demonstrated the relevance of learning analytics in supporting study success by predicting students' grades, behaviour and performance, based on their socio-economic background, learning profiles and study programme. Evidence shows that learning analytics benefits learning and teaching in a variety of contexts by supporting teachers as well as HEIs in making informed decisions. This includes identifying students who would benefit from tutoring, supporting curriculum redesign and providing students with useful and meaningful data about their performance.

Each HEI has the responsibility to decide what data to use to obtain valid and relevant indicators. Although privacy concerns should be carefully considered, learning analytics provide a valuable opportunity for HEIs to support quality teaching and learning.

Despite their potential benefits, there are difficulties in enhancing the use of learning analytics. Hungarian stakeholders participating in the meeting highlighted the shortage of ICT professionals and engineers to support the development of learning analytics as one main challenge, as well as institutional and system-wide barriers, such as the lack of funding to develop such systems. Moreover, participants felt that Hungarian HEIs lacked a strong labour market orientation and collaboration with employers, which they thought could both improve the labour market relevance of their programmes while being an incentive for students to perform better, and in turn, increase interest in learning analytics.

Student associations and government can help improve student trust in HEIs with respect to data protection

In Ireland, many HEIs were surprised by the results of the INDEx survey with respect to data protection concerns among students. They interpreted it as a result of insufficient communication, considering that students were supportive of data use to support their learning. Some changes HEIs considered included allowing students to choose whether or not they wanted to share their data for each class rather than for all classes at once, thereby giving them greater control over their data.

The National Forum for the Enhancement of Teaching and Learning relied on partnerships with most student unions in Irish HEIs and on the creation of a National Student Assembly representative of all HEIs reflecting the institutional diversity to provide insights on students' sentiments and experiences to support the survey design and implementation. The National Student Assembly met once every four weeks throughout the academic year, supported by regular HEI Staff Assemblies. Members of the National Student Assembly were paid for 25 hours of work per semester. The model proved to be very successful, as it allowed for a diversity of perspectives, given that the members of the student assembly differed from the institutional union representatives.

Meeting participants supported increased stakeholder involvement with respect to transparency in the use of data, notably suggesting that students should be given the opportunity to opt-in separately for each course and should be reminded that the data collected would be used to support learning. Student representatives highlighted the important role that student representatives should take to monitor student sentiment towards digital technologies and foster communication between HEIs, teachers and students.

One key lesson from the Irish experience lies in the need for a shared vision between higher education stakeholders – leaders, students and staff – and government in moving forward with initiatives to monitor and expand the digitalisation of higher education.

Table A.1. Participating organisations

Stakeholder interviews – September/October 2020
Association of Hungarian PhD and DLA Candidates
Budapest University of Technology and Economics
Corvinus University of Budapest
Digital Higher Education Competence Centre
Digital Success Nonprofit Ltd.
Educational Authority
Government Information Technology Development Agency
Hungarian Accreditation Committee
Hungarian Rectors' Conference
Károli Gáspár University of the Reformed Church in Hungary
Mediaworks
Ministerial Commission for Creative Industries
Ministerial Commission for Model Change in Higher Education
National Doctoral Council
National Research, Development and Innovation Office
National Union of Students
State Secretariat for Higher Education
Széchenyi István University
Tempus Public Foundation
University of Pécs
Institutional roundtables – January 2021
Budapest Metropolitan University

Budapest University of Technology and Economics
Kodolányi János University
Moholy Nagy University of Art and Design Budapest
Pázmány Péter Catholic University
Semmelweis University
Széchenyi István University
University of Pécs
University of Szeged
International expert meeting – 7 July 2021
Adventist Theological College Pécel
Andrássy University Budapest
Association of Hungarian PhD and DLA Candidates
Budapest Metropolitan University
Budapest University of Technology and Economics
Debrecen Reformed Theological University
Digital Success Nonprofit Ltd.
Eötvös Loránd University
Eszterházy Károly University
Hungarian Rectors' Conference
Károli Gáspár University of the Reformed Church in Hungary
Kodolányi János University
Ministry of Education, Culture, Sports and Youth of Cyprus
Ministry of Science and Education of Croatia
Moholy-Nagy University of Art and Design
National Forum for the Enhancement of Teaching and Learning
Óbuda University
Semmelweis University
SURF
University of Debrecen
University of Dunaújváros
University of Dunaújváros
University of Mannheim
University of Miskolc
University of Nyíregyháza
University of Pannonia
University of Pécs
University of Szeged
University of Veterinary Medicine Budapest

Note by Turkey
The information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the "Cyprus issue".

Note by all the European Union Member States of the OECD and the European Union
The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

Annex B. Summary of insights from the OECD stakeholder consultation survey

As part of the European Commission-Hungary-OECD "Supporting the Digital Transformation of Hungarian Higher Education" project, the OECD conducted a stakeholder consultation survey between 15 February and 15 March 2021. This annex provides a summary of key findings from the survey.

Presentation of the OECD stakeholder consultation survey

Purpose

The OECD stakeholder consultation survey was developed to collect views from Hungarian higher education stakeholders on the current state of digitalisation in Hungarian higher education and on potential policy approaches that could support progress in this area. The Ministry for Innovation and Technology (MIT), the European Commission's Directorate-General for Structural Reform Support (DG REFORM) and the OECD considered different options to consult stakeholders broadly and agreed on the organisation of a stakeholder consultation survey in order to:

1. reach a variety of higher education stakeholders, especially students and staff, that would complement insights obtained through interviews and roundtable discussions (see Annex A)
2. allow for a comparison of digital practices and experiences between students and staff
3. allow for efficient data collection and analysis, given the project's limited timelines.

Design and implementation

In agreement with the MIT and the European Commission, the OECD designed the survey as a web-based, fixed-response, nonprobability survey to be completed in English. It was designed to involve different groups of stakeholders, including students, teachers and individuals in leadership roles at higher education institutions (HEIs); policy makers; and staff from non-governmental organisations (NGOs) and private companies working in the field of education and/or digitalisation.

The OECD designed the survey based on the review of key international surveys, including the European Commission consultation survey for the Digital Education Action Plan 2021-2027, the European University Association (EUA) DIGI-HE questionnaire and the Irish National Digital Experience (INDEx) survey. The MIT and the European Commission provided input on draft survey questions.

The survey covered three themes, namely digital infrastructure and data systems; digitally enhanced teaching and learning, research and engagement; and public policy and institutional framework. The number and content of the questions were tailored to different groups of stakeholders: 19 questions for students and teachers; 7 for leaders; 5 for policy makers; and 4 for staff from NGOs and private companies working in the field of education and/or digitalisation.

The survey was first circulated by the MIT within their network, and was further distributed through different channels, including NEPTUN, a Hungarian student information management system used in public HEIs

by students, teachers and other higher education staff. The survey was voluntary, and no incentives to take part in the survey were provided to respondents.

Respondent characteristics

In total, 3 326 responses were submitted on line between 15 February and 15 March 2021. Among the submitted responses, 31% were complete (1 039 complete responses in total from 629 students, 354 teachers, 38 leaders, 3 policy makers, 5 staff from NGOs and private companies, and 10 others). With the aim of comparing the responses across the set of questions, this summary document focuses on the complete answers of the three stakeholder groups with the largest number of responses, namely higher education students, teachers and leaders. While the sample is not representative, it provides good coverage of respondents with different profiles and institutional settings, as described below.

Student respondents (N=629)

The majority of student respondents were enrolled full-time (79%) and were 25 years old or younger (68%). Undergraduate students represented one-third of respondents, with two-thirds studying at the postgraduate level. Students across different fields of study participated in the survey, with the top three fields being business, administration and law (24%); arts and humanities (13%); and engineering, manufacturing and construction (10%). The majority of student respondents were enrolled in state-owned universities. Respondents studied in institutions of various sizes, from fewer than 2 000 to more than 25 000, with a relatively even distribution of respondents across institutions of different sizes. Half of the student respondents were based in Southern Great Plain and Budapest. The shares of international students and students who reported receiving government financial support to complete their studies were modest (13% and 16%, respectively). The shares of students who reported recognising themselves as a minority population in higher education and having a disability were small (1% and 2%, respectively). Nearly 80% of the respondents reported having more than 50% of their classes on line in the academic year 2020/21, which was expected due to the ongoing coronavirus (COVID-19) pandemic.

Teacher respondents (N=354)

While the majority of teacher respondents had a teaching responsibility (80%), researchers and professional staff responsible for teaching and learning and digital technologies also contributed to the survey. Most of the respondents had at least five years of work experience, with less than 20% being relatively new to the profession (less than five years of work experience). Teachers across different fields of study completed the survey, with the top three fields being health and welfare (17%); natural sciences, mathematics and statistics (14%); and engineering, manufacturing and construction (13%). The majority of the teacher respondents were affiliated with state-owned universities. They worked in institutions of various sizes, with the number of students ranging from fewer than 2 000 to more than 25 000. Approximately 40% of the teacher respondents were based in Budapest, and another 40% were from Southern Great Plain or Southern Transdanubia. Nearly 60% of the respondents reported having more than 50% of their classes on line in the academic year 2020/21.

Leader respondents (N=38)

While the majority of leader respondents worked for universities (79%), those from universities of applied sciences and colleges also contributed to the survey. Around three-quarters of respondents were from state-owned institutions, and another quarter was from private, church-owned or other institutions. The leader respondents worked for institutions of different sizes, with the number of students ranging from fewer than 2 000 to over 25 000. Nearly half of the respondents were based in Budapest.

The sections that follow provide key findings in each of the three themes covered in the survey, namely:

1. digital infrastructure and data systems
2. digitally enhanced teaching and learning, research and engagement

3. public policy and institutional framework.

Selected questions include individuals' access to digital tools and online services, their experience with online teaching and learning, their preferences regarding online and in-person education, and suggestions for public policy priorities.

Digital infrastructure and data systems

The first part of the student and teacher questionnaires asked about their level of access to digital infrastructure and data systems that were used in teaching, learning and research activities. It also asked students and teachers about support to access digital tools, their experience of using digital tools, and about the collection, use and protection of personal data at their institution.

Overall, students and teachers in the Hungarian higher education system reported having good access to digital infrastructure and data systems. They used these digital tools regularly in the academic year 2020/21 and reported that available digital tools met their needs. However, government and institutional supports appeared to have played a limited role in ensuring access to digital infrastructure. In addition, students and teachers were often unaware of how personal data are collected, used and protected at their institution.

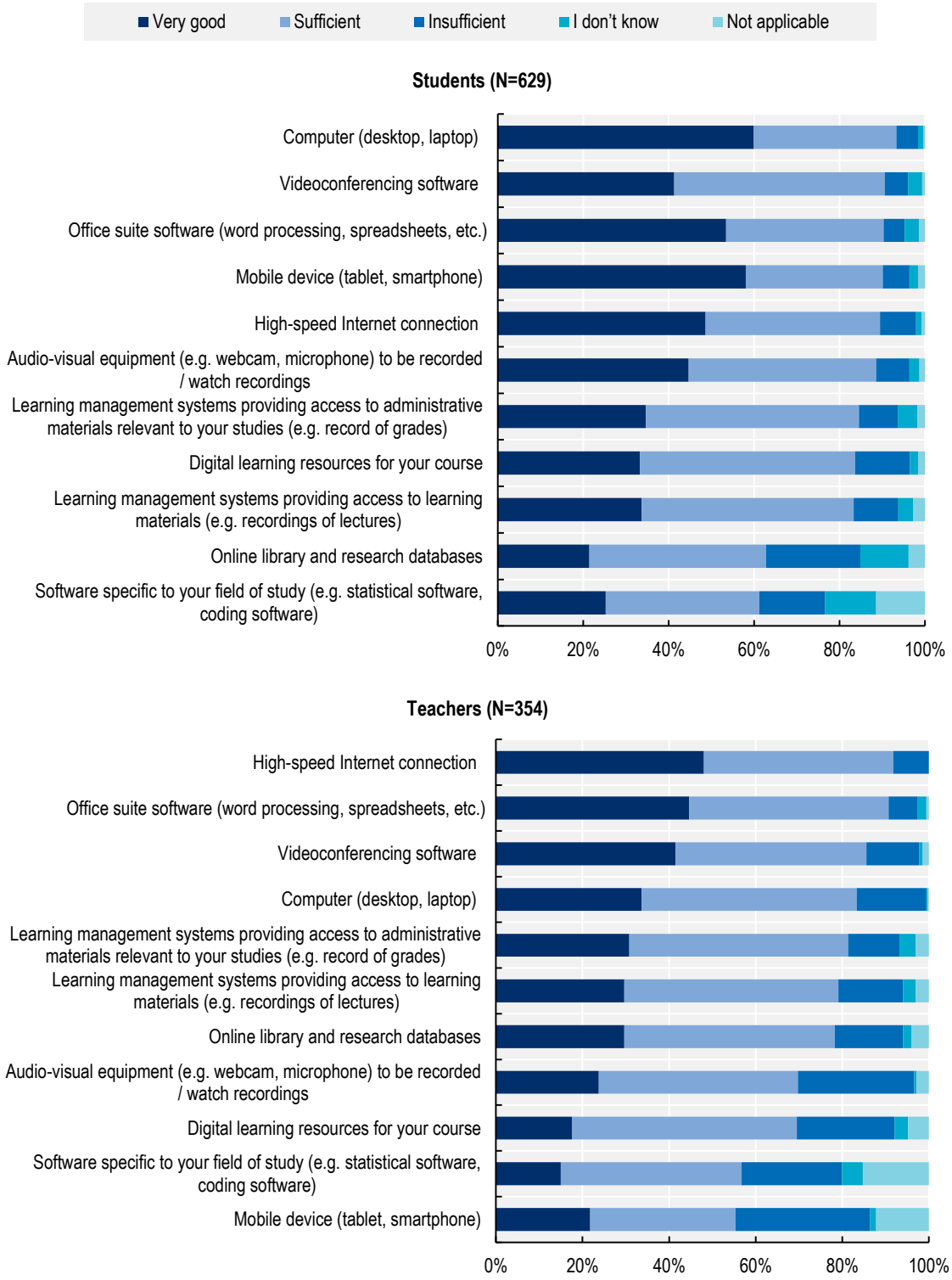
Students and teachers had good access to digital teaching, learning and research tools

Students responding to the survey, in general, reported reasonable access to digital tools to perform their study tasks. Around 90% of student respondents indicated they had very good or sufficient access to hardware, namely computers, mobile devices and audio-visual equipment, and a high-speed Internet connection (Figure B.1). Their accessibility to software varied, from around 90% for videoconferencing and office suite software; over 80% for learning management systems (LMS) and virtual learning environments (VLE), and digital learning resources for courses; to around 60% for online library and research databases, and software specific to fields of study (e.g. statistical software, coding software). Over 20% of student respondents, however, reported that their access to online library and research databases was insufficient, while around 10% noted that they had inadequate access to software specific to their fields of study, to an LMS or VLE, and to digital learning resources for courses.

Teachers' responses were slightly more mixed but showed generally sufficient access to digital tools to perform their teaching and research work. Similar to student respondents, the majority of teacher respondents had sufficient access to high-speed Internet connections (92%), computers (83%), office suite and videoconferencing software (91% and 86% respectively) as well as LMS and VLE (around 80%) (Figure B.1). However, one-third of teacher respondents reported their access to mobile devices was insufficient, and around one-quarter stated they had unsatisfactory access to audio-visual equipment, software specific to fields of study, and digital learning resources for courses. More than 10% reported inadequate access to computers, online library and research databases, LMS and VLE, and videoconferencing software.

Figure B.1. Students' and teachers' access to digital tools to perform study tasks and work

"Please rate your access to digital tools."



Note: Items are listed in descending order of the share of the respondents who selected "very good" or "sufficient".

StatLink https://doi.org/10.1787/888934279187

While teachers' access to digital infrastructure was often supported by institutions, students tended to be responsible for their own access to digital equipment

A modest share of student respondents reported they benefited from governmental or institutional support to access digital tools, suggesting that a large share of students had or accessed tools on their own. In May 2020, as a response to the pandemic, the Hungarian government issued an interest-free Student Loan Plus of up to HUF 500 000 (around EUR 1 400), which could be used for purchasing electronic devices. Among the students who participated in this survey, 5% of them reported having used the Student Loan Plus, for an amount of HUF 235 000 (around EUR 650) on average. In addition, approximately 5% of student respondents reported that their institution lent them computer hardware and devices to enable a mobile wireless connection or provided financial support to purchase such equipment, while nearly 60% were granted free access to the software needed for their learning.

Teacher respondents were more likely to report having institutional support to access digital tools. Nearly 50% of the respondents reported that their institution lent computer hardware, and over 60% had free access to the software needed. However, only around 6% of them reported that their institution provided financial support to purchase digital equipment, such as computers and mobile devices.

Students and teachers regularly used digital tools and were generally satisfied with available tools

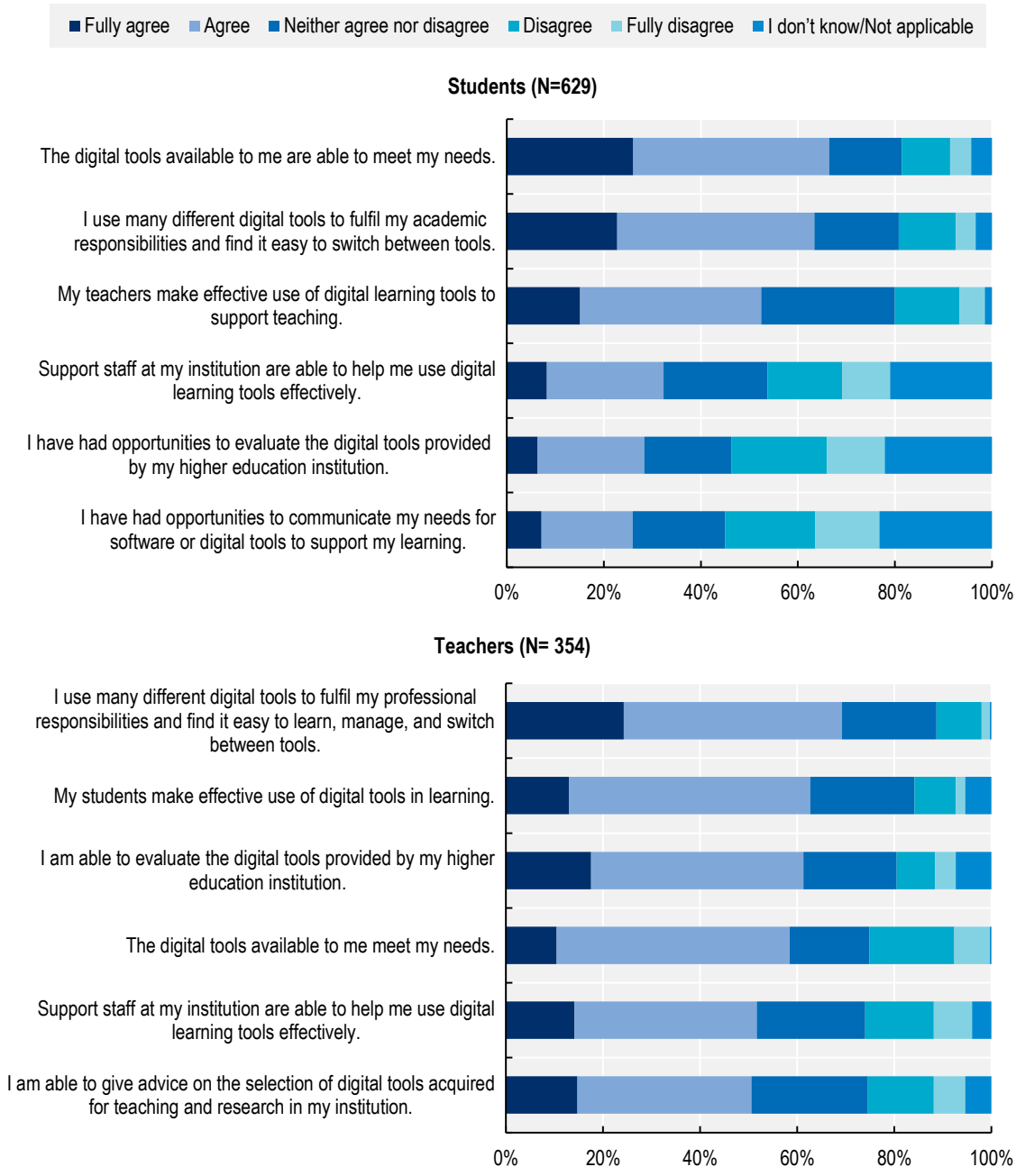
Both student and teacher respondents actively used digital learning tools in the academic year 2020/21. Over 60% of student respondents reported having used digital tools daily to prepare for classes and to attend lectures, with another 30% doing so weekly. Over half of them used digital tools at least weekly in in-class and out-of-class collaboration with peers (69% and 52%, respectively), conducting research (54%) and undertaking assessments (51%). Around 40% of them also used digital tools weekly or more often to access support from instructors (e.g. advising, mentoring and course support). Similarly, three-quarters of teacher respondents reported using digital tools at least weekly for class instruction and student support. In addition, around one-third used digital tools weekly or more often to assess students' learning outcomes, with another 30% doing so monthly. Over 60% also reported using digital tools for research and institutional management activities at least weekly.

In addition, the responses of students and teachers show that they were reasonably satisfied with the digital tools available to them and made good use of these tools despite the sudden transition to an online environment due to the pandemic. Around 60% of student and teacher respondents indicated that digital tools available to them met their needs (66% and 58%, respectively) (Figure B.2). In addition, over 60% agreed that they used different digital tools to fulfil their academic/professional responsibilities and found it easy to learn, manage and switch between tools (63% for students and 69% for teachers). However, while over 60% of teacher respondents rated that their students made good use of the tools, around 50% of student respondents agreed that their teachers made effective use of digital tools to support teaching.

Teacher respondents were more likely to agree that support staff at their institutions could help them use digital tools effectively than student respondents (52% for teachers and 32% for students) (Figure B.2). Teacher respondents also reported more opportunities to evaluate the digital tools provided by their institutions or communicate their needs for digital tools than student respondents (61% and 51% for teachers and 28% and 26% for students).

Figure B.2. Students' and teachers' experience with digital tools

"To what extent do you agree with the following statements regarding your experience with digital tools at your institution?"



Note: Items are listed in descending order of the share of the respondents who selected "fully agree" or "agree".

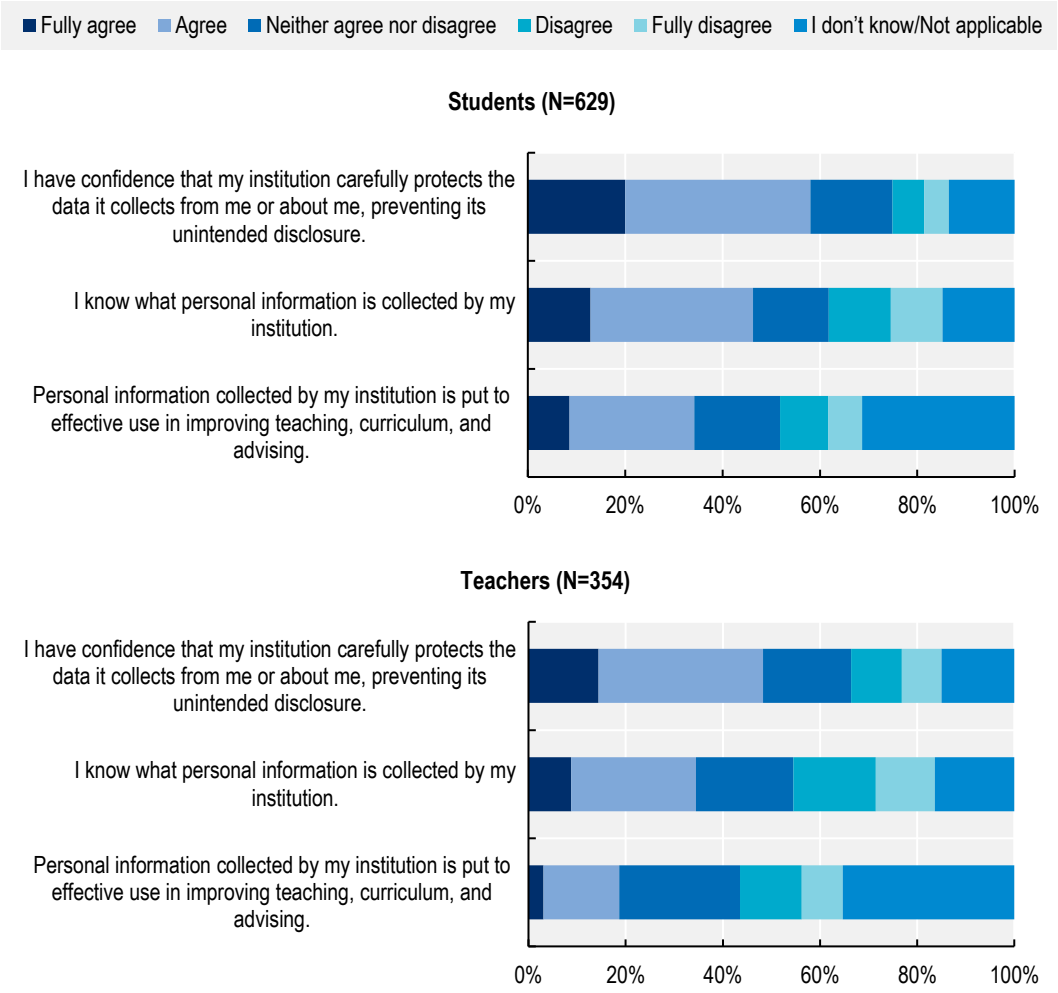
StatLink https://doi.org/10.1787/888934279206

A small share of students and teachers reported having a good understanding of institutional data governance policies

The collection, use and protection of personal data seem to be areas where further improvement is required. First, less than half of student respondents and one-third of teacher respondents indicated they were aware of personal information collected by their institutions (Figure B.3). In addition, only around one-third of student respondents and less than one-fifth of teacher respondents agreed that the collected personal information is used effectively in improving teaching, curriculum and advising. Around 60% of student respondents and fewer than 50% of teacher respondents were confident that their institution carefully protected their personal data. A relatively large share of student and teacher respondents selected the option "I don't know/Not applicable", suggesting there may be a need to increase awareness of the collection, use and protection of student and teacher personal data.

Figure B.3. Collection, use and protection of personal data

"To what extent do you agree with the following statements regarding how your institution collects, uses and protects data?"



Note: Items are listed in descending order of the share of the respondents who selected "fully agree" or "agree".

StatLink https://doi.org/10.1787/888934279225

Digitally enhanced teaching and learning, research and engagement

In the second part of the survey, students and teachers were asked a set of questions related to their teaching, learning and research experiences in a digital environment. They were asked the extent to which teaching, learning and research activities had migrated on line since the onset of the pandemic, the availability and use of support services on line, and their experience in the online setting compared to the in-person setting. They were also asked to examine the best-suited communication channels for different teaching, learning and research activities, and to assess the level of their digital skills.

The majority of student and teacher respondents reported having their teaching, learning and research activities migrated fully or partly on line due to the pandemic. Following this extensive migration to an online environment, access to and use of student support services on line have increased. Students report both positive and negative impacts of online learning and prefer an online environment for certain activities, such as accessing study information and materials, attending large lectures and taking exams. Teachers, on the other hand, highlight the challenges of online teaching and prefer an in-person setting in general for their teaching and research activities. Students and teachers both reported having a good level of digital skills.

The majority of teaching and learning activities have migrated on line since the onset of the pandemic

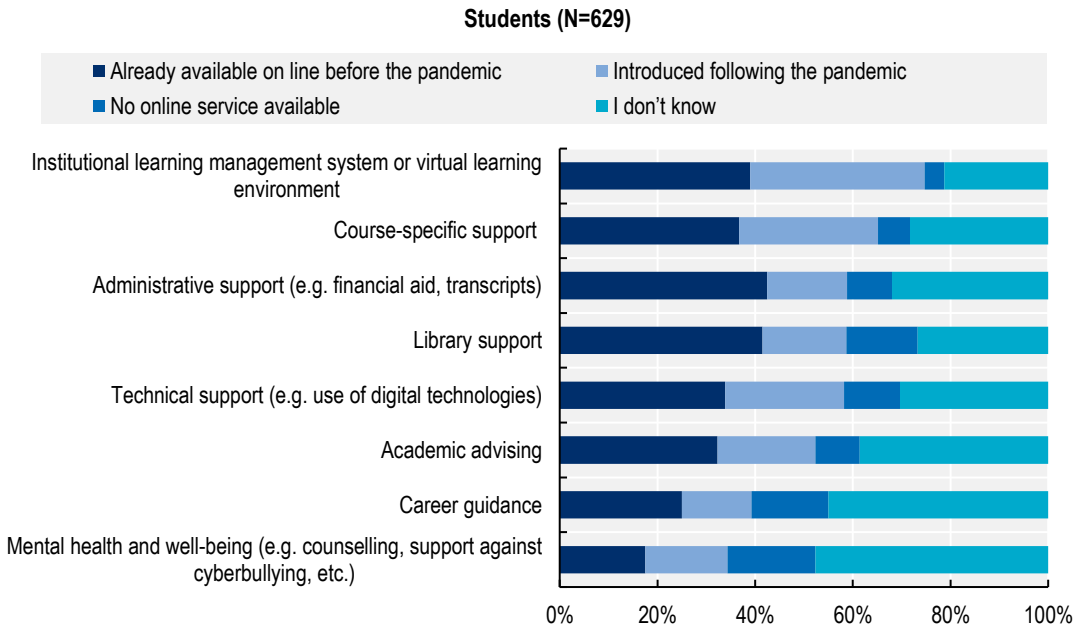
The responses of students and teachers show that higher education activities in Hungary have mostly migrated on line since the onset of the pandemic. More than 95% of student respondents reported that their core learning activities, namely attending classes and taking exams, have migrated on line to some extent (over 85% reported full migration, with around 10% reporting partial migration). In addition, approximately 85-95% of student respondents reported that different types of interactions with teachers and peers had fully or partly migrated on line (receiving teachers' feedback, sharing learning materials, in-class collaborative work, etc.). Similarly, over 90% of teacher respondents reported having delivered a class, conducted student assessments and provided feedback to students on line.

Access to student online support services has expanded during the pandemic

Student access to online support services improved during the pandemic. Before the pandemic, less than half of the student respondents were able to access various services on line, such as administrative support (e.g. financial aid, transcripts) (42%), library support (41%), an institutional learning management system or virtual learning environment (39%), course-specific support (37%), technical support (e.g. use of digital technologies) (34%), and academic advising (32%) (Figure B.4). Following the onset of the pandemic, more student respondents reported having access to online support services, especially with respect to academic supports. An additional 36% reported getting access to an institutional LMS or VLE, an additional 28% reported having access to online course-specific support, and another 24% to technical support – leading to total shares of students with access to these services reaching between 60% and 75% of the respondents. Access to other services, such as online mental health and well-being support (e.g. counselling, support against cyberbullying, etc.), and career guidance, also improved during the pandemic, but the total share of the respondents having access to these services on line remained modest (34% and 39%, respectively) compared to the shares reporting access to academic services.

Figure B.4. Availability of online student support services

"Which of the following support services were/are accessible on line, before and after the pandemic?"



Note: Items are listed in descending order of the share of the student respondents who selected "already available on line before the pandemic" or "introduced following the pandemic".

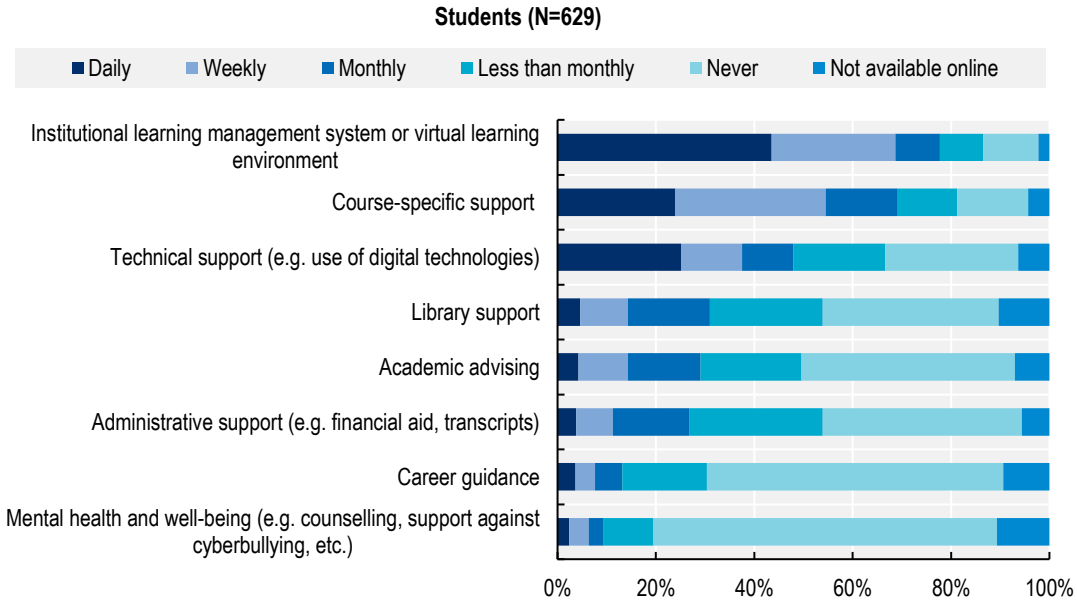
StatLink https://doi.org/10.1787/888934279244

Students regularly use academic support services on line

Among the available online student support services, student respondents used an LMS or VLE, as well as course-specific support, the most. While three-quarters reported having used an institutional LMS or VLE at least once a month (44% daily, 25% weekly and 9% monthly), around 70% reported having used course-specific support (24% daily, 31% weekly and 15% monthly) (Figure B.5). Around half of the students also used technical support regularly (25% daily, 12% weekly and 10% monthly). The use of the other services remained modest. For example, around two-thirds of the respondents reported never using online mental health and well-being support or career guidance support.

Figure B.5. Use of online student support services

"How often do you use online services to obtain support in the academic year 2020/21?"



Note: Items are listed in descending order of the share of the student respondents who responded "daily", "weekly" or "monthly".

StatLink https://doi.org/10.1787/888934279263

Students reported both positive and negative impacts of online learning, while teachers highlighted challenges of online teaching

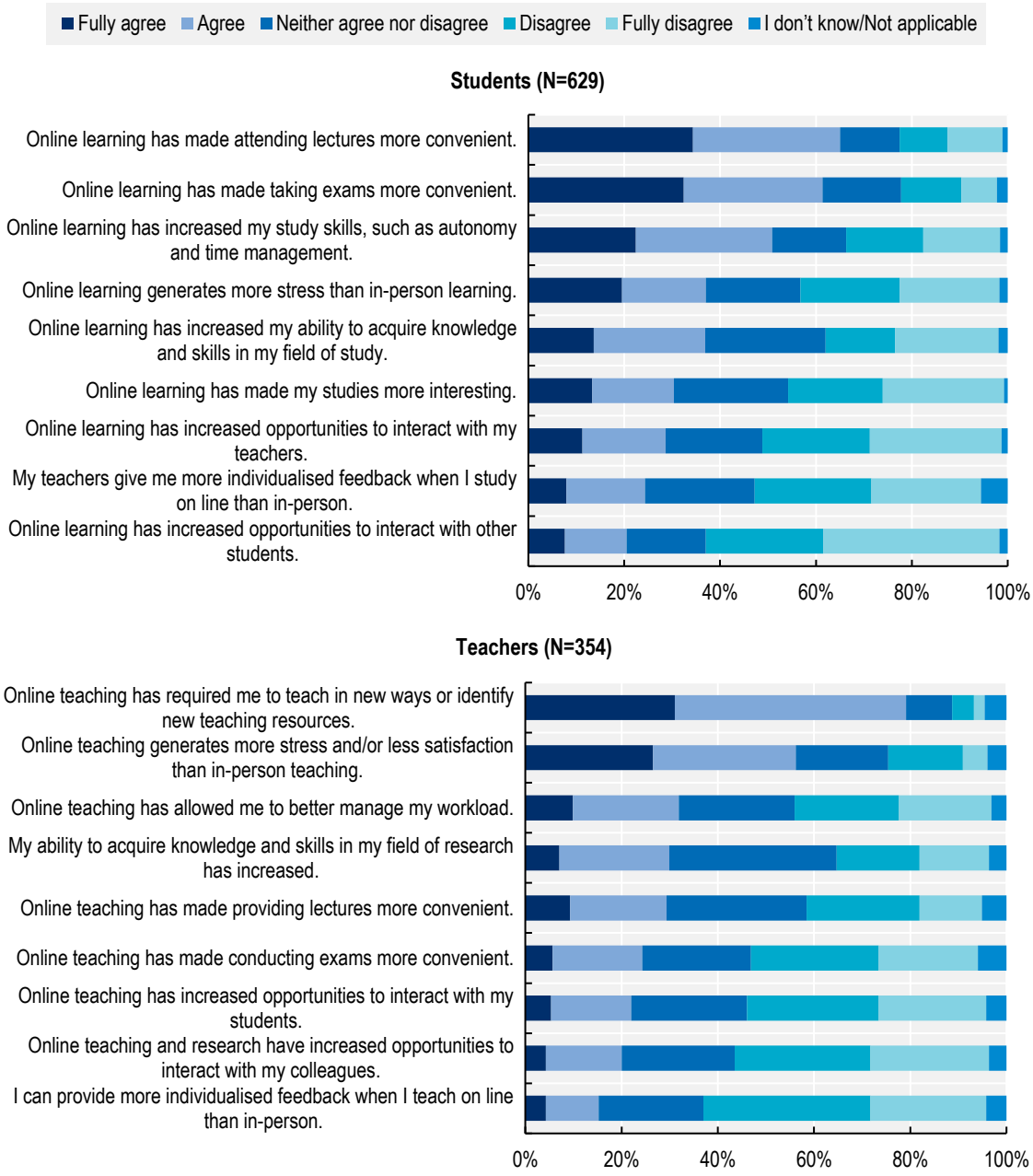
Student respondents generally indicated they were satisfied with the flexibility of online learning and the opportunity to develop their study skills but viewed online learning as less useful with respect to interactions with peers and teachers, obtaining individualised feedback, or making their studies interesting. Figure B.6 shows that over 60% of the student respondents agreed or fully agreed that online learning made attending lectures and taking exams more convenient. Half of the respondents also agreed that online learning increased study skills, such as autonomy and time management, and over one-third reported that it increased their ability to acquire field-specific knowledge and skills. At the same time, nearly 40% of the student respondents agreed that online learning generated more stress than in-person learning. In addition, around 50% of the student respondents disagreed that online learning increased opportunities to interact with their teachers, and over 60% disagreed that it made more opportunities to interact with their peers. Moreover, nearly half disagreed that it made their studies more interesting and helped to receive more individualised feedback from teachers.

Teachers were generally less likely than students to report the positive impacts of online teaching. Approximately 80% of the teacher respondents agreed or fully agreed that online education required them to teach in new ways or identify new teaching resources (Figure B.6). Teachers identified the same types of benefits of online learning as students did but were fewer to report these benefits. For instance, around 30% of teachers indicated that online learning made the provision of lectures more convenient, compared to about 60% of students reporting increased convenience. Similarly, around 30% of teachers reported that online learning allowed them to better manage their workload and increased their ability to acquire knowledge and skills in their field of research. A larger share of teachers (over 50%) than students (close to 40%) reported that online teaching generated more stress and/or less satisfaction than in-person

teaching. Similar to the student respondents, around 60% disagreed that online teaching helped them provide students with more individualised feedback, and about 50% disagreed that it helped increase interactions with their colleagues and students.

Figure B.6. Impact of online teaching, learning and research, in comparison with in-person experiences

"To what extent do you agree with the following statements?"



Note: Items are listed in descending order of the share of the respondents who selected "fully agree" or "agree".

StatLink https://doi.org/10.1787/888934279282

Students prefer an online environment for certain activities, whereas teachers, in general, are in favour of in-person settings

Student respondents believed an online environment is more suited than an in-person setting for accessing study information and materials, attending large lectures and taking exams. At the same time, they highlighted the value of in-person interaction for small group classes or labs and communication with peers and teachers.

Figure B.7 shows that two-thirds or more of the student respondents considered access to course information and learning resources (e.g. research databases) is best provided on line. In addition, around half of them believed that attending large lectures, accessing new learning opportunities (e.g. courses in other institutions, micro-credentials) and completing exams are best conducted on line. On the other hand, over two-thirds thought that attending small group classes or labs is best conducted in person. Moreover, 50-60% believed collaboration with other students (e.g. group work) and obtaining feedback from teachers are best done in person.

The teacher respondents, in general, reported a preference for their work to be conducted in person. Three-quarters of the respondents believed teaching small groups is best conducted in person (Figure B.7). In addition, half or slightly over half considered that providing support and feedback to students, supervising student research or work-based learning, and collaborating with peers in institution governance are best done in person. More than 40% of teacher respondents also believed an in-person environment is best suited for conducting assessments of student learning and delivering lectures to large groups. Around 30%, however, considered an online environment best suited for delivering lectures to large groups and conducting collaborative research projects. Additionally, about one-quarter indicated that they saw no difference between online and in-person communication to provide support and feedback to students, conduct collaborative research projects and collaborate with peers in institutional governance.

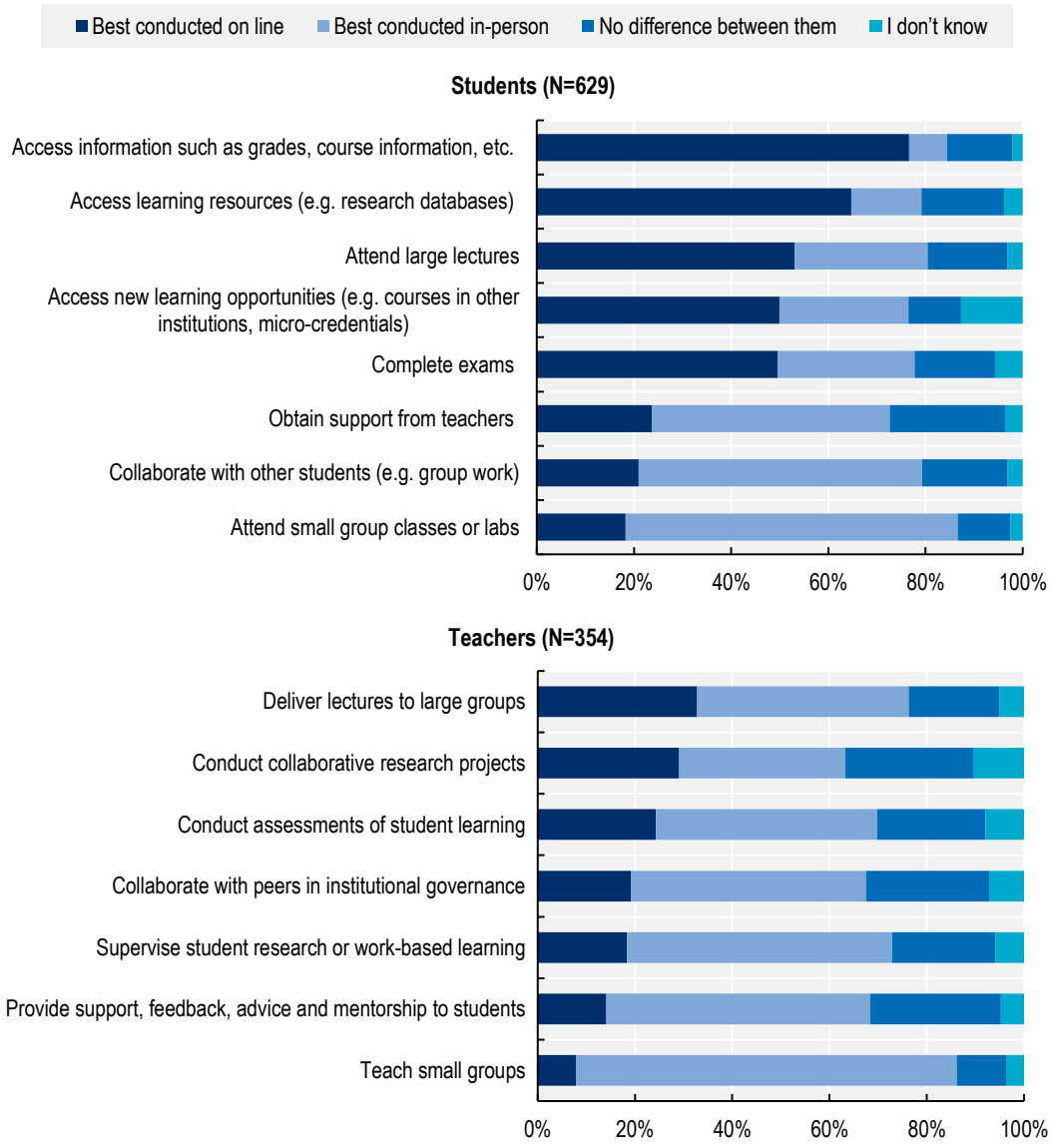
Students and teachers report having a good level of digital skills

Students assessed their digital skills as generally satisfactory for their study programmes and reported that their access to skills development opportunities differed depending on the type of digital skills. Nearly 85% of the student respondents fully agreed or agreed that their current level of digital skills was sufficient for their academic programme (Figure B.8). In addition, approximately 70% reported that they had a clear understanding of the types and levels of digital skills they needed to meet employer needs and progress in their chosen career. Around half agreed that their institution provided them with an opportunity to develop digital skills specific to their field of study, research and analytical skills in an online environment (e.g. manage information overload, identify relevant information) and digital literacy skills (i.e. ability to read, interpret, communicate through digital texts and sources). Less than 40% agreed that they had an opportunity to develop study skills (organisational skills, etc.) and critical thinking skills (e.g. identify facts from false information). One-third or less agreed that they had an opportunity to develop advanced digital skills (e.g. computer programming) and skills to navigate the online environment safely (protecting devices and content, protecting personal data and privacy).

Teachers also thought their digital skills were satisfactory for their professional needs, while they were less confident in their ability to develop students' digital skills. Over two-thirds of the teacher respondents agreed or fully agreed that their current level of digital skills was entirely sufficient for their professional needs (Figure B.8). While nearly 60% agreed that they were aware of the types and levels of digital skills their students need to meet employer expectations and progress in their careers, less than 50% agreed that they were confident in their ability to prepare students to be digitally competent upon graduation. Furthermore, only 42% of teacher respondents reported that their institution provided them with opportunities to further develop digital skills specific to their field of teaching and research.

Figure B.7. Channels best suited for teaching, learning and research activities

"On balance, which channels of communication do you think are best suited for each of the following activities?"



Note: Items are listed in descending order of the share of the respondents who selected "best conducted on line".

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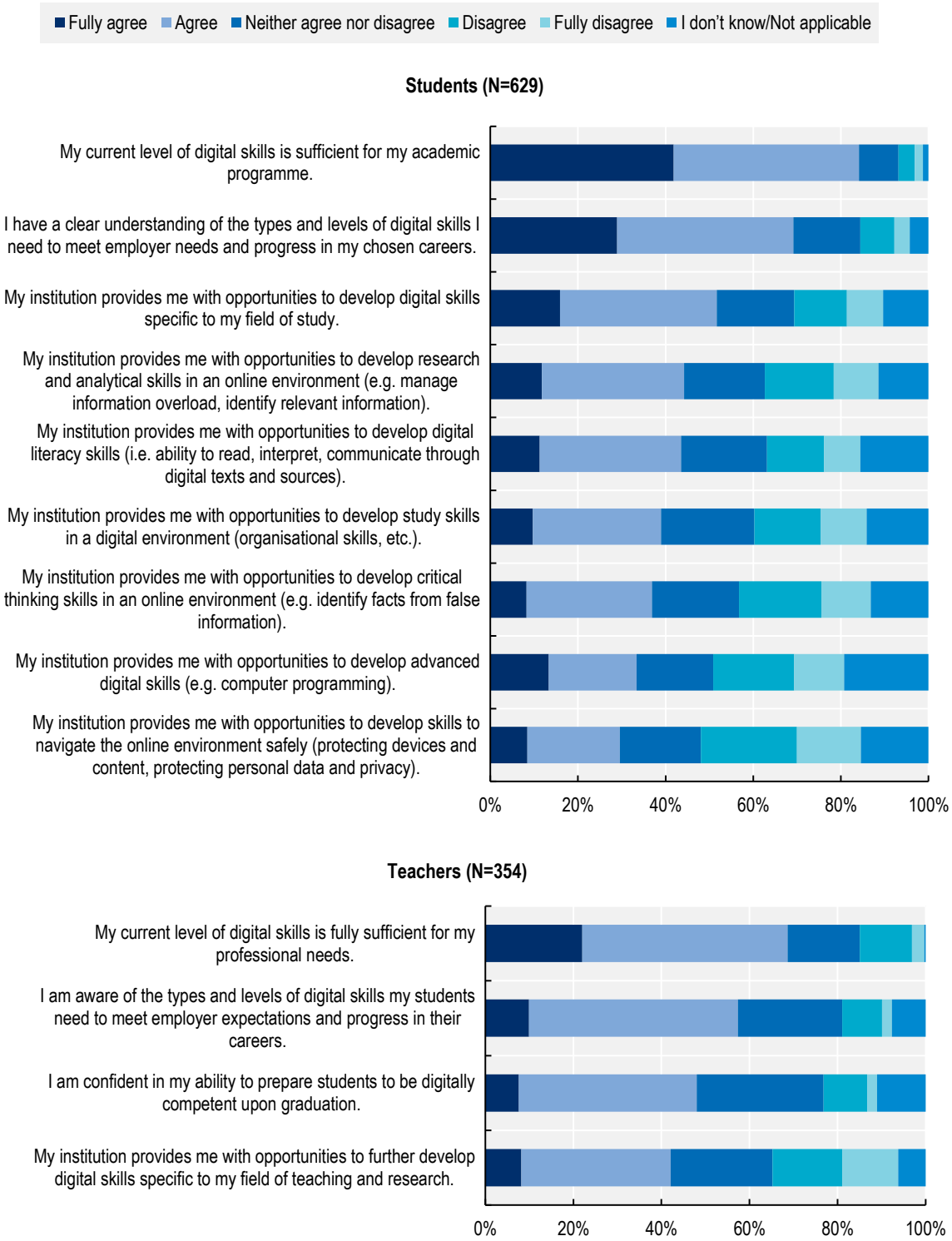
Figure B.8. Students' and teachers' self-reported level of digital skills

"To what extent do you agree with the following statements regarding your digital skills?"



Note: Items are listed in descending order of the share of the respondents who selected "fully agree" or "agree".

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Public policy and institutional framework

Students, teachers and individuals in a leadership role at higher education institutions were invited to share their views on public policy priorities for the successful digital transformation of Hungarian higher education. Leader respondents were also asked to report actions taken at their institutions to support digital transformation.

When the survey was conducted (February-March 2021), the majority of Hungarian HEIs had already implemented some institutional framework to promote digital transformation. In order to realise the successful digital transformation of Hungarian higher education, stakeholders highlighted the continued importance of public investment in digital infrastructure.

The pandemic has accelerated the adoption of institutional practices supporting digital transformation

Respondents in a higher education leadership role reported their institutions' responses to the pandemic, in relation to institutional planning and governance; policies on staff, quality assurance, recognition and intellectual property rights; and budget. Their responses showed that the pandemic has accelerated the adoption of institutional practices supporting digital transformation in all of these areas. While the majority of responding institutions have already established a strategic plan to support digital transformation and allocated a budget to improve their digital infrastructure, a smaller share of institutions have taken steps to update staffing policies to take digitally enhanced learning and teaching into account (Figure B.9).

Institutional planning and governance

Nearly all leader respondents reported that their institution either had an institutional digitalisation plan or was in the process of developing one. The move to develop and adopt a digitalisation plan for the institution plan was accelerated by the pandemic. While around half of the leader respondents reported that their institution had a strategic plan supporting its digital transformation prior to the pandemic, one-third reported having developed such a plan since the pandemic started. Around 20% were developing it at the time of the survey.

Similarly, the majority of the institutions currently have an institutional structure dedicated to the steering and monitoring of the institution's digital transformation (e.g. a dedicated position or office at senior leadership level) or have a development plan for such a structure. Around one-quarter of the respondents reported having the institutional governance structure responsible for digital transformation before the pandemic. Nearly one third reported having changed the institutional governance structure since the start of the pandemic, and another one-third reported they were in the process of developing such a governance structure.

Institutional policies

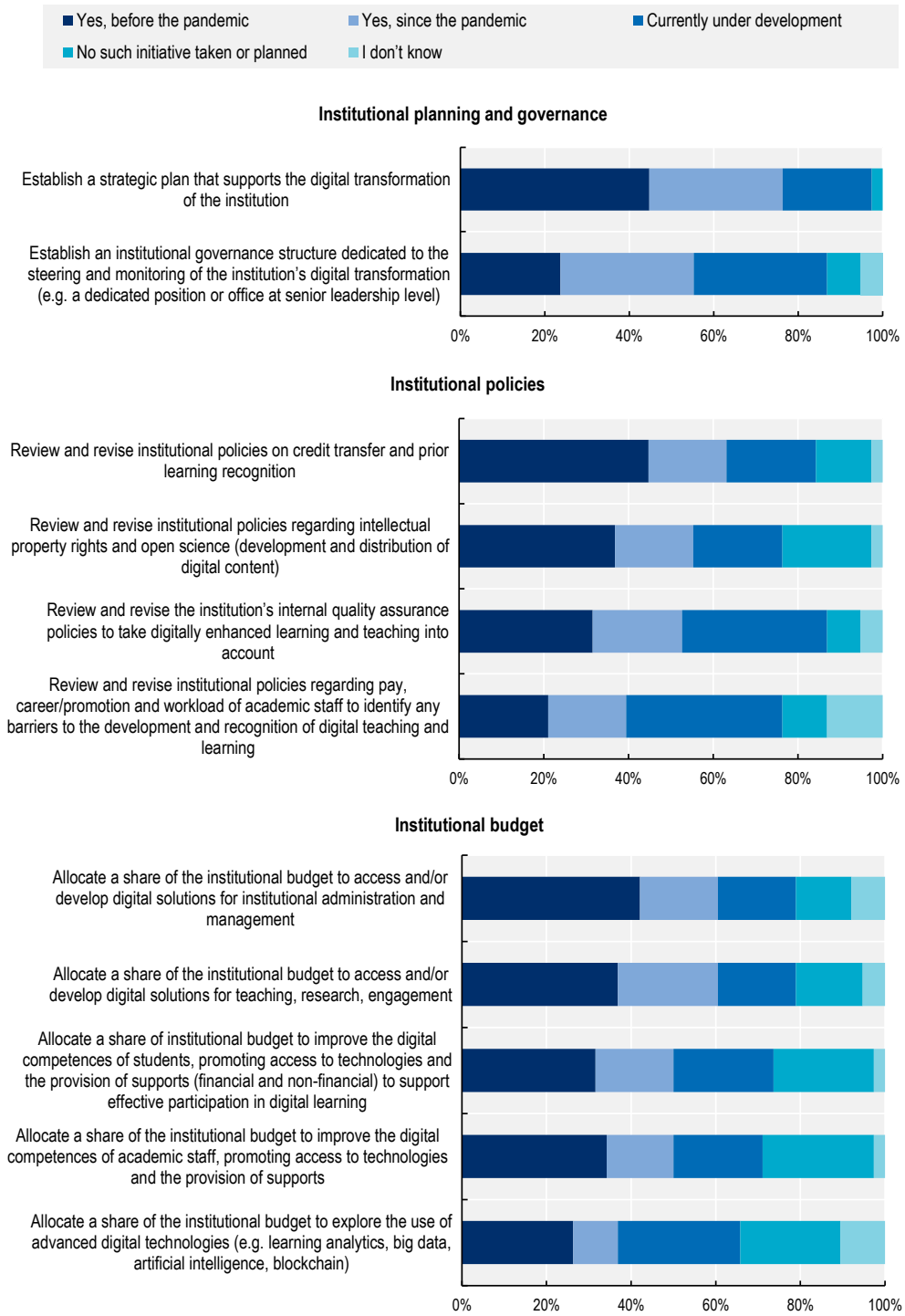
The pandemic also led many institutions to reconsider policies relevant to the digitalisation of higher education, ranging from credit transfer to intellectual property rights or staff-related policies. A relatively small share of leaders (20-45%) reported actions to revise institutional policies before the pandemic, but at the time of response, more than 75% reported having taken or were currently developing actions to review and revise institutional policies in areas relevant to digitalisation.

Credit transfer and prior learning policies constituted the institutional policy area in which the largest share of respondents reported revisions were made before the pandemic. Approximately 45% of the leader respondents reported revisions in this area before the pandemic, 20% reported having done so after the pandemic, and another 20% responded that they were currently in the process. A similar pattern can be found with respect to institutional practices regarding intellectual property rights and open science, with close to 40% of respondents having revised policies in this area before the pandemic, 20% since the pandemic, and 20% reporting current work in this area.

Figure B.9. Institutional practices to support digital transformation

"Which of the following actions has your institution taken and when, to support its digital transformation?"

Higher education leaders (N=38)



Note: Items are listed in descending order of the share of the respondents who selected "yes, before the pandemic" and "yes, since the pandemic".

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Policies on internal quality assurance and policies related to staff pay, promotion and workload to take digital teaching and learning into account were less of a focus before the pandemic, with approximately 30% and 20%, respectively, of leaders reporting having reviewed and revised these policies. However, many institutional leaders began focusing on these policy areas since the pandemic: for both areas, around 20% of respondents reported revising these policies since the pandemic, and 35% reported currently reviewing and revising these policies. This might point to the growing importance of these areas and perhaps also to their complexity, which could explain why many leader respondents reported work to be ongoing at the time of the survey.

Institutional budget

Hungarian higher education institutions have also taken steps to allocate institutional budgets to support the digital transformation of their institution. The responses of higher education leaders show the increasing importance of "core" digital solutions to support both institutional management as well as teaching, research and engagement activities. By comparison, fewer leader respondents reported investments in direct supports to students and teachers and in advanced digital technologies (e.g. learning analytics, big data, artificial intelligence, blockchain, etc.).

At the time of the survey, close to 80% of the leader respondents reported that a share of the institutional budget was allocated to accessing and/or developing digital solutions for institutional management, and teaching, research and engagement activities, or reported planning to do so. This includes 40% for whom such investment began before the pandemic, 20% for whom the budget allocation for digital solutions was made after the pandemic, and 20% who reported a plan to make such investment.

Around 70% of leader respondents reported that their institution allocated, or was planning to allocate, a budget to improve the digital competencies of students and teachers, promoting access to technologies and the provision of supports for effective participation in digital learning. While around one-third already invested in digital skills development before the pandemic, over 15% have done so since the onset of the pandemic. Over 20% of respondents indicated their institution was currently discussing such investment.

A smaller share of the respondents reported allocating a budget to explore the use of advanced digital technologies or having a plan to do so. Prior to the pandemic, one-quarter of the institutions had a budget to explore the use of advanced digital technologies. The share of institutions allocating the budget for this purpose increased by 10% following the pandemic, with around 30% currently discussing this possibility.

Students, teachers and institutional leaders view investments in digital infrastructure as the most important policy option to support digital transformation

Student, teacher and leader respondents were asked to rank six policy options in order of importance to support the digital transformation of Hungarian higher education. Figure B.10 shows the share of the respondents ranking each option as the most and second most important among the six.

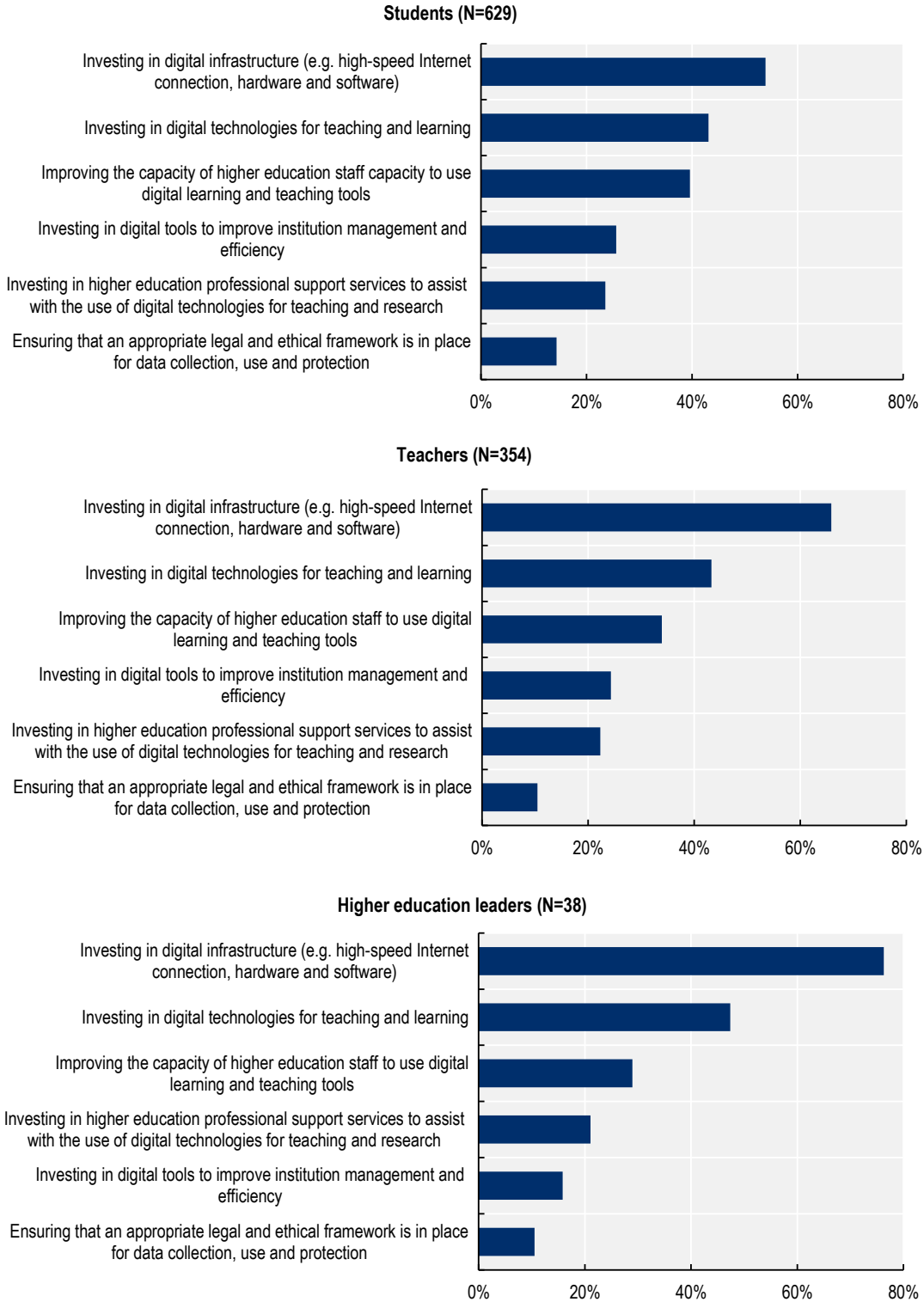
When ranking the six policy options by the share of the respondents selecting them as the most and second most important, the orders of the options were the same for the student and teacher respondents:

1. Investing in digital infrastructure (e.g. high-speed Internet connection, hardware and software)
2. Investing in digital technologies for teaching and learning
3. Improving the capacity of higher education staff to use digital learning and teaching tools
4. Investing in digital tools to improve institution management and efficiency
5. Investing in higher education professional support services to assist with the use of digital technologies for teaching and research
6. Ensuring that an appropriate legal and ethical framework is in place for data collection, use and protection.

Figure B.10. Policy options to support the digital transformation of Hungarian higher education

"Please rank in order of importance for the successful digital transformation of Hungarian higher education."

The share of the respondents who selected the following as the most and second-most important among the six options



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Leaders showed a similar preference, with the only difference being that they prioritised "investment in higher education professional support services to assist with the use of digital technologies for teaching and research" over "investment in digital tools to improve institution management and efficiency".

This finding from Figure B.10 indicates that while students and teachers generally report sufficient access to digital infrastructure (see the section above on digital infrastructure and data systems), they seek improvements in their access to a high-speed Internet connection, hardware and software.

Institutional leaders view the establishment of a national strategy and provision of public funding as the most important policy measures

Leader respondents were invited to share their views on policy priorities in more detail in four policy areas, namely strategic planning and governance; funding; policies, regulations and guidelines; and information (Figure B.11). When comparing policy options by the share of respondents providing the rating of "4" or "5" – on a scale of 1 (not important) to 5 (very important) – the following options appeared as priorities:

- Strategic planning and governance
  - Establish a national strategy for the digital transformation of Hungarian higher education with clear targets and public reporting on progress (74%)
  - Establish a publicly funded body responsible for promoting the adoption and use of digital technologies in higher education by supporting procurement, interoperability standards, data protection and other measures (66%).
- Funding
  - Providing new public funding to institutions to support the development of digital infrastructure and data systems (68%)
  - Providing new public funding to institutions to support higher education staff in acquiring digital competencies, accessing digital technologies, and accessing supports for digital teaching (66%).
- Policies, regulations and guidelines
  - Revised procedures for internal quality assurance (i.e. institutional processes) of existing programmes and establishment of new programmes that support further use of digital technologies in teaching and learning (76%)
  - Revised workload policies and teaching performance evaluations used by higher education institutions to support the use of digital technologies (68%)
  - Guidelines or regulations regarding intellectual property rights and open science (66%)
  - Revised procedures for external quality assurance (i.e. processes led by the Hungarian Accreditation Committee) of existing programmes and establishment of new programmes that support further use of digital technologies in teaching and learning (66%).
- Information
  - Conduct research and evaluation on the impact of digitalisation on higher education efficiency, quality and equity (66%)
  - Provide information to all HEIs, staff and students about existing government supports for digital equipment, teaching, research and engagement and learning in a digital environment (63%).

The policy options related to strategic planning and governance and funding, were of particular importance to leader respondents, with around half of them selecting "5 (very important)". Policy options related to policies, regulations and guidelines were regarded as important, though a smaller share of respondents selected them as very important.

Nearly half of the respondents rated as very important the provision of information to all HEIs, staff and students about existing government supports for digital equipment, teaching, research, engagement and learning in a digital environment. This suggests that the higher education community may not have a good understanding of government initiatives, such as an interest-free Student Loan Plus that was used by 5% of student respondents (see the section on digital infrastructure and data systems).

Figure B.11. Policy measures to support the use of digital technologies in higher education

"How important are these measures in promoting the effective use of digital technologies in higher education?"

Higher education leaders (N=38)

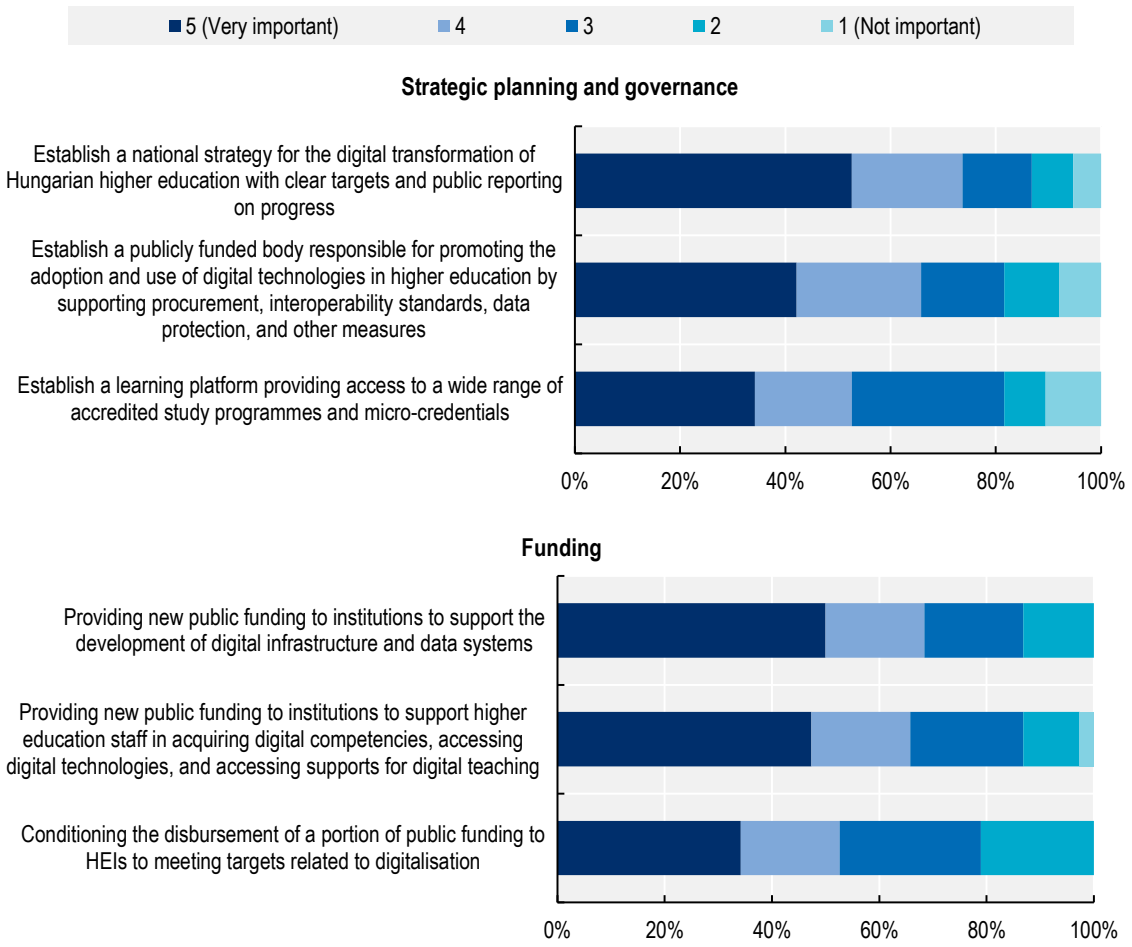
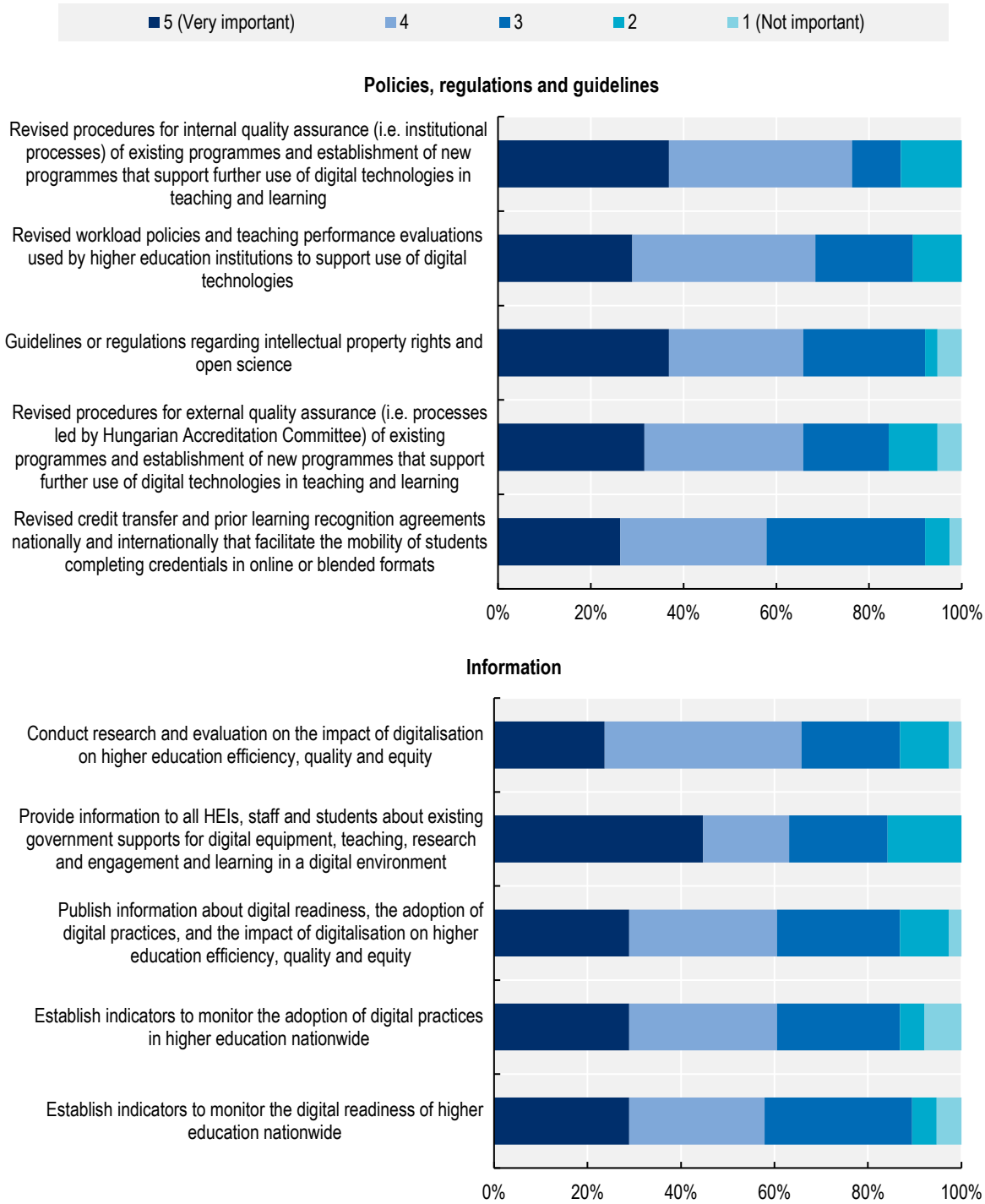


Figure B.11. Policy measures to support the use of digital technologies in higher education (cont'd.)



Note: Items are listed in descending order of the share of the respondents who selected "5 (very important)" and "4" (second-most important).

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Annex C. Summary of comparative research on digitalisation in higher education

As part of the European Commission-Hungary-OECD "Supporting the Digital Transformation of Higher Education in Hungary" project, the OECD conducted a study of international policies and practices that support the digitalisation of higher education. This annex provides a summary of key insights from the study.

Presentation of the comparative study

The study of international policies and practices was a desk-based exercise conducted in fall 2020, which informed the analysis and recommendations provided in the report (see Chapter 3). The study aimed to:

- review recent research on the digitalisation of higher education
- identify practices and policies targeted at the digitalisation of higher education across a range of OECD countries to better understand at what level, with what aim, and with what degree of success these have been implemented
- organise insights obtained from an analysis of available resources on Hungarian higher education and digital transformation, as well as from stakeholder interviews (see Annex A), through a comparative lens.

The analysis includes a range of international examples relevant to digital higher education and general insights drawn from the literature. The selected examples may take the form of: 1) guiding principles to be taken into account before designing a policy (e.g. taxonomy); 2) institutional practices or policies that address an existing challenge (e.g. teacher training programme); or 3) instruments to provide a better understanding of user needs (e.g. survey).

The scope of the findings and examples in this analysis is broad, as the digitalisation of higher education can affect all functions of higher education systems, from the management and operations of higher education institutions (HEIs) to their core activities, i.e. teaching and learning, research and engagement.

The selection of the case studies was not restricted to specific stakeholders, geographies or research publications. Bearing in mind limitations in the body of examples and research in the area of digital higher education, the OECD team selected examples that:

- addressed issues identified as relevant in the Hungarian context based on inputs collected by the OECD team
- showcased the use of a variety of policy instruments (scorecard, procurement system, platform-based solution, etc.)
- are implemented through a combination of bottom-up and top-down mechanisms
- included some monitoring and evaluation information.

Table C.1 provides key insights from this exercise, discussing policy frameworks supporting digitalisation; digital infrastructure; digitally enhanced teaching and learning, research and engagement; and learning processes and outputs.

Table C.1. International examples of policies and practices regarding the digitalisation of higher education

Purpose of policy or practice	Country or organisation	Description
Policy framework		
Reduce the gap between policy goals and implementation; empower stakeholders to shape digitalisation strategy	Ireland	Ireland faced challenges in ensuring that educational institutions incorporated the government's policy priorities into their practices. The **Irish Digital Strategy for Schools 2015-2020** centred on the role of digital technologies in learning, teaching and assessment practices, but schools struggled to understand why and how to use digital tools. To help school communities understand how digital learning could be embedded in their day-to-day activities, the Irish authorities built a **Digital Learning Framework** with 32 standards that outline effective ways digital tools can enhance teaching and learning, leadership and management. A diverse group of stakeholders within the school identify which of the 32 standards the school would like to adopt and what actions it should undertake for that aim, designing a clear **Digital Learning Plan** for their school (PDST Technology in Education, n.d.[1]).
	European Union	The **European Union's Digital Education Action Plan 2018-2020** emphasised that all educational organisations should engage in thinking about how digitally ready their institution is and can be. For that purpose, the European Commission launched, in 2017, the **Self-reflection on Effective Learning by Fostering Innovation through Educational Technologies (SELFIE)** tool, a self-assessment instrument that provides a 360º view on the digital readiness of educational institutions based on stakeholder input. The SELFIE survey allows stakeholders to reflect on the extent to which the digitalisation of school strategies, teaching practices, infrastructure, curriculum, and the student experience has been successful. The results from the tool, which more than 650 000 individuals in 57 countries have used, serve as a basis to identify actions that can enhance the digital readiness of the institution with the participation of all stakeholders (European Commission, n.d.[2]) (Kampylis et al., 2019[3])
Ensure alignment across policy levers to ensure a successful approach to digitalisation	Ireland	Public authorities acknowledged their lack of awareness on why and how higher education stakeholders were engaging with digital tools. A survey focused on the **Irish National Digital Experience (INDEx)** was launched in 2019, leveraging lessons from Australian and British efforts. In its first iteration, it was answered by 30 000 individuals (students, lecturers, tutors, librarians, among others). The survey results provide a thorough overview of all key areas of digital higher education, from digital skills to digital infrastructure, but also of the attitudes and experiences of actors in the digital environment, helping to inform national policies. Institution-level results were shared with HEIs so they could conduct their own analysis and extract relevant insights. Just like the Digital Learning Framework for schools mentioned above, INDEx is an instrument designed at a national level but intended to be tailored and used by each educational institution as well, informing decision making at both levels (National Forum for the Enhancement of Teaching and Learning in Higher Education, 2020[4]).
Digital infrastructure		
Assign responsibilities for infrastructure development and management	Norway and University of Oslo	Digital infrastructure is developed and managed according to a subsidiarity principle in Norway. Services that can be shared nationwide, such as admissions, payroll, or digital identity credentials, are centralised and standardised. In contrast, institution-specific services, such as student data, modular learning platforms, or digital exam solutions, remain at the higher education institution level. The management of infrastructure becomes a responsibility of HEIs as soon as digital tools are more intricately tied with the core functions of institutions (teaching and research), and a more flexible use is expected to meet their specific needs. In addition to allowing for standardised solutions where efficient and customised ones when warranted, the Norwegian approach also allows for both standardised tools from well-established market players and in-house solutions to be integrated into the same digital ecosystem (Ministry of Education and Research of Norway, 2018[5]). At the institutional level, the subsidiarity principle has been reflected in the design of information and communication technology (ICT) environments, such as an enterprise architecture, which considers both the current and future use of ICT in an institution. For example, at the University of Oslo, a public university with around 28 000 students, the local Department of Informatics identified the institution's core activities using technology, mapped the digital resources supporting those activities, and organised these digital resources by "levels" associated with the provider (e.g. national government, market player, HEI) responsible for their provision and maintenance. The highest level is the national level, with other levels including groupings of institutions in the same geographical area, or the institution itself. Mapping the provider responsible for each component of the digital infrastructure ensures a swift response to emerging issues, as responsibilities can be clearly identified (Bygstad, Øvrelid and Oftedal, 2019[6]).

Purpose of policy or practice	Country or organisation	Description
Inform choice of digital infrastructure	Netherlands	**SURF** is an ICT co-operative with over 100 higher education and research institutions founded over 30 years ago in the Netherlands. Its mission is to promote system-wide collaboration of HEIs to address their shared ICT and learning needs, safeguarding the public interest in the introduction of ICT and alleviating concerns over how private firms may shape the digital learning environment. For that purpose, experts from member institutions help peers across the country ensure that services offered by educational technology providers are responsive to the needs of faculty and students and grounded in educational research. Among many areas of focus, advice is provided, for example, on learning analytics, digital educational resources, and infrastructure for student mobility, digital identities and digital certificates. With an annual budget of EUR 200 million, SURF is funded through contributions from member institutions, the Dutch government, and EU programmes (OECD and de Groot, 2021[7]).
	United Kingdom	Three professional bodies focusing on media, estate, and ICT management in higher education launched a toolkit in 2016 to help institutions incorporate technology in physical spaces like classrooms, but also school corridors and outside spaces. E-learning cafés, quick access terminals to the Internet, or glass writing walls are some examples. The guidelines explain how to develop new pedagogies for these spaces, couple learning and design insights, and overcome stakeholder resistance throughout the process. A case study-based toolkit was launched in 2018 with ten examples illustrating first results that speak to the added value of this approach (SCHOMS, AUDE & UCISA, 2016[8]).
	United Kingdom	The British Educational Suppliers Association (BESA), a trade association for providers of educational solutions, launched in 2019 a marketplace where educational staff can find, review, test, and purchase close to 300 products from more than 100 suppliers for a wide array of purposes, such as assessment, online safety, or management. BESA staff check each potential supplier for their reliability and quality before showcasing their products on line. Each customer can request a trial of the product before purchasing, and a peer review system is widely used, providing feedback to both customers and suppliers as to the product's usefulness. The cost of a product subscription is per pupil using the tool, although quantity and other discounts may apply (British Educational Suppliers Association, n.d.[9]).
Digitally enhanced teaching and learning, research and engagement		
Enhance professional digital competences	University of Oslo, Norway	Higher education teachers in Norway are no longer seen as recipients and implementers of national educational frameworks but are increasingly expected to exercise agency in technology-rich environments and demonstrate their professional digital competence (Brevik et al., 2019[10]). Teacher education programmes (for school-level teachers) lacked a structured approach to the development of professional digital competencies. The University of Oslo refined its programmes by adding to the curriculum a small private online course split into four modules, scheduled follow-up practice placements and subject-specific training. In this course, student teachers reflect on their experiences with digital tools and learn how to best integrate them into their teaching practices. Such an example may be helpful to consider in terms of pedagogical training in higher education as well.
	KTH Royal Institute of Technology, Sweden	The KTH Royal Institute of Technology, a public university in Stockholm with close to 14 000 enrolled students, provides an example of an initiative focused on increasing teacher engagement in the design and implementation of technology-enhanced learning to address the low adoption of digital tools by academic staff. In 2014, the institution introduced the Faculty Pedagogical Developer Initiative, creating the role of "pedagogical developer" and selecting for that role 24 faculty members recognised for their teaching excellence. Each pedagogical developer provides dedicated support to their colleagues on how to tangibly integrate digital tools and methodologies in teaching. While the institution's leadership launched and supported this initiative, faculty members have been driving its use, actively proposing initiatives (e.g. new pedagogical courses for teachers, certificate structures for digital competence of teachers) and responding to requests from their peers for expert input on how to use digital tools more effectively. Participating in the initiative is now integrated into KTH's mandatory faculty professional development programme (Berglund et al., 2017[11]) (Viberg et al., 2018[12]).
Use digital tools to expand quality, diversity, and access to educational materials	Wales (United Kingdom)	In 2012, the Welsh government started providing free, centralised, universal access to classroom-focused tools and resources for all teachers and learners in Wales. **Hwb** is the resulting government-led platform with over 2 800 educational resources from a wide range of providers (non-governmental organisations, media entities, museums, etc.), which can be used inside and outside the classroom by school-level students across many subjects. A pilot led by the Welsh government is currently taking place in a subset of HEIs to analyse whether to add higher education resources to the platform. Hwb enables every student and teacher from nationally funded schools to access premium elements for the customisation of learning resources and a set of tools to collaborate. In the wake of the coronavirus (COVID-19) pandemic, Hwb has been the platform of

Purpose of policy or practice	Country or organisation	Description
		reference on distance learning and student support, as it also includes, for example, guidance on digital literacy, security and pedagogy (Education Wales, n.d.[13]).
	Finland	In 2017, the Finnish Rectors' Conference for Universities of Applied Sciences (UAS) emphasised developing a high-quality digital offering and the free circulation of students across institutions as key priorities. To that end, it suggested that each higher education institution should contribute to the country's digital educational offering in their areas of expertise, and students should be able to access and fulfil their academic requirements by enrolling in any digitally enabled courses made available, even if not by their home institution. In line with these priorities, CampusOnline.fi was launched in 2018 as the online one-stop-shop for digitally-enabled courses. All 23 UAS in Finland offer on this platform over 1 300 free, credit-granting courses on both subject-specific and transversal skills all year round in different modalities (non-stop, fall or spring semester, or summer courses) and languages (Finnish, Swedish and English) (CampusOnline.fi, n.d.[14]) (eAMK, 2019[15]).
Learning processes and outputs		
Enhance student engagement and success based on learning design and learning analytics	Instituto Universitário de Lisboa (ISCTE-IUL), Portugal	In Portugal, learning analytics have led to a better understanding of the learning path of students. At ISCTE-IUL, a public university in Lisbon with 9 200 students, faculty and students can benefit from a learning scorecard dashboard to monitor course performance since 2016. The dashboard interface was developed by the institution and receives data from the learning management system (LMS) and students' academic records. Students are asked at the outset of a course to set their learning goals. For the duration of the course, their behaviour within the LMS is monitored on several dimensions, including student engagement, responsibility and collaboration. Both students and faculty have access to a dashboard with pre-defined metrics of performance and student grades, allowing students to self-assess against their peers (and adjust their behaviour) and faculty to have more granular feedback on class performance. Game design elements, such as badges or leader boards, are embedded in the platform and earned by students according to their performance and engagement (Cardoso, 2018[16]) (Cardoso, Costa and Santos, 2017[17]) (Cardoso et al., 2018[18]).
	Georgia State University and the United States	At Georgia State University, predictive analytics have been used since 2012 to follow student performance through its GPS Advising System. Over 40 000 students are assessed for 800 risk factors every day, including whether they are registered in relevant mandatory courses or if, albeit having a passing grade, significant issues on a given area critical for future coursework remain and need to be addressed in future coursework. Early intervention is a priority, and alerts are sent to both students and faculty, with one-to-one meetings to help the student improve. The first set of results demonstrate both a decrease of more than a semester in average time to degree and an improvement in attainment for disadvantaged students (Georgia State University, n.d.[19]). Data collected in LMS has also been used, for example, to identify mismatches between the intentions of academic staff and student study habits, leading staff to refine how learning resources are made available and organised (Viberg and Mavroudi, 2019[20]). Data from intelligent tutoring systems also provide a more nuanced understanding of a student's knowledge gaps through analysing students' reasoning, allowing three universities in the United States to provide more individualised support to close to 1 000 students (Davies et al., 2015[21]).
Improve international credential recognition	Several OECD countries	EMREX is a decentralised data exchange system launched in 2015 by a network of European countries interested in data exchange standards relevant for higher education. It has 9 full members (i.e. with a national contact point for EMREX), namely Croatia, Denmark, Finland, Germany, Greece, Italy, the Netherlands, Norway, Poland and Sweden, as well as 13 associate members (i.e. interested in supporting or working in some capacity with EMREX) from around the world, including Australia, Japan and the United States. Students can request that their academic data (i.e. credentials) be transferred across HEIs in EMREX member countries or be shared with future potential employers (EMREX, n.d.[22]). EMREX uses a custom-made plugin to allow for data exchanges, and the organisation is exploring how blockchain could be implemented to support secure data exchanges and verification. As data exchanges only take place upon student request, and data is transferred between student accounts, students know what data is registered and for what purposes they are used. To ensure the validity of credentials, national contact points oversee data transfers, and participating countries maintain a curated list of credentialing institutions (Mincer-Daszkiewicz, 2017[23]) (Mincer-Daszkiewicz, 2017[24]) (EMREX, n.d.[22]).
Improve digital provision of upskilling opportunities	Finland	Finland's CampusOnline.fi is an easily accessible, high-quality platform where students can develop transferable skills (e.g. time management, communication), foreign language skills and other competencies in areas which, although not their field of study, can bolster the skill levels and employability of students in the labour market (CampusOnline.fi., n.d.[25]).

Purpose of policy or practice	Country or organisation	Description
	Wales (United Kingdom)	In Wales (United Kingdom), the in-person regional offices of Seren, a cross-sector partnership supporting secondary and further education students in their preparation for higher education, were replicated on line during the COVID-19 pandemic. Masterclasses, mentoring, study advice, among other features, are made available for students to guide their tertiary education choices, stimulate lifelong learning and provide a preview of university life. Taken together, these activities are expected to have positive impacts on students' skill levels, labour market outcomes and higher education attainment (Education Wales, n.d.[13]). (Education Wales, 2017[26]).

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Higher Education

Supporting the Digital Transformation of Higher Education in Hungary

Digital technologies have transformed the way people interact, work and learn. The emergency transition to online teaching and learning necessitated by the coronavirus (COVID-19) pandemic has posed a serious challenge to instructional routines of higher education systems across OECD countries. The pandemic has demonstrated the ability of higher education institutions to ensure continuity in teaching and learning, but it has also revealed that much work remains to be done to ensure digital technologies are effectively used to promote quality, efficiency and equity in higher education. This report, which focuses on the digital transformation of higher education in Hungary, is a collaboration between the European Commission's Directorate-General for Structural Reform Support (DG REFORM), the Hungarian Ministry for Innovation and Technology and the OECD's Directorate for Education and Skills. Building on stakeholder engagement and comparative analysis, the report offers an assessment of the current state of digitalisation in higher education in Hungary, identifies policy recommendations to strengthen the current policy framework supporting digitalisation, and provides suggestions to help Hungarian authorities and stakeholders develop a monitoring framework and indicators to measure the digitalisation of the higher education system.

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