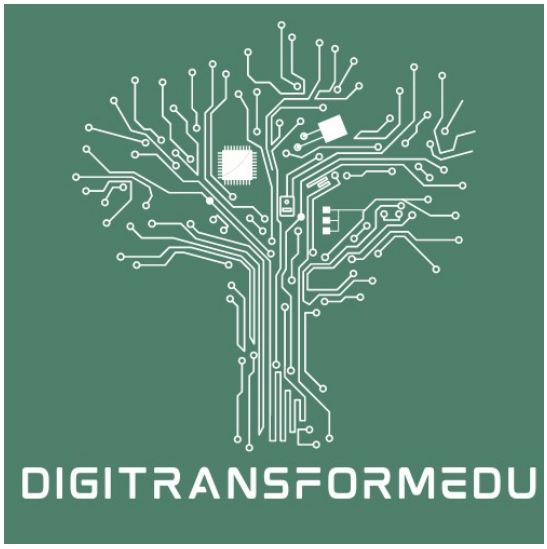

Digital Readiness and Resilience of Educational and Training Institutions in Response to the COVID-19 Pandemic in Bulgaria, Croatia, Germany, Italy, and EU

Lessons Learned From the COVID-19 Crisis: Governance and Enabling Services, Teaching, Students and Infrastructure

April 2023

Title:
Digital readiness and resilience of educational and training institutions in response to the COVID-19 pandemic in Bulgaria, Croatia, Germany, Italy, and at EU level

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In this document we publish the report *Digital readiness and resilience of higher educational and training institutions in response to the COVID-19 pandemic in Bulgaria, Croatia, Germany, Italy, and at EU level*. This report represents the combined Result 1 (R1) and Result 2 (R2) of the Digital Transformation of Higher Education and Training (DigiTransformEdu) project (No: 2021-1-BG01-KA220-HED-000031185) co-funded by the Erasmus+ Programme, Strategic Partnerships for Higher Education, Cooperation for innovation and the exchange of good practices (Key Activity 2). All activities preceding this report were performed between January 2022 and January 2023. The DigiTransformEdu project is aiming at fostering the digital transformation of educational and training institutions in EU.

This is to recognise and acknowledge that this report comes as the result of an effort, multiple contributions and commitment by the DigiTransformEdu Project Team members and other individual contributors representing the following project partners:

- Digital National Alliance, Bulgaria (lead partner)
- EFMD, Belgium
- New Bulgarian University, Bulgaria
- ESI CEE, Bulgaria
- Academy Nikola Tesla, Bulgaria
- Algebra University College, Croatia
- Munster University of Applied Sciences, Germany
- Fondazione Giacomo Brodolini, Italy
- Gruppo Pragma, Italy

Content

Abbreviations:

HE – Higher Education

HEI – Higher Education Institution

VET – Vocational Education and Training

LLL – Lifelong Learning

EU – European Union

Synthesis Report

Authors: Adisa Ejubovic (Münster University of Applied Sciences) and Boriana Marinova (New Bulgarian University)

Introduction

This synthesis report is a summary of the main findings coming from the series of individual reports detailing the developments in the DigiTransformEdu project partner countries as well as developments in the EU in general and aims to inform the actors on the current state of affairs when it comes to digitalisation of higher education and training. The project "Digital Transformation of Higher Education and Training: DigiTransformEdu" (https://www.digitransformedu.com/) is a 26-month Erasmus+ project (2021-2023) that aims to foster the digital transformation of educational and training institutions by mapping their digital readiness and resilience in response to the COVID-19 pandemic among other objectives. The project is centred on the transformation to digital/online education that is defined as a distance form of education, in which digital tools and information and communication technologies are used to enable teaching, learning, assessment, certification, and the organisation of the educational process while learners, teachers, and administrators might be located in different places and the process might be either synchronous or asynchronous in time.

The rapid onset of COVID-19 permanently changed the digital landscape of education in the EU and beyond. Though digitalisation was on the agenda in many EU countries pre- COVID-19, it is through forced closures of schools, universities, and other training institutions that the digital strategies and words turned into action. The DigiTransformEdu project explores the digital transformation in the educational systems mainly above level 5 (from 5 to 8) in accordance with the International Standard Classification of Education (ISCED) but also touches upon developments in the other levels of education including primary, secondary, and vocational education and to some extent lifelong learning (LLL). In this study, four EU countries (Bulgaria, Croatia, Germany, and Italy) and EU-general level were examined in terms of digitalisation before and after the pandemic. More specifically, four dimensions of institutional structures were used as a prism, namely governance, enabling services and administration, infrastructure, and teaching and learning. The study conducted desk research and empirical research (surveys and interviews) to gauge to which extent COVID-19 accelerated digitalisation in Higher Education Institutions (HEIs), and Vocational Education and Training (VET) organisations, what were particular drivers, barriers, support mechanisms and learning takeaways.

Main Findings

With the onset of the COVID-19 pandemic, it is evident that the transition to digital education happened very swiftly in the given countries mainly in the HEIs and less smoothly in VET establishments whose traditional practices are strongly rooted in the physical presence of the learner. Structures were put in place very promptly to enable functioning of the institutions and to ensure that the processes go unhindered as much as possible. In Italy for instance, 72% of teachers managed to

activate remote teaching just within few days from the start of the lockdown. Italian “Digital Solidarity" initiative promoted by AGID and the Ministry for Technological Innovation, schools and universities had access to totally free services or to special procurement conditions. In Croatia, in the first week of lockdown, more than 50.000 virtual staffrooms were established with the participation of 450.000 students and teachers. In Bulgaria, the HEIs that before the pandemic had offered distance education, had invested in e-learning platforms, and had established well-functioning centres of distance and online education managed to make the transition without disruptions and compromising much on quality. Differently, the German HEIs appeared less prepared for online education that resulted in lower satisfaction with the way their HEI responded to the pandemic and students attending less classes compared to the classical face-to-face environment. When it comes to learning platforms and virtual classrooms, majority of countries adopted Moodle, Microsoft Office 365 Education including Microsoft Teams, Zoom, etc.

Digital competencies of teachers were put into the spotlight across many countries, as in most of the cases they were not up to the challenge, but the need for strengthening soft and transferrable skills, such as communication and problem solving, was also highlighted. Looking into some empirical data in Croatia (4139 teacher sample), 95% of teachers are satisfied with the way they perform distance teaching while 90% think students manage well their distance learning. In Italy, 57% of teachers reported they believed their digital skills increased. In Germany, 71% of teachers said their digital skills improved compared to pre-COVID-19 times. In Bulgaria, the majority of students (62%) and lecturers (81%) consider that their digital competence improved during the pandemic and agree that the digital competence of their counterparts also improved.

As mentioned, in many of the countries, even before the COVID-19 pandemic, there has been a commitment on the governance level to push forward the digitalisation at universities and training institutions. However, less than 20% of universities in the EU had a plan with specific measures with regards to digitalisation, while the majority had mainly some kind of institutional approach for digitally enhanced learning and teaching. Yet, this has proved to be a big motivating factor during the pandemic. Italy, for instance, had formulated as one of their statements a need to “build a vision of education in the digital era, through a process able to tackle all the challenges that our society is facing supporting lifelong learning both as a formal and non-formal process”. The idea of cultural change in terms of digital education was also evident in Germany with the term “digital turn”. In Croatia, a substantial motivating factor was fostering teachers’ digital independence, while the Bulgarian legislator ‘upgraded’ distance education from an organisation of the educational process (2004) to a form of higher education (2021). Other motivating factors included need for more flexibility, timesaving for students due mainly to reduction in commuting time, need for effectiveness (Italy) and need for adopting digital technologies (Croatia).

This was not without issues and many similar problems that came to the surface. Examination was reported to be difficult indicating that not all phases of digital pedagogy were ‘ready’ to be transferred online. For instance, in Bulgarian HE landscapes cheating has been often perceived as an issue, as well as the inadequate use of online tests in the examination process. Furthermore, practical exercises and activities were particularly challenging, especially in VET, where learning from practice and technical training form an important part of the curricula. Didactic problems were frequently reported as a major tripping stone in all countries surveyed. Stress, overload, and digital fatigue were often stated as major issues, particularly on the side of the teachers/lecturers, while students struggled with

distraction and decline in motivation. In Italy, more than 70% of teachers reported that they needed more time to prepare digital lessons, as well as organise and carry out examinations. Cybersecurity, data protection and privacy concerns were also intensified during the pandemic. Socio-economic issues were as well reported with the digital divide increased to further deepen the problems for students with disadvantaged social background. This led to an extensive discussion at national, European, and international levels about how to narrow the digital gap and ensure inclusive digital education.

What does the future have in store for digitalisation in education? Looking at the findings from all countries, it has been a consensus that digital education cannot fully replace face-to-face education. Things like human interaction, socialisation and physical space cannot be overridden for their digital equivalents. An interesting finding here is the difference in preferences among students and teachers when the format of education is concerned. While bachelor and especially first-year students prefer education on site and if this is not possible, are attracted by hybrid or online education that is as similar as possible to the on-site education, master students, who often combine their study with part-time or even full-time job, prefer more diversity in the format, greater interactivity, and autonomy, and opt for fully online or blended. At the same time, teachers prefer blended or fully face-to-face teaching and are not persuaded by the fully online option. Another important point is that digital education requires particular attention and a different approach in terms of strategy, content, pedagogy, and competencies (integrated in the professional development schemes for teachers) and the mere transposing of face-to-face classes and practices into online teaching is not an option especially when areas such as individual and group interaction and online evaluation are concerned.

In this respect, Bulgaria puts forward a well-aligned strategy to support comprehensive digitalisation, digital competencies, innovative pedagogy, and other dimensions. In Croatia, the recovery and resilience plan include the development of a strategic framework, “Croatia 2030 Digital Strategy” and investments to support the development of digital skills and the continuation of the reform of the education system. German education advocates for digital allowance for universities to have stable and sustainable funding base to execute digitalisation in all areas. In Italy, the focus is on connectivity by providing ultra-broadband Internet and innovative services to public schools as well as to the scientific, academic, and cultural community. This approach resonates at EU level with the 2021-2027 Digital Education Action Plan that offers guidance to the Member States on how to prioritise funding for digital education using the Recovery and Resilience Facility and other cohesion policy instruments, in which upskilling and boosting very high-capacity broadband connectivity are “flagship investments”. All in all, one thing is for sure, COVID-19 has initiated a digital revolution and it is a matter of institutional commitment that will decide to what extent this momentum is captured.

Executive Summaries of Country Reports

EU Overview

The document provides an overview of the EU policies, motivators, and barriers with regards to the digitalisation of Higher Education (HE), Vocational Education (VET) and Life-long Learning (LLL) programmes prior and after the COVID-19 pandemic. The past decade the EU launched several frameworks in this area and funded various projects keeping the issue in the agenda across the Member States. The report includes overview of data related to strategic planning, quality assurance, local innovations, and other areas with regards to the status of digitalisation in these sectors prior to the pandemic. Different actions were in place and the three sectors had already started their digitalisation process prior to the COVID-19 pandemic. However, many of these actions were characterised sporadic without clear prioritisation and follow up with the Member States resulting in inhomogeneous progress, which for many it has been attributed to this very lack of central enforcing policies along with the particularities of each country.

Following the COVID-19 pandemic, the EU stepped up launching The Digital Education Action Plan (2021-2027) and other subsequent initiatives outlining the Commission's vision for high quality, inclusive and accessible digital education. Through the Plan, EU called for stronger cooperation at European level to learn from the COVID-19 crisis and to make education and training systems fit for the digital age (ICDE, 2020). This Plan and the crisis itself have motivated reflection and experimentation with innovations and changed paradigms, while the three sectors are now engaged in dialogue with the interested parties (teachers, faculties, communities, etc.) to explore whether digitalisation "came to stay". The report reviews the results of surveys and other data related to the impact of the pandemic and perceptions with regards to the digitalisation of these three educational sectors.

Issues to consider addressing or investigating further through the DigiTransformEdu project:

- With regards to policy making and mapping, should EU consider the regional differences between most/less advanced countries and adapt the respective policies?
- Is there a need for centralised EU VET & LLL policies or do these sectors benefit more from localised approach?
- How can VET and LLL capitalise the innovation regarding digitalisation led by their partners (SMEs, etc.)?
- Do privacy issues online create a barrier in the development of digitalisation of the VET and LLL sectors in EU?
- Why digitalisation in HE at EU level has not been promoted by operational and targeted policies prior to COVID-19? As opposed to other HE policies?
- Is there a need for a centralised platform at EU level that gathers all initiatives for the digitalisation in HE?
- Incentives must focus more on educators or strategic/leadership level?

- Is informing and training on legal and copy right issues for digital education equally or even more important compared to professional development for professors in the use of technology?
- Do we need more focus on skills needed to transfer the teaching load online?
- How do educators in VET and LLL define “innovation” in digital education and investigate further their “openness” to it?
- Did the changes in the EU funding policies towards the digitalisation of HE play a role in influencing the digital transition of the European HEIs?
- Is data protection in digital education in HE an issue that must be addressed by the EU, as a whole, instead of launching national policies?
- Are inclusion issues more obvious in the VET/LLL sectors and digital learning?
- Should “inclusion” in these sectors be addressed with different criteria compared to HE?
- More details on how exactly the involved stakeholders would define the “proactive” approach.
- The aspects of an institutional strategy with regards to digitalisation which would make it “robust” or “comprehensive”.
- The project could fill the gap and provide more data regarding drivers and motivators for the digitalisation of the VET and LLL sectors.

Bulgaria

The report aims to inform the actors on the current state of affairs when it comes to digitalisation of higher education in Bulgaria.

To study the situation in Bulgaria, available research publications, national strategic documents, reports, studies, and articles that deal with the digitalisation of education were reviewed. In addition, nine HE, VET, and LLL institutions were directly or indirectly surveyed to provide further insight into the impact of the pandemic upon the digitalisation of education. Representatives from New Bulgarian University, Pedagogical College - Pleven, ESI-CEE, and Academy Nikola Tesla were directly interviewed and/or answered the online questionnaires while views of representatives from the other institutions (i.e., D. A. Tsenov Academy of Economics, American University in Bulgaria, University of Forestry, "Angel Kanchev" University of Ruse, and University of National and World Economy) were collected from online sources, such as media interviews or public debates. The DigiTransformEdu survey was conducted in the period January - April 2022 for the desk research and March - September 2022 for the interviews and online questionnaires.

The digitalisation of the HE in Bulgaria should be seen in the context of its membership in the Bologna Process / European Higher Education Area and the European Union. Moreover, it is strongly associated with the development of distance education in the country that historically has strong roots in the higher education spectrum and received a new dimension in the early years of the 21st century when technology was introduced as a means in education. At that time, different HEIs started developing and introducing e-learning platforms, a process that was particularly boosted when a serious budget was invested to support the development of electronic systems for distance education funded in the framework of the Human Resources Development Operational Programme.

The organisation and implementation of distance education in the Bulgarian HEIs is regulated with an Act of the Council of Ministers, whose latest update came into force on 1 September 2021 to replace the Act from 2004. It was the 2004 Act that made it possible to build the necessary infrastructure to allow the Bulgarian HEIs to provide e-learning and was broadly considered as a success factor for the overnight transition to digital education imposed by the COVID-19 pandemic. The most important driver to choose the distance form of education that is now still valid in the case of digital education is the possibility to combine studies with work. At the same time the distance education stayed in the 'shadow' of the regular on-site format that was and remains the most selected format in Bulgaria where a pure analogue of the 'open university' model is missing.

In the abrupt shift to online mode of delivery, forced by the pandemic, it appears that the institutions that offered distance education and used e-learning platforms before the pandemic managed to make the transition without disruptions and compromising much on quality while others struggled a lot that led to serious omissions in the educational process. This can be explained with the fact that institutions providing distance education are technologically better equipped not only in terms of hardware, software, and technology but also in terms of availability of lecturers and staff trained and prepared to use the technology and deliver distance/online education. In addition, they have established well-functioning centres of distance and online education that oversee all aspects of the delivery of educational, administrative, and enabling services to the students enrolled in distance education programmes.

On the regulatory stage during the pandemic, a series of important steps were made that aim to promote and enhance digital education and might help the distance education in Bulgaria to get out of the 'shadow' of the on-site education and develop as a stand-alone educational format that with the flexibility it provides fits the needs of working students and is in line with the current trend of working and studying from anywhere at any time.

For higher education, the pandemic has been widely acknowledged as an accelerator for its digital transformation that came along with a range of difficulties and obstacles. Major drawbacks are digital exhaustion, decreasing motivation and engagement of students with a growing sense of isolation, difficulties in joint and practical activities, difficulties in the organisation of online exams and assessment, data protection and privacy concerns, and technical and technological issues alongside with digital skills that were not up to the challenge. Another problem that is common - not only for Bulgaria - is that the pandemic increased the digital divide to further deepen the problems for students with disadvantaged social background.

When looking forward, probably the most important opportunity is the range of programmes and initiatives that have been developed or are in the process of development to train and re-train teachers to deliver digital education in terms of using technology but also digitalisation of pedagogy, content, and assessment methods. This refers not only to digital skills but also to cultural, interpersonal, and communication competences. Another positive aspect is the realised need for strategy for digital education to guide educational and training institutions in the organisation and delivery of high-quality digital education and digitalisation of the educational process. There is also an extensive discussion at national, European, and international level about how to narrow the digital gap and ensure inclusive digital education. Finally, the DigiTransformEdu project aims to trigger tangible changes in digital strategy, digital pedagogy, and digital competence within the participating

organisations and beyond thanks to the provision of guidance, tools, and resources that should be developed by the end of 2023.

Croatia

Digitalisation of Education in Croatia is part of several wider projects as e-Schools: a comprehensive informatisation of school operation and teaching processes aimed at the creation of digitally mature schools for the 21st century, and Comprehensive curricular reform which involves all primary and secondary schools in Croatia, as well as Regional vocational competence centres with focus on vocational education.

Digital transformation of higher education is led by Science and Technology Strategy and E-learning strategy with aims to encourage innovative approaches to delivering study programmes, and to applying high-tech teaching aids through the substantial use of information and communication technologies. E-learning centres or e-learning support teams were established at almost all Croatian universities, with a network of experts to foster and facilitate e-learning in the academic community.

Main leaders of digital transformation in Croatia are CARNET – Croatian Academic and Research Network for pre-tertiary education and SRCE – University Computing Centre for higher education.

The challenges of digital transformation in Croatia can be grouped into five categories: learning styles and cultures, digital pedagogy, technology, technical training, and time management challenges. On the other hand, enablers are teachers, their passion and innovations in distance teaching and learning.

The recovery and resilience plan include investments to support the development of digital skills aimed at upgrading teachers' and students' digital skills, the plan includes the continuation of the reform of the education system. The reform is expected to, inter alia, improve the basic skills of pupils through increased instruction time and strengthen the link between vocational and adult education, on the one hand, and the labour market, on the other. Part of this reform includes the development of new curricula, which will include a focus on the digital transition.

The recovery and resilience plan include the development of a strategic framework, "Croatia's 2030 Digital Strategy", which will steer the digital transformation of Croatia's society and economy for the next decade. It will set the frame for investments in the digital transition and will define strategic objectives in the following areas:

- digital transition of the economy,
- digitisation of public administration and justice,
- digital connectivity/development of broadband electronic communications networks,
- development of digital skills and digital jobs.

Germany

The research paper revealed that digitalisation pre-COVID and (post-)COVID in higher education, VET/LLL has been a complex issue. In both periods digitalisation has been put on the prominent level by policymakers, with obviously more prominence being given in the post-COVID era. The accent on digitalisation in the pre-COVID era was driven more by the need for innovation (digitalisation has been perceived as inextricably linked with innovation, either as a vehicle or end in itself), while in the COVID and post-COVID era the digitalisation was more need-based (during the pandemic the digital modes of education were the only way to continue with providing education services).

Though there has been a clear commitment on the government level, the implementation aspects have been exacerbated by issues such as underfunding, scepticism in academia, lack of competent/trained staff and lack of institutional commitment (among others).

Italy

Despite the efforts, programmes and financial resources devoted by the Italian Government since 2008 for speeding up the digitalisation process, the school system in Italy at secondary and VET levels, up until the pandemic had been strongly characterised by an "in presence approach". The pandemic was the real change maker since schools were literally obliged by law to guarantee the delivery of teaching and learning activities during the lockdown via DAD (Didattica a Distanza - Distance Learning).

Schools made an amazing effort for moving in a blink of an eye all their activities online, despite the existing technological constraints (i.e., the schools were not equipped with digital learning platforms, not all students could have access to the needed devices, the connectivity was an issue in some peripheral areas, etc.) and unpreparedness of the staff and teachers (appropriate teaching methods and ICT skills).

While DAD presented a series of limitations (i.e., disengagement of students given the use of passive teaching methods, higher workload for teachers for re-designing lesson plans, difficulty with the assessment) it was the first real attempt made by Italian schools to implement the digital transition. Nonetheless research revealed that with DAD "in the face of a great workload, the evaluation of the results appears not commensurate with the perception of learning effectiveness and inclusion". Therefore, the MIUR came up with Linee Guida per la Didattica Digitale Integrata (DDI - Digital Integrated teaching) (MIUR 2020), providing schools with any order and grade detailed guidelines and suggested methods for redesigning the teaching activity in blended learning and on how to prepare the Digital School Plan (DSP).

Linee Guida per la Didattica Digitale Integrata represents the turning point from the "experiment phase" determined by the Covid pandemic to the "new normal" where digital learning should be compulsory embedded in school practice and presented in the school PTOFs (Piano Triennale dell'offerta formativa - 3 years plan of the educational offer) as a standard complementary service, and managed according to guidelines and organisational principles defined by the MIUR on the basis of the lessons learned from the pandemic.

Despite the Linee Guida, we might argue whether the schools would be able to ground their plans for DDI rather than just look for formal compliance in their PTOFs. Whilst PNRR will channel a consistent financial resource to complete the infrastructure development, we believe that school's/headmasters' organisational preparedness and teachers' pedagogical preparedness will play a major role in completing the digital transition.

The Italian University system is guided by the principle of organisational, economic and didactic autonomy of universities, a principle that is provided for in art. 33 of the Constitution and which is implemented by the reforms that have taken place in recent years, in line with the Bologna Process, to overcome the existing gaps in the Italian system and ensure the quality and didactic performance required by the economic and social development of the country.

Looking at the university system, the main players involved (alongside the MUR, the Italian Ministry of University and Research) are the single universities, the Rectors' Conference (CRUI) and the AGID (National Agency for Digital Italy). The latter was created to support the achievement of the Italian digital agenda objectives, to contribute to the diffusion of digital technologies, and to support digital innovation.

The digitalisation of universities concerns the organisational and operational levels of each single university and the system, as well as the innovation and development of digital teaching and learning capabilities, needed to innovate and giving a boost to the development of human capital of the country. Concerning the first aspect, the indications and guidelines deriving from the policies and impacting on the governance of the universities are included in the CAD (Codice dell'Amministrazione Digitale – The Digital Administration Code) and are expressed in the CRUI / AGID collaboration protocol. As for the second aspect, this is the field of action of didactic and pedagogical innovation, and it contributes to the attractiveness and competitiveness of each university.

During the pandemic the universities have shown a great response capacity and resilience; they have held up during the long months of the emergency. At the same time, teaching with the DAD instead of taking a leap forward from a pedagogical point of view, has rather taken a step backwards, anchoring itself widely to frontal teaching, albeit online.

The university system with the GARR network and the pertaining digital services system is equipped with a modern, widespread, and effective infrastructure, capable of ensuring infrastructural resources and technological security standards.

The challenge of the university system stands in the capability to adapt and enhance the teaching quality and to provide de-bureaucratisation to freeing up resources to be dedicated to innovative education offers and to design and implement research networks, which are priorities valued in the PNRR, in particular in Mission 4.

The findings from the field research show the pandemic gave a boost to the digitalisation process of the Italian educational systems. The interviews and surveys highlighted a general satisfaction with the overall quality and efficiency of the services provided throughout the pandemic, especially with regards to the provision of devices and the implementation of the digital platforms. However, there are still some cultural and organisational blockers preventing a systemic transition, for example the scepticism of the teaching staff towards more interactive ways of structuring their courses and classes, and the overall reorganisation of the activities in a remote mode. On the other hand, teachers, and

tutors in HE and especially VET institution demonstrated a stronger commitment to rethinking their teaching and evaluation practices, with the aim of providing a more student-centric, engaging learning experience for their students.

Moreover, all interviewees highlighted specific subjects, methods as key enablers for achieving an effective digital transition of their respective organisations, which they would look forward to being trained in. Such enablers are:

- **Governance**
    - Integrating AGILE methodology in curriculum design
    - Digital Teamwork
- **Enabling services**
    - Digital communication and problem solving in support of administrative and service-related workflows: techniques and tools
    - Digital engagement for events and partnerships: techniques and tools
- **Teaching and Learning**
    - Digital communication and engagement for remote learning: techniques and tools
    - Collaborative learning activities
    - Course design
- **IT services**
    - Policies on cyber-security and data treatment, as per national and EU policies
    - Major software and platforms updates

Overall, the most relevant choices to be observed highlight the need for strengthening soft and transferrable skills, such as communication and problem solving, that the pandemic redefined or expanded in terms of remote or blended working as well as learning settings. Equally important seem to be a periodical update on the technical features as well as best practices, as well as a specific upskilling of the teaching staff (namely, tutors and faculty within the university system) with regards to more interactive, dynamic, and inclusive ways of engaging with students. The impact of more engaging methodologies seems to stretch beyond the adaptation of traditional academic teaching to virtual settings, towards a comprehensive redefinition of goals and modalities to achieve meaningful, sustainable learning experiences.

Country Report Overview: EU

Author: Athanasia Panoutsou (EFMD)

Executive Summary

The current document provides an overview of the EU policies, motivators, and barriers with regards to the digitalisation of Higher Education (HE), Vocational Education (VET) and Life-long Learning (LLL) programmes prior and after the COVID-19 pandemic. The past decade the EU launched several frameworks in this area and funded various projects keeping the issue in the agenda across the Member States. The report includes overview of data related to strategic planning, quality assurance, local innovations, and other areas with regards to the status of digitalisation in these sectors prior to the pandemic. Different actions were in place and the three sectors had already started their digitalisation process prior to the COVID-19 pandemic. However, many of these actions were characterised sporadic without clear prioritisation and follow up with the Member States resulting in inhomogeneous progress, which for many it has been attributed to this very lack of central enforcing policies along with the particularities of each country.

Following the COVID-19 pandemic, the EU stepped up launching The Digital Education Action Plan (2021-2027) and other subsequent initiatives outlining the Commission's vision for high quality, inclusive and accessible digital education. Through the Plan, EU called for stronger cooperation at European level to learn from the COVID-19 crisis and to make education and training systems fit for the digital age (ICDE, 2020). This Plan and the crisis itself have motivated reflection and experimentation with innovations and changed paradigms, while the three sectors are now engaged in dialogue with the interested parties (teachers, faculties, communities etc.) to explore whether digitalisation "came to stay". The report reviews the results of surveys and other data related to the impact of the pandemic and perceptions with regards to the digitalisation of these three educational sectors.

Pre-COVID-19 Status Quo of Digitalisation of HE/VET/LLL in EU

The past decade, a big number of policies and funding in the EU has been dedicated to the improvement of digital skills from a very young age until continuous professional development opportunities. The past decade EU has been considered a hospitable and competitive environment with regards to digitalisation in education, commerce, policies etc., also due to the ambitious EU plan to build a single digital market.

Higher Education

With regards to the issue of strategy and planning for digitalisation according to an extensive U-Multirank database (2020) the data show that prior to the COVID-19 pandemic only 17.6% of universities in the EU had a plan with specific measures with regards to digitalisation. 42.1% of EU universities had a section within their respective strategic plans in which online teaching was given some consideration. Approximately 40% of EU universities had no plan at all (Christiansen, 2021).

This is also confirmed by a 2013 survey conducted by the European University Association (EUA) which indicated that 63% of the surveyed universities had some kind of institutional approach for digitally enhanced learning and teaching. *Figure 1*. below shows the state across EU HEIs with regards to the existence of some policies at institutional level.

Figure 1. E-learning in European Higher Education Institutions results of a mapping survey, 2014.

According to the same 2013 survey from EUA, e-learning was not regarded as an issue of sufficient importance for Quality Assurance (QA). On that time, only 29% of the surveyed institutions had quality assurance procedures in place that include provisions for e-learning offer (Gaebel, Kupriyanova, Morais & Colucci, 2014).

The skills of the European workforce and its ability to navigate and take advantage of the new digital society is considered an indicator of the state of digitalisation of the European HE (Zalite & Zvirbule, 2020). Even though overall, the EU HEIs understand the need to align their research and offer with the digital society, we did not see all of them succeeding in this. In 2019, northern countries appeared more advanced with regards to the skills of their human capital to take advantage and be ready for the new digital society (Zalite & Zvirbule, 2020).

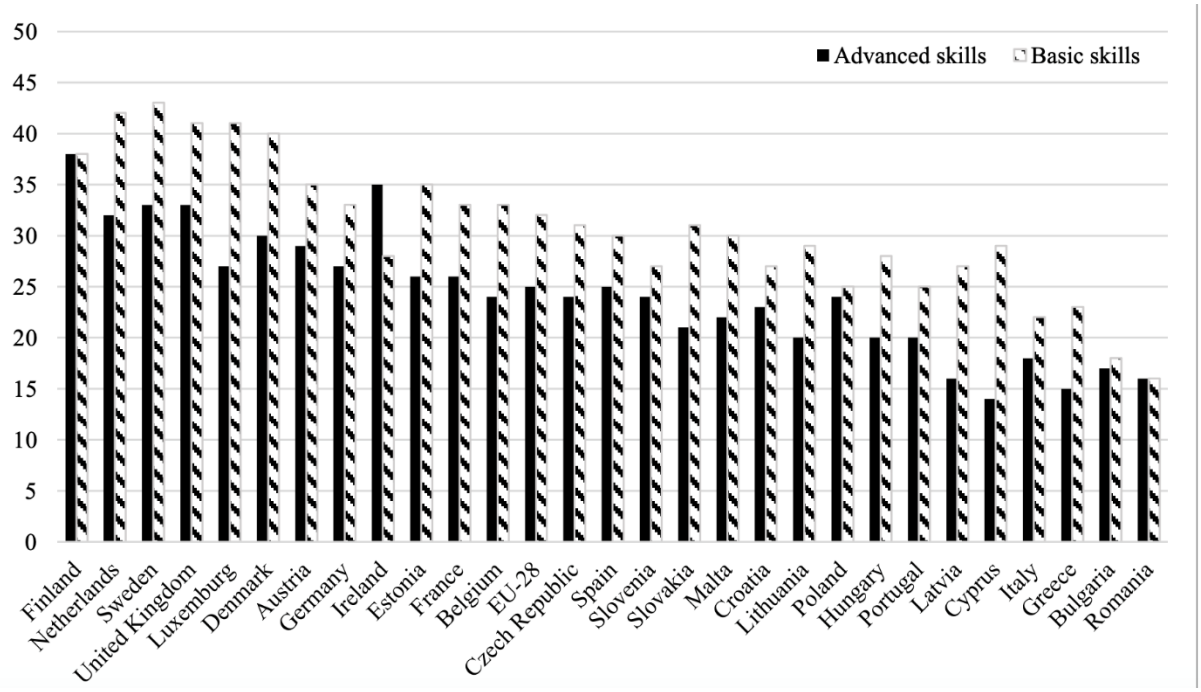

Figure 2. Advanced vs. basic human capital skills in the European Union Member States, DESI 2019.

With regards to the available infrastructure at the European universities, *Figure 3.* below provides an overview of the way the availability of the technical equipment has evolved from 2014 until 2020. Overall, basic infrastructure (e.g., open library access and online repositories) has been available at the European Universities for many years now, long before the COVID-19 pandemic but other infrastructures such as personalised study portals and online student admission system either throughout the institution or in some faculties increased sharply in 2020, possibly because of COVID-19. However, more specialised infrastructure such as VLE and online labs are available in less than 60% of the responding institutions, with considerable differences between Northern Europe (84%) and Eastern EU countries (34%) and the Balkans (as opposed to 35%) (Gaebel, Zhang, Stoeber & Morrisroe, 2021).

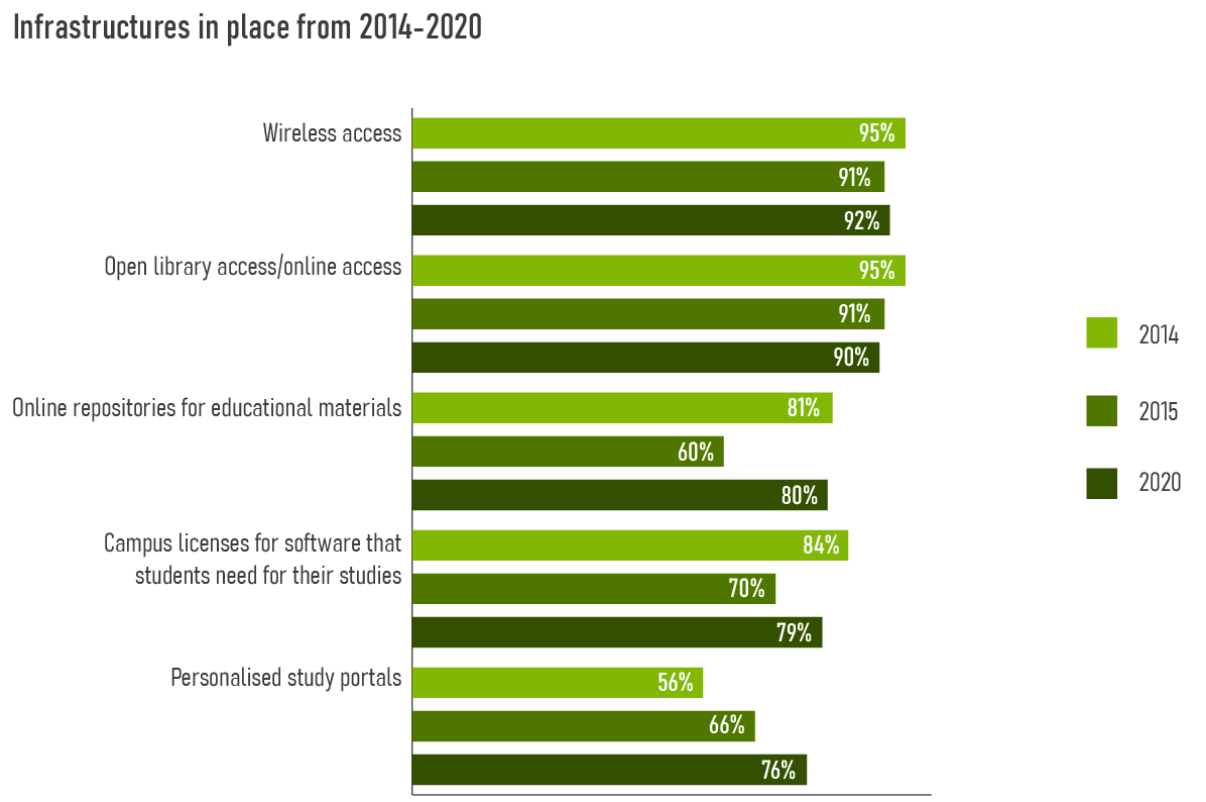

Figure 3. 2014 E-learning Study - Does your institution use any of the following types of educational resources? (Online repositories for educational material) / Which of the following information technology (IT)-related systems does your institution use or provide? / Which of the following information technology (IT) systems or tools does your institution use or provide for its students? / Which of the following infrastructures can students' access at your institution? (Source: DIGIHE, 2021).

Issues to consider addressing or investigating further through the results of DigiTransformEdu project:

- With regards to policy making and mapping, should EU consider the regional differences between most/less advanced countries and adapt the respective policies?

Vocational Education and Training

VET in the EU has been considered an innovative sector, familiar with digital learning environments. This is mainly due to the close and continuous contact with smaller businesses and enterprises, often the drivers of innovation in the EU in this domain (EU Commission, 2020). At the same time, because of its strong attachment to the characteristics of its local environment the digitalisation of VET is considered sporadic and occurring in some EU countries, while European VET was not able to capitalise, structure and further develop the innovation and digital readiness that their partners in smaller business and enterprises were able to maintain (EU Commission, 2020).

In accordance with the EU Digital Education Action Plan of 2018, VET promotes the development of digital skills and competencies across Europe as a major objective on EU's agenda however, there is limited literature on the digitalisation of vocational education in Europe as a whole.

Lifelong learning

Similarly, the Index of readiness for digital LLL published in 2019 *(Figure 4.),* show that there is still work to be done. Even for the more advanced countries there is room for progress. In the case of LLL, we do not see the usual gap between northern and southern countries, but we do see uneven progress with some of the biggest EU economies (e.g., Germany) scoring poorly in the use of digital technologies in the LLL sector (Beblavy, Baiocco, Kihoffer, Akguc & Jacquot, 2019). According to the authors of this report, some of this inhomogeneous progress does not have much to do with the economic situation in the country, which was the case for example for the HE. Even though there is no one-size-fits-all model, these results can be attributed partly to the existence (or not) of investments in the digital skills of the educators as well as the citizens', students', and the learners' trust on privacy issues online.

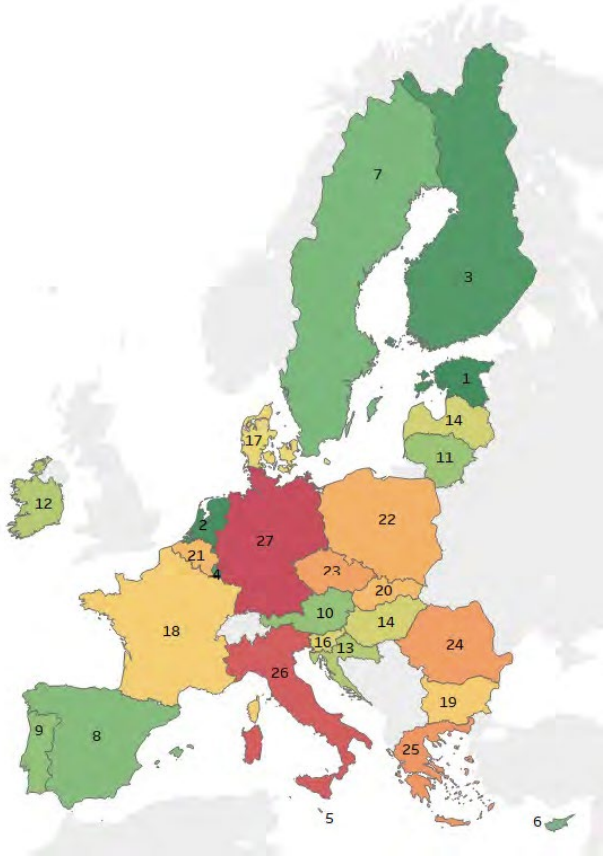

Figure 4. Overall results of digital learning index in EU-27

Issues to consider addressing or investigating further through the results of DigiTransformEdu project:

- Is there a need for centralised EU VET & LLL policies or do these sectors benefit more from localised approach?
- How can VET and LLL capitalise the innovation regarding digitalisation led by their partners (SMEs, etc.)?
- Do privacy issues online create a barrier in the development of digitalisation of the VET and LLL sectors in EU?

Policy and practice

Higher Education

Following the agreement of the Bologna Process (1999), digitalisation was established as a requirement for quality learning in HE. At EU policy level, except the Bologna process (1999) which "promised" to support the digitalisation of the European HE, there are limited initiatives/actions that focused only on HE in EU and digitalisation. Most of the plans before COVID-19 referred to education and learning in the EU area in general, with education provided at HE levels not being separated from the overall educational offer in EU.

In 2018, EU launched the Digital Education Action Plan, which set out three priorities:

- Making better use of digital technology for teaching and learning.
- Developing relevant digital competences and skills for the digital transformation.
- Improving education through better data analysis and foresight.

For HE this was considered a promising plan, which could take the Bologna Process further promoting "*a more open understanding and focus on digitalisation*" (Rampelt, Orr & Knoth, 2019).

The plan was built on the Renewed Agenda for Higher Education (2017) which emphasised the need to address the skills mismatch and the need for the digital enhancement of learning and included provisions for the creation of a Europe-wide platform for digital higher education supported by Erasmus+. The idea was that best practices and lessons learned from the EU projects on HE and digitalisation can be gathered and promoted through a centralised platform. Online research for the purposes of this report did not clear up whether this initiative finally took place. However, some similar initiatives funded by the EU do exist online, for example, d-learn (European Digital Learning Network).

Even though various policy papers show that the digitalisation of the European HE has been in the EU's agenda the past years, there is a lack of rather specific interventions and actions towards this. In contrast with the Bologna process for example, which put forward policies and practices that were built following ministerial meetings and agreements and moved the EU HE towards a specific direction.

Issues to consider addressing or investigating further through the results of DigiTransformEdu project:

- Why digitalisation in HE at EU level has not been promoted by operational and targeted policies prior to COVID-19? As opposed to other HE policies?
- Is there a need for a centralised platform at EU level that gathers all initiatives for the digitalisation in HE?

Vocational Education and Training and Lifelong Learning

For the digitalisation of the VET and LLL sectors in the EU, we see different policies and frameworks launched prior to COVID-19 that aim mostly at defining and clarifying the digital competencies of today's learners and their educators, and related terminologies.

In fact, several such frameworks for education have been developed such as the European Qualifications Framework (set up in 2008 and revised in 2017), the Europass (set up in 2012) and the European Key Competences Framework (revised in 2018).

The Digital Competence Framework for Citizens, DigComp. 2.1. described eight proficiency levels, which apply to five competence areas: information & data literacy, communication & collaboration, digital content creation, safety, problem solving. All five competencies together are considered as enabling someone to use and interact with digital technology. DigComp was used for the development and strategic planning of digital competence initiatives at EU and national levels while it was considered that it successfully combined the digital skills with other key skills necessary for educators (Redecker 2017), (Beblavy, Baiocco, Kihoffer, Akguc & Jacquot, 2019).

The Digital Education Action Plan of 2018, also mentioned earlier for HE, was considered a turning point for the VET and LLL sectors. Under its 3 priorities, several actions were proposed to address digitalisation of education and training and include mentoring schemes for schools, digitally signed qualifications, "code-week" for schools and other.

The Digital Action Plan of 2018 was renewed in 2021 following the COVID-19 pandemic. It seems difficult to find online the original Plan of 2018, with most information on it coming from experts' analyses. Overall, the discussion regarding EU policies and practices for the digitalisation of these sectors seems to start and end with the discussion regarding the e-competencies of the VET and LLL educators.

Issues to consider addressing or investigating further through the results of DigiTransformEdu project:

- The benefits of creating several different frameworks for educators and the skills needed for digital learning.
- The recognition and (self)assessment of those skills
- Do the EU VET and LLL frameworks and policies that refer to e-competencies frameworks only address the issue of digitalisation partially?

Drivers and motivators

Higher Education

In 2013, EUA surveyed 249 European HEIs and among others it investigated the main enablers and motivators for digital learning. The most popular answers are:

- flexibility of learning provision,
- enhanced efficiency of classroom time,
- more and better learning opportunities for distance learning and resident students,
- e-learning is perceived as a means for collaborating within the institution and other international higher education institutions.

(Gaebel, Kupriyanova, Morais & Colucci, 2014)

In addition, in EU in general, the structure and management of universities offer the space to the faculties to experiment and innovate in the field of digital education. There is a high degree of

autonomy and decentralization that allows this kind of innovation to take place (Hochschulforum Digitalisierung, 2015).

With EU being one of the most important and competitive providers of HE worldwide, it is also worth investigating whether major international "trends" in HE has been motivators for change in this field. Following the appearance of MOOCs for example, and according to the same EUA survey (2013), several universities were inspired to investigate this kind of platforms and prepare for the changes that they could induce in the future. However, statistically speaking, there was no obvious correlation between the use of MOOCs and engagement in other forms of e-learning. Incentives and motivation for this discussion come mainly from institutional leadership and in some cases because of external funding (Gaebel, Kupriyanova, Morais & Colucci, 2014).

At the same time, other researchers were not convinced by the European HEIs' reaction to this "international driver". European HE was characterised as "rigid and reluctant to change" that it did not embrace MOOCs while internationally MOOCs was already ten years ago considering the future of education (Kaplan, 2020).

Issues to consider addressing or investigating further through the results of DigiTransformEdu project:

- Is structural autonomy and decentralisation in the management of HEIs favourable with regards to digital education?
- Does European HE need further alignment with the international trends in the digitalisation of HE?

Vocational Education and Training and Lifelong Learning

As stated earlier, innovation that is taking place nationally and locally by the partners of the VET and LLL sector (trainers, SMEs, teachers, trainers, etc.) has been the main driver and motivator for these two sectors (EU Commission 2020).

For example, in the case of VET, most teachers appear to be making decisions about ICT without being motivated by plans or strategies of any type (Gaebel, Kupriyanova, Morais & Colucci, 2014). The educators themselves are motivated by the characteristics of the learners while depending on the country, issues such as available funding is also one of the drivers in this field. In this sense awareness raising and continuous professional development seem to play a key role in driving innovation in digitalisation in the VET and LLL sectors, at least locally if not at EU level.

Issues to consider addressing or investigating further through the results of DigiTransformEdu project:

- Incentives must focus more on educators or strategic / leadership level?

Barriers and obstacles

Higher Education

An important barrier with regards to digital education in HE has been the uncertainty about legal issues associated to digital learning in HE and copyright issues regarding the creation and use of

teaching and learning materials. These are issues for which European professors have not been sufficiently informed and trained until even today (Müller, Füngerlings & Tolks, 2018).

At the same time, with professors having the autonomy to experiment in terms of digital education, a barrier that appeared again and again was the online management of the teaching load of a course planned originally to take place in the class (Müller, Füngerlings & Tolks, 2018). With the lack of specific directions, trainings, and strategies at EU level and often nationally, professors and faculty organised the digital offer themselves. At the end, they ended up facing the fact that the teaching load was not fulfilled. Naturally, this in turn led to consider the available equipment and the possibility to deliver a course online deficient.

On the other hand, according to some researchers, the overall reluctancy and inhomogeneity of the European HE with regards to digitalisation can be attributed to the academics themselves. They have been blamed as remaining reluctant to stand in front of the camera *either because of great respect for this unknown world or for fear of making themselves redundant* (Kaplan, 2020). As a result, the universities in general stayed behind in informing themselves not just about digital learning but the way their administration and management should adapt accordingly in terms of business models, compensation models, or even legal issues related to intellectual property (Kaplan, 2020).

Issues to consider addressing or investigating further through the results of DigiTransformEdu project:

- Is informing and training on legal and copy right issues for digital education equally or even more important compared to professional development for professors in the use of technology?
- Do we need more focus on skills needed to transfer the teaching load online?
- Should incentives focus more on professors or leadership level?

Vocational Education and Training and Lifelong Learning

Similarly, for the case of VET and LLL it is the educators that appeared resistant (for some understandably) to embrace and engage in continuing professional development activities related to digital education (EU Commission 2020).

“Openness to innovation” is a variable that should be investigated in EU and for the VET and LLL educators. As stated earlier, it is the educators that drive digital education in the VET and LLL sectors however, ‘openness to innovation’ seems to be lower in EU overall than in other parts of the world (EU Commission 2020). From the same report of the EU Commission (2020), *this pattern is hard to explain and even in countries where teacher autonomy is high (as in some Scandinavian countries) innovation rates are low compared to other non-EU countries.*

Despite the multiple frameworks that EU has launched related to giving directions on the necessary digital skills and competencies it seems that this approach itself could be counterproductive. The results from a 2020 survey are shocking, showing that there is a significant lack of digitally skilled workforce resulting in an estimated digital skills gap of as many as 1,000,000 workers (DITA, 2020).

Issues to consider addressing or investigating further through the results of DigiTransformEdu project:

- How do educators in VET and LLL define "innovation" in digital education and investigate further their "openness" to it?

During/Post-COVID-19 Status Quo of Digitalisation of HE/VET/LLL in EU

Policy and practice

With the spread of COVID-19, European HE had to transition to digital learning almost overnight. As a response, the EU Commission eventually launched The Digital Education Action Plan (2021-2027) outlining the Commission's vision for high quality, inclusive and accessible digital education. Through this plan the EU called for stronger cooperation at European level to learn from the COVID-19 crisis and to make education and training systems fit for the digital age (ICDE, 2020).

The 2021-2027 Digital Education Action Plan was built on the 2018-2020 Action Plan. In the new Action Plan, EU aspired to play *a more active role in identifying, sharing, and scaling up good practices, fostering cooperation between all stakeholders and supporting EU Member States and the education and training sector with tools, frameworks, guidance, technical expertise, and research* (ICDE, 2020).

The Action Plan outlines the way that Member States can benefit from the Erasmus programme, the European Social Fund, the European Regional Development Fund and smart specialisation policies, the Connecting Europe Facility, the Digital Europe Programme and Horizon Europe to enhance their digital educational offer at all different levels and sectors (Digital Action Plan, 2020).

In addition, the Action Plan offers guidance to the Member States on how to prioritise funding for digital education using the Recovery and Resilience Facility and other cohesion policy instruments, in which upskilling and boosting very high-capacity broadband connectivity are *flagship investments* (Digital Action Plan, 2020).

As for the 2018 version of the Action Plan, in this major policy document EU emphasises digitalisation at all stages of education for the EU citizens and the plan is not meant to address only the needs of HE or only VET and LLL. However, it appears to be a document that aspires to provide more specific guidelines and prioritisation with regards to digitalisation in education, also because of the clear-cut guidelines for seeking funding from funding instruments not originally meant for education such as the Recovery and Resilience Facility.

Higher Education

At institutional level, the European HE had to adapt to the new COVID-19 reality. The Universities reviewed and updated their policies and compared to 63% in 2014, in 2020, 88% have a component in their wider institutionally strategy referring to digital learning and teaching (Gaebel, Zhang, Stoeber & Morrisroe, 2021).

At the same time, the trend of decentralised policies with regards to digitalisation and the almost complete freedom to the professors and faculties to innovate has also been impacted by COVID-19. Possibly because of more specific directions, prioritisation and funding coming from EU, we saw that

the universities shifted towards a rather centralised and shared-responsibility approach with regards to digitalisation. Something that could also allow more efficient quality assurance and evaluation of such activities (Gaebel, Zhang, Stoeber & Morrisroe, 2021).

At policy level, EU appeared to have reacted fast doing what it was expected to do and prioritise the transition of HE to digital education and dedicate additional funding. However, for some researchers this was a perhaps rushed action that did not give any consideration to major issues that come with the "platformisation" of HE (Giannopoulou, Ducato, Schneider, Angiolini, 2021).

There are several data protection implications that come together with the digitalisation process and with the fact that the universities started relying on third-party services for the delivery of the courses. EU could have led collective negotiations on behalf of the European universities to ensure that they can preserve their autonomy and ability to apply their own data protection policies (Giannopoulou, Ducato, Schneider, Angiolini, 2021). This is in contrast, for example, with the active role that EU took few years ago in the "negotiations" with Google and the launching of the New Data Protection Law (GDPR).

Issues to consider addressing or investigating further through the results of DigiTransformEdu project:

- Did the changes in the EU funding policies towards the digitalisation of HE play a role in influencing the digital transition of the European HEIs?
- Is the issue of data protection in digital education in HE, an issue that must be addressed by the EU instead of launching national policies?

Vocational Education and Training and Lifelong Learning:

As mentioned earlier, following the impact of the COVID-19 pandemic on education, the EU Commission eventually launched The Digital Education Action Plan (2021-2027) outlining the Commission's vision for high quality, inclusive and accessible digital education (ICDE, 2020). In this major policy document EU emphasises digitalisation at all stages of education for the EU citizens and the Plan is not meant to address only the needs of HE or only VET and LLL.

For some researchers and NGOs, the sectors of VET and LLL "felt" more the impact of the COVID-19 pandemic in terms of dealing with the exclusion and vulnerability of the learners. Many learners across Europe live in poverty with no digital devices and/or web access at home, they are in remote areas lacking learning materials or school supplies, while several lost their source of income during the pandemic (Cedefop, 2020). With both sectors being closely dependent on the characteristics of their local context, the educators had to step up to provide solutions which in turn informed the updated EU Action Plan as well as the calls for projects during the pandemic for the readiness of HE and VET and LLL sectors.

In a survey report from Cedefop (2020), VET and LLL educators described the main activities they organised to support learners at risk. These include as much as possible the use of free platforms and providing financial support for unlimited internet connection, organising more translations of the material into different languages spoken by ethnic minorities and refugees, including sign language for hearing impaired students, offering more training opportunities to learners on digital skills and

competences and using tools to monitor the learners' engagement in online classes and detect on time the risks.

With such data and information coming from practitioners, the EU stepped up and announced two "extraordinary calls for projects each providing €100 million to respond to the educational challenges resulting from the COVID-19 pandemic" (Erasmus+, 2020).

Particularly the call for "Digital education readiness" addressed and supported the initiatives already taken by educators that are described above. This call funded projects in school education, vocational education and training, and higher education. *Its aim was to enhance online, distance and blended learning - including supporting teachers and trainers, as well as safeguarding the inclusive nature of digital learning opportunities* (Erasmus+, 2020).

Issues to consider addressing or investigating further through the results of DigiTransformEdu project:

- Are inclusion issues more obvious in the VET/LLL sectors and digital learning?
- Should "inclusion" in these sectors be addressed with different criteria compared to HE?

Drivers and motivators

Higher Education

In a 2020 survey by DIGIHE supported by EUA, the respondents described as main enablers *(Figure 5.),* the existence of a comprehensive institutional strategy with regards to digitalisation and appropriate support to staff and students (Gaebel, Zhang, Stoeber & Morrisroe, 2021).

A robust institutional strategy with regards to digitalisation concerns the entire institution and calls for the proactive approach of all actors from design to implementation. The authors of this report point out that the main driver and enabler, contrary to what many would believer, is not the availability of up-to-date technologies and infrastructure but people's attitude. Three-quarters of the respondents pointed out the proactive participation of staff and students, the availability of professional development and training, followed by strategy and investments in equipment and infrastructure much lower (Gaebel, Zhang, Stoeber & Morrisroe, 2021).

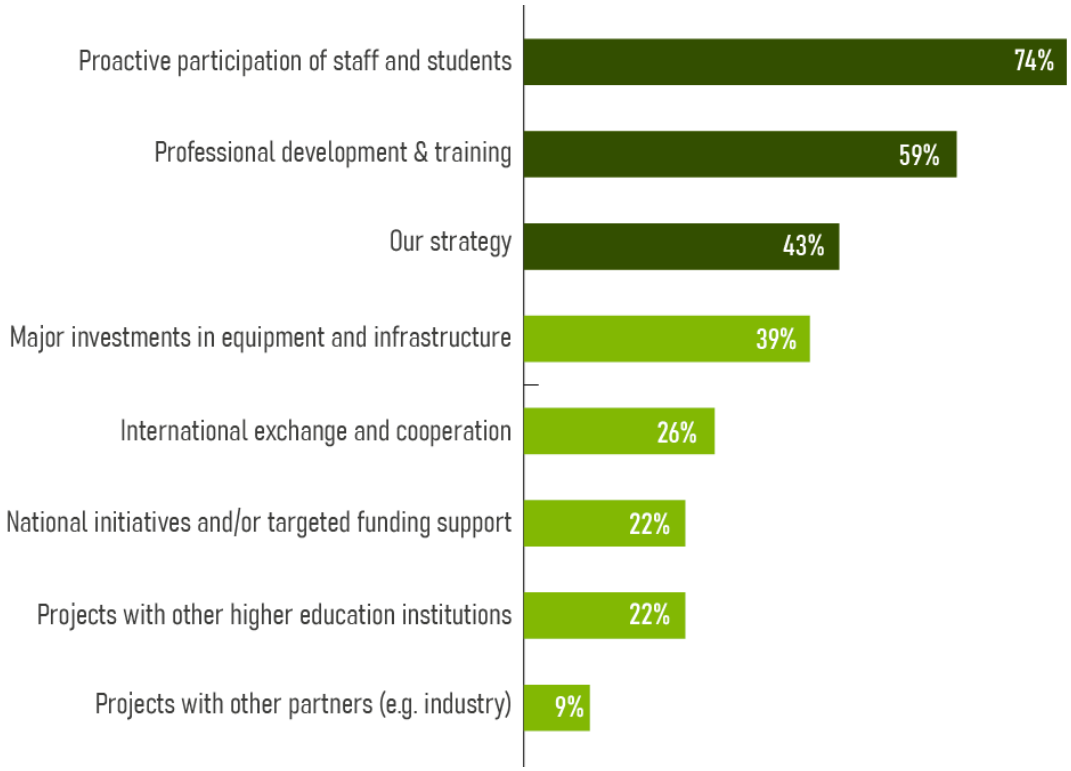

Figure 5. What are the top 3 enablers of digitally enhanced learning and teaching at your institution? (Please select your top three choices) (source: DIGIHE 2021).

Issues to consider addressing or investigating further through the results of DigiTransformEdu project:

- More details on how exactly the involved stakeholders would define the "proactive" approach.
- The aspects of an institutional strategy with regards to digitalisation which would make it "robust" or "comprehensive".

<u>Vocational Education and Training and Lifelong Learning</u>

There is limited literature online related to the specific enablers for the digitalisation of the VET and LLL sectors. Most of the available resources repeat the need for a coherent strategy at EU level that goes beyond the definition of the e-competencies and the increase of investments and funding on these fields.

Issues to consider addressing or investigating further through the results of DigiTransformEdu project:

- The project could fill the gap and provide more data regarding drivers and motivators for the digitalisation of the VET and LLL sectors.

Barriers and obstacles

Higher Education

Following the results of the same study in chapter 3.2, it seems that the drivers and enablers are mirrored for digitalisation in HE in the top barriers *(Figure 6.).* The lack of staff resources, the lack of external funding, the difficulty to devise a concerted approach for the entire institution and the lack of staff motivation were identified as the top barriers (Gaebel, Zhang, Stoeber & Morrisroe, 2021).

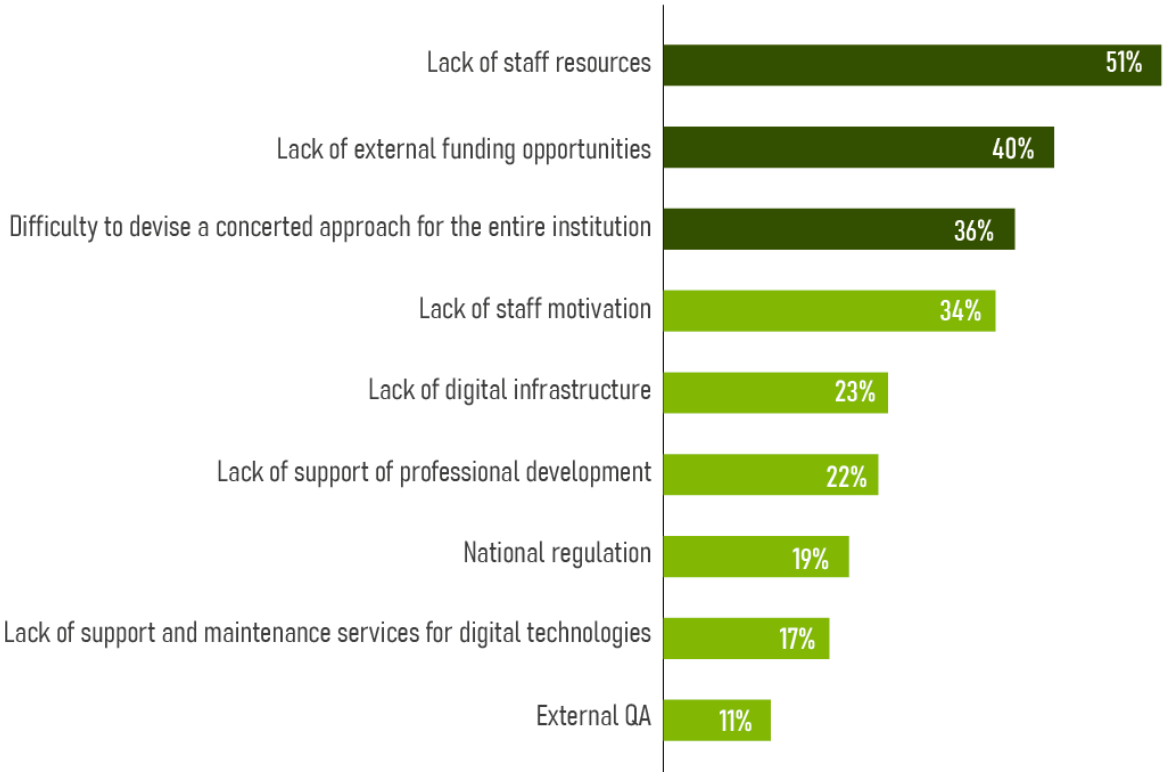

Figure 6. What are the top 3 barriers to digitally enhanced learning and teaching at your institution? (Please select your top three choices) (Source: DIGIHE, 2021).

The issue of legal and copyright issues also appeared in this report and even more important as a national and European problematic issue rather than just institutional. The authors refer to *anecdotal evidence* that confirm uncertainty with regards to copyright issues and reservations against Creative Commons licensing and Open Education Resources approaches (Gaebel, Zhang, Stoeber & Morrisroe, 2021).

Finally, it is important to refer to the issue of student and faculty mobility in HE for which the EU at policy level and the Member States have invested many years and significant funding to support it and establish it as a common practice in Europe. The universities have benefited greatly and at many levels by the physical presence of international students and faculty. The COVID-19 pandemic and the digitalisation of higher education put a stop on it overnight. The impact has been immense and even though most universities eventually offered alternatives for "virtual mobility", it has been argued that the results were not close to the desired ones (Farnell, Matijević & Schmidt, 2021). As a result, some universities might still be sceptical of transitioning all university experiences, such as the welcoming of international students, to digital environments.

Issues to consider addressing or investigating further through the results of DigiTransformEdu project:

- Should all university services by digitalised? Should universities prioritise or exclude some fields from the process of digitalisation?

Vocational Education and Training and Lifelong Learning

As for the case of the "drivers and motivators", there is limited literature related to this topic in the EU overall. We could assume however, that the drivers and motivators are also mirrored in the barriers and obstacles and concentrate on the fact that these sectors are largely based on the specificities of each national context. Even though this seems appropriate for VET and LLL, the lack of coherent policies that consider the often met North-South gap and can in turn direct the available funding and coordination with the Member States could be a way to start this discussion.

Issues to consider addressing or investigating further through the results of DigiTransformEdu project:

- The project could fill the gap and provide more data regarding barriers and obstacles for the digitalisation of the VET and LLL sectors.

Future Outlook and Opportunities

The urgency that the spread of COVID-19 created in EU led in some cases the educational institutions in Europe to prioritising the management of a health crisis but not to provide a better and adapted learning and teaching. Their reaction, due to its urgency was most likely not linked to their mission and strategy leading some experts to believe that once the situation clears up *most of the universities will appear dysfunctional in a post-COVID-19 environment, and that there will be strong pressure to return to "normality", meaning physical face-to-face on-campus provision* (Gaebel, Zhang, Stoeber & Morrisroe, 2021). In this sense, HE in the EU will miss its opportunity to maintain the momentum, sustain and built on the first - in many cases impressive - results and continue beyond the urgency of the crisis to lead innovation in the field.

It has been said that the COVID-19 pandemic ended up being a driver and a motivator for the educational offer in Europe. The pandemic originally presented a threat, but for many it ended up being an opportunity. In the field of HE, with almost all universities being forced to go online basically overnight, the European HE *experienced the biggest EdTech experiment in the history of education* (Kaplan, 2020).

Currently, the universities are reflecting and experimenting with innovations and changed paradigms and are engaged in a dialogue with the interested parties (teachers, faculties, communities etc.) to explore whether digitalisation will become itself a driver for change in HE. Such pedagogical innovations include for example:

- hybrid programmes where students spend their first year working while attending online courses to learn basic concepts and theories,
- maintaining contact online with alumni and students abroad,

- rethinking the existing facilities as a space for team working and collaboration (largely missing from the online platforms) instead of classrooms and amphitheatres.

(Kaplan, 2020).

Overall, for the European educational offer, including HE, as well as the VET and LLL sectors, facilitating exchange and track the progress and best practices is essential. The EU must support and actualise further such initiatives. This means that a coherent vision for digital education across Europe is needed, which will take into consideration national particularities (advanced/non-advanced countries, poor/rich countries, etc.), set common standards, and lead the way to EU becoming a competitive industry for digital learning (Beblavy, Baiocco, Kihoffer, Akguc & Jacquot, 2019).

The quality of learning and teaching in the digital environment must be studied further with consideration of all types of learning, from early childhood to continuous professional development. This must be developed jointly, to avoid fragmentation and partial view of this issue limited only to defining digital skills or acquiring digital technologies (Beblavy, Baiocco, Kihoffer, Akguc & Jacquot, 2019). Research and innovation, at university as well as entrepreneurial level, come forward to play a crucial role in optimising and advancing educational technologies and the study of human-computer interface.

Some experts recommend starting with short-term and urgent priorities, such as ensuring equal access to inclusive digital education for across Europe. This in turn will provide the base for studying and mapping the needs across Europe to design a coherent robust policy for the digitalisation of education that goes beyond the setting of objectives and puts forward among others funding, research, and quality assurance.

Conclusions and DigiTransformEdu Survey Results

As stated earlier, the COVID-19 pandemic - in some cases - ended up being a driver and a motivator for the educational offer in Europe. It originally presented a threat, but for many it ended up being an opportunity. In the field of HE, with almost all universities being forced to go online basically overnight, the European HE *experienced the biggest EdTech experiment in the history of education* (Kaplan, 2020).

The past decade, a big number of policies and funding in the EU has been dedicated to the improvement of digital skills from a very young age until continuous professional development opportunities. The past decade EU has been considered a hospitable and competitive environment with regards to digitalisation in education, commerce, policies etc., also due to the ambitious EU plan to build a single digital market.

The EU must now support and actualise further its role in promoting the digitalisation of the educational sector. This means that a coherent vision for digital education across Europe is needed which will take into consideration national particularities (advanced/non-advanced countries, poor/rich countries etc), set common standards, and lead the way to EU becoming a competitive industry for digital learning (Beblavy, Baiocco, Kihoffer, Akguc & Jacquot, 2019).

As an additional way to verify the results coming from the literature review, EFMD shared the DigiTransformEdu lecturers' survey (see Methodology) with lecturers active professionally during and after the COVID-19 pandemic in countries around Europe.

The results of the survey indeed verify some of the conclusions coming from the literature review. More specifically:

- mixed results with regards to how the use of online teaching improved the digital competencies of both, educators, and students. Indicating that the process of capitalising the opportunity that the pandemic has "offered" has not started yet,
- mixed results with regards to the organisation of the exams online. Indicating that not all phases of digital pedagogy were "ready" to be transferred online,
- mixed results with regards to the lecturers' preference for online teaching with the majority preferring blended or fully face to face teaching. Indicating that the way the transition happened and teaching online took place, has not yet convinced educators about the potentials of this approach,
- most of the recommendations from the lecturers refer to class-level interventions, indicating that there is still work to be done in terms of institutional policies and wholistic approach to digital education.

Country Report: Bulgaria

Author: Boriana Marinova (New Bulgarian University)

Executive Summary

This report aims to inform the actors on the current state of affairs when it comes to digitalisation of higher education in Bulgaria.

To study the situation in Bulgaria, available research publications, national strategic documents, reports, studies, and articles that deal with the digitalisation of education were reviewed. In addition, nine HE, VET, and LLL institutions were directly or indirectly surveyed to provide further insight into the impact of the pandemic upon the digitalisation of education. Representatives from New Bulgarian University, Pedagogical College - Pleven, ESI-CEE, and Academy Nikola Tesla were directly interviewed and/or answered the online questionnaires while views of representatives from the other institutions (i.e., D. A. Tsenov Academy of Economics, American University in Bulgaria, University of Forestry, "Angel Kanchev" University of Ruse, and University of National and World Economy) were collected from online sources, such as media interviews or public debates. The DigiTransformEdu survey was conducted in the period January - April 2022 for the desk research and March - September 2022 for the interviews and online questionnaires.

The digitalisation of the HE in Bulgaria should be seen in the context of its membership in the Bologna Process / European Higher Education Area and the European Union. Moreover, it is strongly associated with the development of distance education in the country that historically has strong roots in the higher education spectrum and received a new dimension in the early years of the 21st century when technology was introduced as a means in education. At that time, different HEIs started developing and introducing e-learning platforms, a process that was particularly boosted when a serious budget was invested to support the development of electronic systems for distance education funded in the framework of the Human Resources Development Operational Programme.

The organisation and implementation of distance education in the Bulgarian HEIs is regulated with an Act of the Council of Ministers, whose latest update came into force on 1 September 2021 to replace the Act from 2004. It was the 2004 Act that made it possible to build the necessary infrastructure to allow the Bulgarian HEIs to provide e-learning and was broadly considered as a success factor for the overnight transition to digital education imposed by the COVID-19 pandemic. The most important driver to choose the distance form of education that is now still valid in the case of digital education is the possibility to combine studies with work. At the same time the distance education stayed in the 'shadow' of the regular on-site format that was and remains the most selected format in Bulgaria where a pure analogue of the 'open university' model is missing.

In the abrupt shift to online mode of delivery, forced by the pandemic, it appears that the institutions that offered distance education and used e-learning platforms before the pandemic managed to make the transition without disruptions and compromising much on quality while others struggled a lot that led to serious omissions in the educational process. This can be explained with the fact that institutions providing distance education are technologically better equipped not only in terms of hardware,

software, and technology but also in terms of availability of lecturers and staff trained and prepared to use the technology and deliver distance/online education. In addition, they have established well-functioning centres of distance and online education that oversee all aspects of the delivery of educational, administrative, and enabling services to the students enrolled in distance education programmes.

On the regulatory stage during the pandemic, a series of important steps were made that aim to promote and enhance digital education and might help the distance education in Bulgaria to get out of the 'shadow' of the on-site education and develop as a stand-alone educational format that with the flexibility it provides fits the needs of working students and is in line with the current trend of working and studying from anywhere at any time.

For higher education, the pandemic has been widely acknowledged as an accelerator for its digital transformation that came along with a range of difficulties and obstacles. Major drawbacks are digital exhaustion, decreasing motivation and engagement of students with a growing sense of isolation, difficulties in joint and practical activities, difficulties in the organisation of online exams and assessment, data protection and privacy concerns, and technical and technological issues alongside with digital skills that were not up to the challenge. Another problem that is common - not only for Bulgaria - is that the pandemic increased the digital divide to further deepen the problems for students with disadvantaged social background.

When looking forward, probably the most important opportunity is the range of programmes and initiatives that have been developed or are in the process of development to train and re-train teachers to deliver digital education in terms of using technology but also digitalisation of pedagogy, content, and assessment methods. This refers not only to digital skills but also to cultural, interpersonal, and communication competences. Another positive aspect is the realised need for strategy for digital education to guide educational and training institutions in the organisation and delivery of high-quality digital education and digitalisation of the educational process. There is also an extensive discussion at national, European, and international level about how to narrow the digital gap and ensure inclusive digital education. Finally, the DigiTransformEdu project aims to trigger tangible changes in digital strategy, digital pedagogy, and digital competence within the participating organisations and beyond thanks to the provision of guidance, tools, and resources that should be developed by the end of 2023.

Pre-COVID-19 Status Quo of Digitalisation of HE/VET/LLL in Bulgaria

Bulgaria has been a full member of the Bologna Process / European Higher Education Area since 1999. As a result, the Bulgarian Higher Education has gone through a series of significant reforms in the process of harmonisation. In addition, as part of the European Union, Bulgaria adheres to the EU frameworks and programmes in the field of HE and its digitalisation, such as the Digital Agenda for Europe, the Digital Education Action Plan 2021-2027, the European Skills Agenda for sustainable competitiveness, social fairness and resilience, the European Education Area by 2025, etc.

The process of digitalisation of the HE in Bulgaria is strongly associated with the development of the distance education in the country, especially in the early years of the 21st century when technology was introduced as a means in education. Distance education in Bulgaria started gaining popularity already in the 50's-60's of the previous century as it was found considerably suitable for working

people. With the emergence of the Internet, technology started to be used in higher education to at first support communication and presentation of learning content that slowly transformed into e-learning.

In response to the e-Learning Action Plan of the European Commission, at the end of 2002 the Ministry of Transport and Communication funded a project to create a pilot Virtual Department of Computing with the participation of eleven HEIs and four Institutes of the Bulgarian Academy of Science. In the framework of this project and with the support of the Ministry of Education and Science, 50 computer rooms all over the country were equipped to provide e-learning. As continuation of this project, at the end of 2004 the Bulgarian Virtual University was launched with the involvement of 37 HEIs and 27 Institutes of the Bulgarian Academy of Science. The initial idea was to turn the virtual university into a national educational portal to all HEIs in the country and subsequently to increase its purpose and functions as an autonomous body that creates regional virtual universities and a network of inter-connected virtual libraries. In this respect, the aim of the Bulgarian Virtual University was to provide technical and methodological support to the regional universities in their transition to e-learning and to guide them how to create computer rooms, how to introduce software platforms for e-learning, and how to develop web-based courses, virtual laboratories, digital libraries, centres for distance education and even digital universities and campuses. Another important aim was to promote the integration of the Bulgarian virtual education with European and international virtual education initiatives. However, it is not clear to what extent these ambitions were achieved beyond the realisation of the national educational portal, described by Mitova (2011), as its website (i.e., https://www.bvu-bg.eu/) is no longer supported.

At the same time, individual HEIs in the country started developing and introducing e-learning platforms. Some of the platforms are used only for education, others for administration, while some solutions provide integrated educational and administrative services. Some HEIs developed their own custom-made platforms while others bought standard solutions. For example, a doctoral student developed the e-Learning Shell for Angel Kanchev University of Ruse that was also introduced in other universities and institutes while a bachelor student developed the software for VEDA, the first e-learning platform used in New Bulgarian University. In most recent years, standard platforms such as Moodle and MS Teams, gain popularity against the custom-made solutions because of the technical support their producers provide and the possibility for integration with other technological tools, such as virtual classrooms or useful add-ons, such as anti-plagiarism software.

A crucial impact on the introduction of e-learning platforms in the Bulgarian HEIs and the opportunity to catch up with the more developed in this respect European countries played the Human Resources Development Operational Programme co-funded by the European Social Fund of the EU. At the end of 2011 the Ministry of Education, Youth and Science through its Directorate General Structural Funds and International Educational Programmes published a Call for Proposals[1] under which 50 projects received 32.5 million BGN (about 16.6 million EUR) in total to support the development of electronic systems for distance education. That allowed the majority of the HEIs in Bulgaria to develop platforms and systems and advance their technological infrastructure that was necessary to provide high-quality distance education but also benefitted the regular on-site educational and administrative services.

[1] BG051PO001-4.3.04 „Razvitie na elektronni formi na distantzionno obuchenie v sistemata na vissheto obrazovanie": http://ophrd.government.bg/view_doc.php/5456

Research conducted among more than 12.000 students in the period May - June 2019 for the purposes of the Ranking System for the Higher Education Institutions in the Republic of Bulgaria[2] demonstrates that before the pandemic the HEIs regularly used different forms of online education, ensured access to online resources, and provided electronically some of their administrative services. More than 2/3 of the surveyed students agree that most of the lecturers take advantage of the new technologies in their teaching (69%) and provide access to their lectures online (72%). Similarly, the respondents agree that they can have free access to the internet in the HEIs (74%), have an easy access to sufficient digital educational resources (66%), and that most of the administrative services in the HEIs are accessible online (67%).

Policy and practice

The organisation and implementation of distance education in the Bulgarian HEIs is regulated with an Act of the Council of Ministers, whose latest update came into force on 1 September 2021 and will be discussed later in the report. The previous version of the Act came into force in 2004 and made it possible to build the necessary infrastructure that allowed the Bulgarian HEIs to provide e-learning and was broadly considered as a success factor for the overnight transition to digital education imposed by the COVID-19 pandemic. The first major requirement to legally permit a HEI to offer distance education is to possess an accredited environment for its provision that includes a professional software platform dedicated to the provision of distance education and specialised servers that can ensure a broad band internet connection. Then, the second requirement naturally deals with offering accredited educational services in the form of Bachelor, Master, and Doctoral programmes. For both requirements, the National Evaluation and Accreditation Agency is the responsible independent national body that has the authority to carry out evaluation, accreditation, and quality control in the activities of HEIs as well as to carry out post-accreditation monitoring and control.

Drivers and motivators

As already mentioned, the main driver for choosing a distance form of higher education is the possibility to combine education with work. This is confirmed by studies trying to identify the profile of the distance education student (Chukurliev, 2018). The distance education (also called digital, education from home, online and open education) proves to be the most flexible form of higher education that allows broad clusters of people from different age, employment status, residence and with special needs to benefit from educational opportunities and pursue tertiary education.

[2] The Bulgarian University Ranking System web portal (https://rsvu.mon.bg/rsvu4/#/) was created in 2010 under the project "Development of a Ranking System for the Higher Education Institutions in the Republic of Bulgaria". It was developed further in 2013-2015 under the project BG051PO001/3.2.04-0001 "'Development of the Bulgarian University Ranking System" with the financial support of the Human Resource Development Operational Programme 2007-2013, co-financed by the European Social Fund of the European Union and the project BG05M20P001-2.005-0001 "Maintenance and improvement of the developed university ranking system – Phase 1", with the financial support of the Science and Education for Smart Growth Operational Programme, which is co-financed by the European Union through the European Structural and Investment Funds.

Barriers and obstacles

There are various barriers and obstacles for the distance/online education that can be grouped according to different criteria. Probably the most important of them is to ensure quality of delivery. Even though a preferred form of education for working people, the distance education remained in the 'shadow' of the regular on-site format that was and remains the most selected format in Bulgaria where a pure analogue of the 'open university' model is missing. Distance education is offered alongside the regular presence form and a particular accreditation is required for its provision. As such, the educational offer in terms of programmes and content is based on the on-site format as a starting point and rather as a rule than an exception not adapted to students' or business's expectations and requirements. Often lecturers are less motivated that lowers the quality of educational provision and results in less interest among the potential students while distance education needs exactly the opposite – greater attention to students to compensate for the limited contact with lecturers (Chukurliev, 2018).

Another challenge that is worth underlining is the distance/online organisation of exams and evaluation of day-to-day work, especially of big groups of students, that has not only to prevent cheating but has to find suitable solutions for authentication, anti-plagiarism, and the 'market' for buying ready-made case studies, thesis, and other types of project and written assignments.

Other challenges can be listed as:

- technological that are related to the rapid development of the Information and Communication Technologies (ICT) and the respective (digital) competencies required to deal with them combined with the ever-growing need of high-speed internet connection and up-to-date hardware able to run the technologies,
- methodological that are related to the peculiarities of distance education in terms of course design, delivery, and assessment. There is already sufficient evidence in the scientific literature that points out to the differences and underlines that the methods used in a face-to-face classroom cannot be transferred to online settings without appropriate adaptations and the use of visual and interactive elements,
- demographic that are related to the adverse situation in Bulgaria where a stable and relatively high number of HEIs are trying to attract a decreasing number of potential students, which in some cases translates into a much higher offer than demand in the higher educational landscape. This naturally results in lower quality of education and distrust among employers about the value of certain diplomas. In this context, it is often the quality of distance education and its recognition that pay the price,
- regulatory that are related to the need to find the right balance between the academic autonomy and the role of the state to ensure the quality of education,
- political that are related to the membership in the Bologna Process and the European Union and the adherence to the respective frameworks and programmes while attempting to balance with the national interests and context,
- psychological that are related to higher motivation, self-discipline, and time management of the distance education student who has to remain focused in often distractive environment. Here the resistance to change and educational innovation among a substantial number of educators can be added.

During/Post-COVID-19 Status Quo of Digitalisation of HE/VET/LLL in Bulgaria

As of 11 March 2020, all schools and HEIs had to move their educational services entirely online to respect the required social distancing measures enforced by the government in an attempt to reduce the spread of COVID-19. In Bulgaria, as in many other countries in the world, it was the first instance of online delivery of education at such a scale. As the requirement for social distancing was prolonged several times, what was expected to be a temporary measure, spanned over two years and affected five academic semesters, during which not only the course delivery moved online but also the exams and assessments, the university and school administrations and management, the services for students and candidates, the monitoring and control exercised by the Ministry of Education and Science, in fact our entire lives.

While some educational and training institutions managed to quickly shift to online mode of delivery that resulted in generally high satisfaction among both students and teachers, others struggled a lot that led to serious disruptions and omissions in the educational process. During the pandemic in the period April-June 2020, another research was conducted for the purposes of the Ranking System for the Higher Education Institutions in the Republic of Bulgaria among almost 25.000 students. It demonstrated that 95% of the students had already moved to online education and more than 2/3 of them were satisfied with its accessibility, regularity, and the quality of the online classes (between 75% and 83%). Similarly, the survey conducted in the framework of the DigiTransformEdu project revealed high satisfaction with the way their institutions responded to the pandemic and the organisation of the online classes among both lecturers (94%) and students (92%). The reasons behind this high satisfaction were stated to be rapid and adequate organisation of the entire process, prompt transition to online education that kept the schedule of the lessons, teamwork and mutual support, accessible and diverse learning platforms, ensuring laptops and paid technological tools for online education if needed, online access to the university library, etc. Among the shortcomings, the lack of coordinated position on which learning platforms and virtual classrooms to use and hence the multitude of technologies that were abruptly introduced, problems with the organisation and the scheduling, not sufficient support to teachers and students to ensure their access were mentioned. While both lecturers and students were generally very satisfied with the online classes under the circumstances, the transition to online administrative and enabling services was less satisfactory and often they had to be provided by phone rather than digitally. Another problematic domain was the online organisation of the exams and the routine assessment. Even though the majority of the respondents were generally satisfied and when the evaluation was done with the help of projects or assignments, the assessments went smoothly, cheating during the exams and inadequate choice of online tests were often stated as troublesome.

The literature review and the collection of primary data within the framework of the current DigiTransformEdu project led to the assumption that there is a correlation between the offer of distance education and the use of e-learning platforms before the pandemic and the speed and quality of reaction in the move to online delivery. Logically, institutions that provide distance education are technologically better equipped not only in terms of hardware, software, and technology but also in terms of availability of lecturers and staff trained and prepared to use the technology and deliver distance/online education. In addition, they have established and well-functioning centres of distance and online education that oversee all aspects of the delivery of educational, administrative, and

enabling services to the students enrolled in distance education programmes. It appears that such institutions were very flexible and managed to make the transition to online education without disruptions and compromising much on quality and interaction. However, detailed analysis of the situation based on reliable research data collected from a representative sample of HEIs and their populations have not been yet performed in the country, and as such it is early to make definitive conclusions about digital higher education, its opportunities and limitations, and its efficacy compared to the traditional classroom format (Mihailova, Mirchev, 2021).

When looking more into detail in the technological and communication tools used during the pandemic, the educational and training institutions continued using the e-learning platforms they had developed before that. However, certain modifications and additions had to be made to face a situation of distance education, communication, and administration only. Moodle seems to be the most used platform among the HEIs probably because of its open code and the possibilities for adjustments and customisation that the open-source learning management system provides. Another popular platform is Microsoft Teams whose massive application can be explained with the free of charge provision of MS Office 365 Education given by Microsoft to eligible schools and educational institutions[3]. Additionally, Discord was praised for the easiness of its breakout groups and classrooms. Standard and custom-made solutions to support virtual classrooms (e.g., Big Blue Button), e-teacher and e-student were added as well as other technological tools that were deemed necessary. In addition, educators started using a wide range of digital tools, some of which particularly aimed for education, such as Kahoot and OpenBoard, while others primarily intended for other purposes but proved very useful under the circumstances like social media, such as Facebook and Messenger, video communication platforms, such as Zoom and Google Meet or their functionalities to support breakout rooms or organise voting polls, collaboration tools like Miro, MURAL and Lean Coffee Table, and many others.

It is exactly here that the educators' digital skills and experience with technology or their absence made the difference and turned some classes into fascinating learning experiences while others remained boring, tiring and almost useless. For example, *I have prepared electronic simulations (games) to be included in the practical exercises and used a digital platform for discussion moderation of the Lean Coffee type.* compared to *Many lecturers cannot demonstrate the resources they have prepared because they cannot effectively use the selected software or didn't adapt their class to online teaching*. However, on the positive side the majority of students (62%) and lecturers (81%) consider that their digital competence improved during the pandemic and agree that the digital competence of their counterparts also improved (77% of the students consider that the digital competence of their lecturers improved and 88% of the lecturers find the same about their students).

An important conclusion that can be made, concerns the difference in perceptions between bachelor and master students and between students and lecturers. Not surprisingly and evident from previous research, bachelor and especially first-year students prefer education on site and if this is not possible, are attracted by hybrid or online education that is as similar as possible to the on-site education (i.e., virtual classrooms, lessons dominated by the teacher, possibility for recorded lessons that they can re-visit and re-view) while master students, who often combine their study with part-time and very often in Bulgaria even with full-time job, prefer more diversity in the format, greater interactivity, and

[3] https://www.microsoft.com/en-us/education/products/office

autonomy and are more inclined to move entirely to online education. In this respect, 92% of the respondents to the online questionnaire who were only master students occupying full-time positions find online education more flexible and more timesaving while a very small minority of them point to the negative aspects with more distractive being indicated the most (31%). When asked for their preferred format of education, 46% opted for fully online and 39% for blended while completely on-site and hybrid education were equally frowned upon. Rather different picture can be observed among the lecturers. While they also agree that online education provides more flexibility (75%) and somewhat saves time (50%), the negative aspects were pointed out much more often with 44% acknowledging more personal workload, 38% pointing to difficulties to practice or reflect on what the students have learned, and similarly to students emphasise the distraction risks (31%). The perceptions on the format are also very different with 69% of the lecturers opting for blended education and 25% for completely face-to-face while none of them selected the fully online option. Some quotes by lecturers come to support these findings, *Teaching has turned mostly into giving directions, emphases, and instructions with visual and verbal anonymity on students' side, they are just listening, especially the bachelor students while the master students are more open.* or *There are differences between the working students (usually 3rd and 4th year) compared to the 1st and 2nd year who are not working yet. The working students participate more adequately in online education because this is the format they prefer.*

Policy and practice

In Bulgaria the end of the 2014-2020 programme period coincided with the end of implementation of the first Strategy for the Development of the Higher Education Sector[4] that was the first document at such level for the sector. In the middle of the COVID-19 pandemic, a new strategy for the period 2021-2030 was publicly discussed and adopted by the General Assembly on 17 December 2020[5]. Understandably, the impact of the pandemic was reflected in the new strategy and resulted in drawing particular attention upon the digitalisation of Higher Education in the country and setting it as a priority for the period. The emphasis on digital transformation of education was already set at EU level and transposed in a range of programmes and funding instruments, including the Erasmus+ programme.

The new strategy aspires to achieve complete digitalisation and development of the educational systems that is complementary or alternative to the classic higher education. The strategy points out to the need for urgent digitalisation that is imposed not only as result of the pandemic but also due to the worrisome situation of digitalisation in Bulgaria[6]. The possibility that through digital education a higher number of students coming from different backgrounds can be reached is also stressed as an important opportunity. At the same time, it underlines the lack of match between the higher education offer in its current form and the needs of the digital generations and the competencies

[4] Ministry of Education and Science of Bulgaria, 2015, Strategia za razvitie na vissheto obrazovanie v Republika Bulgaria 2014-2020, adopted by the General Assembly on 26 February 2015: http://www.strategy.bg/StrategicDocuments/View.aspx?Id=962

[5] Ministry of Education and Science of Bulgaria, 2020, Strategia za razvitie na vissheto obrazovanie v Republika Bulgaria 2021-2030, adopted by the General Assembly on 17 December 2020: https://www.strategy.bg/StrategicDocuments/View.aspx?lang=bg-BG&Id=1492

[6] According to the Digital Economy and Society Index (DESI) in 2019 Bulgaria ranked last out of the EU countries with among the lowest Human capital and Connectivity scores in the EU.

required by the labour market in the digital era. In this respect, the strategy sets a range of objectives that aim to modernise the educational process and programmes by making them more digital, more practical, more flexible, and interdisciplinary and at the same time focusing more on training teachers to use technology and improving their digital skills. It is important to note that the strategy seeks to significantly increase the programmes for digital distance education and improve the platforms for digital education to better respond to the characteristics, needs and expectations of the digital generations. If this is accomplished, it might finally help the distance education in Bulgaria to get out of the 'shadow' of the on-site education and develop as a stand-alone educational format that fits the needs of working students and is in line with the current trend of working and studying from anywhere at any time.

Similarly, under the 'shadow' of the COVID-19 pandemic, on 1 September 2021 a new Act[7] came into force to regulate the organisation of the distance form of higher education. It came to replace the previous Act from 2004 and naturally targeted the digitalisation of distance education. Probably the most important difference between the two Acts can be found in the definition of distance education. While in 2004 the legislator defined distance education as an organisation of the educational process, in 2021 distance education is already identified as a form of higher education and as such obtaining rather an autonomous status that goes beyond organisation to embrace digital education. While the latest Act is logically more detailed in terms of stating the use of digital means for the organisation, administration, and functioning of digital education, a commonality in the two Acts is the central role of the Distance Education Centre that should be created and responsible to ensure the institutional, regulatory, operational, technological, pedagogical, and other aspects of the distance education.

Another important document adopted during the pandemic period and affecting the digitalisation of higher education in Bulgaria is the Digital Qualification National Programme that was introduced in March 2021. The programme will be implemented for three years and has a budget of 2mln BGN (about 1.02mln EUR). It answers the need to train and re-train academics and make them competent to lead and execute the digital transformation of education and aims to equip them with the necessary (digital) skills. This should further facilitate the education of highly demanded specialists in the ICT sector whose profile can meet the labour market needs in accordance with the latest industry trends and requirements. As a weakness of the programme can be considered its intention to benefit only state universities and as such, failing to support HEIs that have already proved to be able to educate highly competent ICT specialists but nevertheless can further profit from support in their pursue of excellence.

At institutional level, a range of regulations, directives, and guidelines were adopted and regularly distributed and made available online to guide teachers, students, administrators, and stakeholders through the process of entirely online education. Here again, some institutions managed better and faster to organise themselves and similarly to the delivery of teaching, their resilience in terms of institutional functioning and the provision of enabling and administrative services could be related to the status of their digital readiness, equipment, and skills before the pandemic.

[7] https://web.mon.bg/upload/25604/nrdb-distancionno-VU_160321.pdf

Drivers and motivators

The pandemic has been widely acknowledged as an accelerator of the digital transformation of companies, work, and society. Education is no exception and some HEIs even admit finding it difficult to get students back in the classroom. In this respect, some online classes reached 100% attendance, situation that was rarely observed on site before the pandemic.

There are different reasons to explain why students prefer to continue studying online. Online education was found to be more flexible and convenient for students, especially the more mature ones while freshers suffered the most (Ellyton et al., 2022). As it permits education from anywhere and at any time and has been already emphasised in this report, digital education is particularly preferred by working students and students who otherwise have to relocate and make extra costs for housing or should spend much time in commuting like one student stated: *By not losing time for commuting to the university, I've got more time to better organise all of my everyday tasks around the lectures.* or another one, *I can learn from wherever I feel like it, I don't lose time in commuting and can multitask, doing my housekeeping while listening to the lecture, for example.* Other students found it more relaxed to study from home: *For me, the home environment ensures one of the most important conditions for a successful learning experience and that is calmness. Since the moment we shifted to online education, I find that my learning experience has become more pleasant, relaxed, and of course successful.*

Another positive side is the enhanced learning experience due to the increased access to teaching materials and lectures, the availability of recordings, the variety of tools and media used to present the learning content, the amplified use of platforms and social media to communicate and collaborate with co-students and lecturers, etc. Here is a quote of a student explaining the easier access: *I can find information and general material easier and watch the recordings. Everything is generally easier online compared to face-to-face*. In addition, at the end of the pandemic both students and lecturers saw their digital skills improved and different programmes and initiatives were launched at EU, national, regional, and institutional level to focus on the development of pedagogical competencies of teachers and their digital competence in particular. To HEIs, digital education allows to reach to broader groups of students, such as non-traditional learners, disadvantaged or disabled individuals, to go beyond state borders, or target working people.

Barriers and obstacles

In terms of barriers and obstacles, major drawbacks are the decreasing motivation and engagement of students just like one of them put it: *It is very difficult to study online, at least for me. No motivation, constantly sitting closed at home surrounded by the same walls. I am very much against online education*. or a lecturer stated, *The lack of face-to-face contact sets students and lecturers in a situation of distancing and demotivation for learning / teaching*. Often this is due to distractive elements, such as social media or other family members or pets in the same space, expressed in the words of a student: *When I am at home and can do whatever I want, I find a million reasons to get distracted*., with a growing sense of isolation due to the lack of human contact, expressed in the words of a lecturer: *Isolation is the main reason to lose interest in doing whatsoever, including education*. To these we can add difficulties in joint and practical activities combined with technical and technological issues, summed up by another student: *Depression, no desire to do whatsoever, I was just skipping lectures. It is one thing to be in class, listen to the explanations, and pay attention to the body language*

and completely a different story to sit in Moodle, lose connection every two minutes and didn't understand a thing at the end.

In this respect, digital exhaustion was a common problem cited by both students and lecturers (Ellyton et al., 2022), as one student stated: *The long hours in front of the computer during lectures and exercises make me tired and demotivated. I get easily distracted when there are no people around me*. Likewise, the "no-cameras-on" issue was often emphasised by lecturers as problematic that contributed to the dehumanisation of education and the sense of isolation. The multitude of platforms, they had to deal with, did not make the situation any better either, especially with a significant number of lecturers self-reporting that their digital skills need improvement and the suboptimal status of the technology infrastructure in HEIs impacting the educational process. Simply transposing face-to-face lectures into online teaching did not help either like a student emphasised: *Many of the courses were not developed to suit online education and we got lost. Moreover, the exams were very chaotic. The lecturers themselves often preferred to provide the lectures and the materials separately instead of teaching them online. As such, the communication was very difficult and often it took very long to find an answer to a question you happened to have*. However, the educators who took the digital challenge seriously and made the effort to update their courses to online teaching, had to invest much of their time and were overloaded and exhausted at the end, as one lecturer stated: *I am investing much more effort than during the on-site lessons because I have to prepare additional materials and assignments and after that to discuss them with the students*.

Another big group of problems concerns technical and infrastructure issues. These issues relate to lacking or slow internet connection, connectivity problems, system failures, devices not working properly (e.g., mic or headphone), background noise and disturbances, lacking internal tools for fast teacher/student communication that imposes the need to use external apps (i.e., Messenger, Instagram, WhatsApp, etc.), etc.

These findings were also confirmed by the respondents to the DigiTransformEdu online questionnaires. The majority of the lecturers complained about internet connection problems (81%) and technical issues (63%) followed by not sufficient student engagement and participation (44%), not sufficient interaction with the students (38%), absences and drop-outs (38%), lack of face-to-face contact (31%), online fatigue and stress (31%), and cheating during online exams and tests (also 31%). Surprisingly the students complained less about internet connection problems (39%) and technical issues (39%) but mostly about the lack of face-to-face contact (46%), and equally (23%) about the lack of appropriate digital tools to carry out certain teaching components, not sufficient interaction with the lecturer, not sufficient interaction with the co-students, and online fatigue and stress.

At the beginning of the pandemic when education had to move online overnight, it was the centres of distance and online education and the IT departments that were most overloaded and had to take important decisions very quickly and in extreme circumstances. In many cases, the e-learning systems and platforms were not up to such volumes at the same time or were not properly equipped with virtual classrooms or secure environments for tests and exams to avoid cheating and plagiarism. Naturally, HEIs that did not have such centres or did not invest in equipment and technology suitable to deliver online distance education had it even more difficult to make and keep everything up and running. In some cases, they even had to start with uploading documents and resources that were not at all available electronically. A particular issue was reported to address the access to libraries, paid databases access to which was ensured only from within the university, and proprietary literature resources. These issues could not be resolved even though attempts to rely on cloud technologies and Open Educational Resources bid partially a solution.

Cybersecurity, data protection and privacy concerns also were issues that intensified during the pandemic. And while some institutions report to have taken measures and installed specific software, others could not do much. A common challenge that to some extent can explain the “no-cameras-on” practice relates to privacy concerns, as both educators and learners didn’t feel comfortable other people to “enter” their homes. Similarly, measures had to be taken to prevent students from cheating and plagiarism during evaluations and exams. Here most institutions report to have used specific anti-plagiarism software, such as Turnitin and PlagScan in addition to introducing procedures and rules for the organisation of the exams (e.g., obligation to have the camera on and to share the screen).

Another problem that is common not only for Bulgaria, is that the pandemic increased the digital divide with students from disadvantaged social background suffering the most. They often did not have appropriate internet connection or suitable devices that would allow them to properly follow classes or access the learning platforms or virtual classrooms. During the DigiTransformEdu survey, some evidence was found suggesting that educational and training institutions in Bulgaria were providing lecturers or students in need with devices or other solutions to help them overbridge the difficulties, but it was not a common practice especially in the case of students. In this respect some students recommended to provide such support to students with disadvantaged social, financial or health situation.

In summary, the DigiTransformEdu survey highlighted the following barriers, obstacles, and challenges:

- initial struggle to start using e-platforms and e-resources without any time for preparation and adaptation,
- initial expectations that the pandemic situation was only temporary that caused delays in the instruction of some courses and resulted in squeezing them afterwards that consequently did not allow focusing and devoting enough time on the different topics,
- lack of direct and on-time feedback from students and trainees about the appropriateness of teaching content, methods, and tools,
- increasing costs for digital tools and services (e.g., some educators paid from their own pocket the subscription costs allowing them to use the videoconferencing platforms with bigger groups and not limited in time),
- increasing costs to study and test the appropriateness of methods and tools for effective teaching,
- problems related to the connectivity and the shared learning space,
- retaining learners’ attention,
- screen fatigue for both learners and educators,
- difficulties with practical exercises that made them less effective,
- difficulties with and even impossibility to find internships,
- attempts to replicate traditional education in virtual environment without any adaptation,
- problems with authentication and cheating during evaluations and exams,
- staying at home all the time created the expectation that everybody should be available 24/7,
- conducting a class simultaneously in a physical classroom and online to provide hybrid education because *the lecturer can't be split in three to pay attention to the students in the classroom, the online students and the ones writing in the chat*.

As one of the interviewees put it bluntly: *For me the main disadvantage is the lack of direct contact with the students. I am used to constantly communicate with the ones present in the classroom. It is not only that I ask questions, but I can see who comprehends what I am talking about. I can "read" in their eyes who is listening and who is already dreaming about the evening programme or the latest post on the internet. If it is needed, I can "wake up" the audience with a question or even a joke. This cannot happen online even with the help of videoconferencing technology. The students are at home and don't want to switch their cameras on, and you cannot force them – they were still in their pyjamas, the interior at home was not suitable to show, the internet connection was slow and so on, and so forth. And at the same time, they might be not listening at all or not even being in the room. But even if they are online and listening, they cannot "touch" what I am demonstrating, the discussions are not the same as live, we have to wait for each other, we have to speak one-by-one and so on. Another problem is the exams and the regular assessment where it is much more difficult to confront the "group work" during individual tests, or lifelines like "phone a friend", "ask the audience" and others of the sort. But for me one of the most challenging problems is to supervise exercises when the students have a practical project to work on. It takes much more time to explain, correct and evaluate compared to the classroom format and moreover it is not completely effective. The practical activities that in some programmes can take 50% of the classes suffered the most*.

Future Outlook and Opportunities

Probably the most important opportunity is the range of programmes and initiatives that have been developed or are in the process of development to train and re-train teachers to deliver digital education in terms of using technology but also digitalisation of pedagogy, content, and assessment methods. Training and upgrading staff, and to some extent students', skills is a necessity. This refers not only to digital skills but also to cultural, interpersonal and communication competencies.

In this respect, the respondents to the online questionnaires were asked to assess the usefulness during the pandemic of certain teaching practices. Almost all students (92%) and 68% of the lecturers selected tasks to complete individually or in group as the most useful practice followed by online Q&A sessions (77% of the students and 68% of the lecturers), work sessions in small groups with the lecturer (with the cameras on) (69% of the students and 62% of the lecturers), and personalised (one-to-one) guidance and support (also 69% of the students and 62% of the lecturers). The students and to a lesser extend the lecturers appreciated to have a structured communication plan or protocol that in advance announces interaction and discussion moments with the lecturer. Interestingly, teaching practices traditionally considered as an essential element of online education, such as videos and flipped classroom, were found even as not useful by some students and lecturers, and generally scored lower than expected. In addition, 38% of the lecturers couldn't find themselves in shortening the lectures and presentations to avoid online fatigue while students were much more positive about this practice with only one student finding it not useful. Moreover, the following practices were cited by the respondents themselves as used to improve their lectures or solve certain problems they faced: project work individually or in groups, dividing students in small groups and grouping them according to their level, demonstrating good practices and examples of students' project works from previous years, inviting business representatives as guest speakers, making regular breaks, creating communities of teachers on social media to help and consult each other and share best practice, etc.

Another positive aspect is that most of the HEIs and other educational entities realised the need of having a strategy for digital education and are either developing one or improving their existing strategy to guide them in the organisation and delivery of high-quality digital education and digitalisation of the educational process. In this respect, the approaches that can be considered are (Blagoeva, 2020):

- Smaller groups of students in the classrooms, as the number of students will depend on the available space,
- Less on-site lessons for some courses again depending on the available space,
- Some of the courses become entirely online,
- Combination of on-site and online education at the level of programme/speciality and year of study.

However, what should be kept in mind is that (Ellyton et al., 2022):

- Face-to-face education remains essential to humanise the learning experience and implement practical activities.
- Digital technologies should be applied to transform educational pedagogies and support learning journeys, but not relied upon as the core proposition.
- Content and methods need to be designed specifically for online environments.

There is also an extensive discussion at national, European, and international level about how to narrow the digital gap and ensure inclusive digital education. Inclusive digital education is understood as the provision of digital education that respects diversity and considers the variety of learning and teaching needs and is in the core of another Erasmus+ project[8] with the participation of New Bulgarian University. In this respect, the DigiTransformEdu survey highlighted the use of a combination of different technologies rather than the reliance on one to guarantee that all students are reached, and their diversity considered. Additionally, lecturers should pay attention on their speed of instruction, as it appears often to be suited only to the students who already have some knowledge on the subject and not at all to the ones who are new to it. Concerning this, sessions devoted to questions and answers and e-mail exchanges with the lecturer are found extremely useful as well as setting clear rules for communication in the form of communication plans or protocols. In addition, more should be done to provide technical and technological equipment to the ones in need, especially students with disadvantaged social background and students with disabilities.

Some researchers suggest a framework for the development of mobile education in higher education to improve quality (Todoranova and Penchev 2020) using ICT including security protocols and certificates that should improve the secure transfer of data (Petrov et al. 2020) and as such, set the focus on data protection and cyber security of the digital education. In this respect, further work should be also done to improve the test and exam environments to ensure proper authentication and prevent cheating. Nacheva, Jansone (2020) advocate for the development of a practically applicable framework for digital education that considers the national, European, and international requirements for higher education i.e., laws, strategies for the digitalisation of education, European

[8] The project "Inclusive Digital Education Access: IDEA", is a 2-year Erasmus+ project (2021-2023) that aims to offer guidance and tools that promote and facilitate inclusive digital environments in higher education. The project is centred on the concept of inclusiveness which is defined as the provision of education that meets the expectations, needs and constraints of all students (https://theideaproject.eu/).

policies, frameworks, directives, programmes, etc. In addition, this framework should include guidelines for forming students' skills through digital education.

Ivanova (2021) argues that to achieve quality digital education, it is necessary to:

- synchronise the national and European strategies and actions for the digitalisation of education,
- remove the regulatory obstacles that hamper the delivery of open and digital education,
- stimulate the European HEIs to improve their institutional approaches towards digitalisation,
- develop structures and strategies for the continuous improvement of digital education and the choice of strategic approaches to digital education,
- develop an action plan for digital education that includes measures to improve lifelong learning and flexibility and to stimulate the development of digital skills and competencies,
- introduce shared responsibility for digital education and involve students in managing digitalisation,
- develop digital skills in two directions: digital skills specific to the field of education and general digital competence,
- promote digital ethics (the so-called netiquette[9]),
- synchronise the process of digitalisation with the process of quality assurance,
- stimulate internationalisation and virtual mobility – maintain international academic cooperation,
- reflect the transformational impact of digitalisation upon the academic and administrative staff, and the students,
- improve data analyses, and academic research and forecast,
- update the institutional policies for remote work,
- improve the use of digital libraries to increase digital capacity,
- research innovative teaching methods and new instruments for communication and collaboration,
- define vision for the 'new normal' and what we would like it to be.

The lessons learned and the new opportunities that stemmed from the pandemic in the eyes of the respondents, surveyed in the framework of the DigiTransformEdu research, can be summarised as follows:

- teamwork, as quoted by a student: *For many of the courses we have to work in a team on a common assignment or project and because of that we had to improve the communication with the co-students. We have used various online platforms for the teamwork and as such, managed to quickly finish our assignments*,
- flexibility,
- building readiness to work under force-major and digital resilience,
- constantly adapting and updating learning content and pedagogical methods to the current needs, conditions, and technologies,
- developing simulation models and gamification while stimulating the active participation of educators in these activities as part of their professional development,

[9] Netiquette is a made-up word from the words net and etiquette. Netiquette thus describes the rules of conduct for respectful and appropriate communication on the internet.

- precious experience that can help finding the right balance between online and on-site teaching methods for each individual programme or course,
- involving students' councils and bodies,
- decentralisation and limiting regulation at national level,
- taking initiative, sharing best practices, and funding development projects.

Finally, the Digital Transformation of Higher Education and Training project, of which this report is part of, aims to trigger tangible changes in digital strategy, digital pedagogy, and digital competence within the participating organisations and beyond thanks to the provision of guidance, tools, and resources. The focus on the strategical aspect of digitalisation will result in a blueprint to guide HE and VET institutions in the development of a digital strategy. By mapping successful practices, approaches and tools used for the design, delivery, and assessment of digital education, a set of guidelines and operational tools will be defined in the form of a blueprint to assist in making the transition from a traditional class-based pedagogy to a blended or pure digital one. By reflecting on the different roles of the digital educator and relying on the conducted analyses and identified learning needs, inputs about the knowledge and skills needed for each role and ways to assess them will be collected and a model will be elaborated that can be used to design training.

Conclusion

The COVID-19 crisis forced HEIs to move their courses online rapidly and embrace digital education. Although some universities have been delivering distance education for years and had established e-learning platforms, the situation was far from optimal for most of them. Most of the institutions were not prepared for this radical switch. They found out that infrastructure was lacking, the digital skills of lecturers were not up to the challenge, and that even the familiarity of students with digital tools and platforms was lower than expected. There was no time for instructional design and conceiving a new format of lectures and assignments. As a result, the adoption process for both lecturers and students were affected, and the quality of the educational delivery and the learning experience of students suffered. However, under the circumstances they demonstrated understanding, compassion, and responsibility and at the end of the day were rather satisfied with the abrupt transition to online education and the organisation and delivery of online classes.

The pandemic was also a tipping point for digital transformations. Not because it significantly altered the solutions, but rather because it amplified the need to implement them fast. On one hand, the crisis emphasised the potential of online teaching and learning, but it also revealed huge gaps in the delivery capacities of educational institutions as well as gaps in the capacity of individuals to actively participate and take up what is being offered. It was the right time for many educators to update and enrich their lectures and to optimise and modernise their practical exercises. Many of us found new means of communication, which we didn't even know they existed. Moreover, we have learned to control processes and enormous flows of constant questions and materials without having the direct contact with the students.

As now we are moving back to 'normal', we should continue reflecting about pandemic imposed online education, identify the good practices and lessons learned and use them to go forward and improve the way we provide digital education, as one thing is certain, digital education is here to stay. In this respect, a lecturer said: *The online distance education is already a regular teaching method and*

a good alternative for specific cases. However, the fact that I do not know my students in person and that there is no sense of academic community can destroy the trust in the institution. So, the way forward is to shift the focus from technology, as it used to be before the pandemic, to the 'human side' of education in terms of digital skills, competencies, and practices.

Country Report: Croatia

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Executive Summary

Digitalisation of Education in Croatia is part of several wider projects as e-Schools: a comprehensive informatisation of school operation and teaching processes aimed at the creation of digitally mature schools for the 21st century, and Comprehensive curricular reform which involves all primary and secondary schools in Croatia, as well as Regional vocational competence centres with focus on vocational education.

Digital transformation of higher education is led by Science and Technology Strategy and E-learning strategy with aims to encourage innovative approaches to delivering study programmes, and to applying high-tech teaching aids through the substantial use of information and communication technologies. E-learning centres or e-learning support teams were established at almost all Croatian universities, with a network of experts to foster and facilitate e-learning in the academic community.

Main leaders of digital transformation in Croatia are CARNET – Croatian Academic and Research Network for pre-tertiary education and SRCE – University Computing Centre for higher education.

The challenges of digital transformation in Croatia can be grouped into five categories: learning styles and cultures, digital pedagogy, technology, technical training, and time management challenges. On the other hand, enablers are teachers, their passion and innovations in distance teaching and learning.

The recovery and resilience plan include investments to support the development of digital skills aimed at upgrading teachers' and students' digital skills, the plan includes the continuation of the reform of the education system. The reform is expected to, inter alia, improve the basic skills of pupils through increased instruction time and strengthen the link between vocational and adult education, on the one hand, and the labour market, on the other. Part of this reform includes the development of new curricula, which will include a focus on the digital transition.

The recovery and resilience plan include the development of a strategic framework, "Croatia's 2030 Digital Strategy", which will steer the digital transformation of Croatia's society and economy for the next decade. It will set the frame for investments in the digital transition and will define strategic objectives in the following areas:

- digital transition of the economy,
- digitisation of public administration and justice,
- digital connectivity/development of broadband electronic communications networks,
- development of digital skills and digital jobs.

Policy and practice

Digitalisation of VET schools is part of the wider project "e-Schools: a comprehensive informatisation of school operation and teaching processes aimed at the creation of digitally mature schools for the 21st century", which involves all primary and secondary schools in Croatia. Thee-Schools project is organised in two phases: a pilot in 2015 – 2018 for 151 schools and the second phase in 2018 – 2023 for all primary and secondary schools in Croatia (1310 schools) among which are 317 VET schools. Thee-Schools project is one of the measures defined in the Education, Science and Technology Strategy (MZO, 2014).

Objectives of the project are efficient and transparent management of the school, the development of digitally competent teachers prepared for the application of innovations in their own pedagogical practices and the development of digitally competent students, who are prepared for a continuation of their schooling and competitive on the labour market.

The main objective of this segment of the project is to ensure all the infrastructural prerequisites for the realisation of the pilot project, which includes the establishment of adequate data centres, the establishment of adequate school infrastructure (local wired and wireless network), including the equipping of classrooms and staff, the establishment of a network of Regional Training Centres. Schools are also equipped with two different types of classrooms, a presentation one - equipped with a PC computer, a touch screen monitor, and loudspeakers - and an interactive one, which includes tablets or notebooks, along with the presentation equipment. All teaching staff is equipped with laptop computers. For the purposes of carrying out the systematic education of the project participants, Regional Training Centres are established and adequately equipped for educational activities (with tablets, laptop computers, touch screen monitors, videoconferencing equipment…). (CARNET, 2022)

In 2018, a reform of the vocational education started in Croatia with the appointment of 25 regional vocational competence centres with the aim of establishing programme and staffing conditions that will improve work-based learning opportunities for students and adult learners in the sub (sectors) of mechanical engineering, electrical engineering and computer science, agriculture, and health. Along with the 25 main project leaders, additional 200 VET schools and LLL partners are involved in the regional competence centres' activities. Project activities are establishing the organisation of work and development of the regional competence centre, development and improvement and implementation of regular vocational education programmes, adult education programmes and lifelong learning programmes aimed at strengthening the competencies of educators and mentors and promoting professional occupations and work of the Centre. Among others, some activities are dedicated to digital transformation. (MZO, 2022)

In the late 1980s and early 1990s, most higher education institutions developed strategic plans aimed at implementing information technology. Equally, much of the discussion on information strategy focused on the use of management technology. When we mention the digital transformation of the University, it includes the organisational structure of the University, which is the concern of management, administrative and professional services, infrastructure capacity and technical

equipment, information, and communication infrastructure, which is a prerequisite for everything else that makes the University which is students and staff through the implementation of educational programmes. Digital transformation involves digital technology and individuals: it is not enough to just introduce digital technology to business; it is also important to educate employees.

Since the adoption of the Education, Science and Technology Strategy (MZO, 2014) in Croatia, one of the goals is to expand and improve the application of ICT in learning and education. Thus, e-learning is recognised as an important factor in improving the educational process.

Strategy defines measures for the development and diffusion of e-learning and for the introduction of expert teaching systems and other modern teaching methods based on information and communication technologies. These measures will be aimed at all levels and types of education. Open educational contents and tools with free access will also be developed and supported.

E-learning provides temporally and spatially flexible access to up-to-date and current multimedia and interactive teaching materials. When integrated into teaching, it enables the dynamic use of Croatian and international repositories of educational content, digital libraries, archives, and museums. Furthermore, information and communication technologies (ICT) provide modern opportunities of adjustment to personal learning styles, collaborative learning and acquiring skills for project work and teamwork, as well as providing access to a wider range of learners (learners with special needs, learners in remote locations, foreign learners, etc.). The expansion of e-learning increases the role and importance of teachers, as mentors, coordinators, and instigators of the educational process. E-learning also places learners at the centre of the learning process, thereby encouraging them to take an active role and responsibility for their educational outcomes.

Objective 1 in Education, Science and Technology Strategy is to improve study programmes by consistently implementing the principles of the Bologna reform and by re-defining acquired competences (Measure 1.2.2. Introduce a system for encouraging innovative approaches to delivering study programmes, including the use of information and communication technologies).

It is especially necessary to encourage innovative approaches to delivering study programmes and to applying high-tech teaching aids through the substantial use of information and communication technologies. In this respect, it is necessary to introduce e-learning as a complementary form of teaching (i.e., as a mixed, hybrid approach).

Special attention should be paid to modernising study programmes for teacher competences, since they have a significant and direct impact on the quality of primary and secondary education, as well as an indirect impact on all levels of education. In addition, there is also a need to modernise programmes for the lifelong learning of civil servants.

In-service training of teaching staff will be introduced in the form of specially designed courses that will be a prerequisite for assuming teaching obligations, as well as a condition for appointment into a research/teaching grade. Such courses will be organised in the form of direct teaching or e-learning. In addition, short courses will be organised aimed at upgrading the competences of teaching staff, not only in terms of pedagogy, but also in terms of other transversal competences such as the use of information and communication technologies or the preparation and submission of a project proposal. Initial training for developing teaching competences will be obligatory for all teaching staff entering the system and will represent a minimum criterion for their first appointment into a teaching

(or research/teaching) grade. Further in-service training of teaching staff in transversal competences will be among the prerequisites set by quality assurance plans of higher education institutions (Measure 3.1.3).

Objective 5 in Education, Science and Technology Strategy is to secure appropriate premises and information and communication technologies infrastructure for higher education institutions including measure 5.2. Upgrading information and communication technologies (ICT) infrastructure, with sub-measures:

- develop a plan for developing an information and communication technologies infrastructure,
- upgrade and link existing information systems in higher education. Link the higher education information systems to the systems in science and lifelong learning to ensure the availability of integral and high-quality information needed for decision-making related to the system of higher education and science,
- develop a package of programme tools for managing higher education institutions,
- define models and upgrade systems for the development and use of open educational contents, including literature and other open-access teaching material.

In 2005, the international Tempus project EQIBELT12 (Education Quality Improvement by E-learning Technology) was launched, coordinated by the University of Zagreb, which then encouraged the systematic implementation of e-learning at three Croatian universities: University of Zagreb, University of Rijeka, and University of Dubrovnik. The most important outcomes of this project were strategic and operational documents on e-learning and the establishment of e-learning support centres. Thus, e-learning is recognised as an important factor in improving the educational process. The project finished in 2009 and had successfully fulfilled all planned goals and objectives. The universities of Dubrovnik, Rijeka and Zagreb prepared, discussed, and adopted policy documents for the implementation and use of e-learning. E-learning centres or e-learning support teams at each of these universities have been established and are operational. A network of experts exists at each of the universities to foster and facilitate e-learning in the academic community. Good cooperation has been established with local teams and representatives for e-learning at faculties and departments within universities.

The National Council for Science, Higher Education and Technology development adopted already in 2013 the Criteria for evaluation of online study and in 2016 revised the Criteria (AZVO, 2022). By the beginning of 2020, some higher education institutions are already conducting accredited online studies (13 of them at the end of 2020). Although classroom teaching is still the dominant model in higher education institutions, digital technologies are present to some extent, mostly as a supplement in a mixed form of teaching with a lower percentage of e-learning, most often up to 20%. Higher education institutions mostly use the SRCE e-learning system or use their own systems.

E-learning at the University of Zagreb has been in use since the nineties, mostly in the form of individual activities of some teachers or as a technological possibility in a few schools, but these initiatives didn't result in a systematic and sustainable use of e-learning. With the adoption of the E-learning Strategy in 2007, the process of systematic implementation of e-learning started. Following the E-learning Strategy stipulations, the University Office for E-learning, the E-learning Centre, and the University Committee for E-learning were established. In addition to standard strategy elements (vision, mission, strategic objectives), the Strategy contains an action plan with a number of activities

within several areas of strategic operations, concrete assignments of activities to competent/responsible bodies and deadlines for activity realisation. Such systematic planning of activities enabled school managements to define the most appropriate paths and forms of e-learning in their educational environments. The strategic goals of the E-learning Strategy are defined as:

- improving the quality of university education,
- support teachers and students in fulfilling new roles in the educational process,
- increasing the competitiveness of universities and university study programmes,
- training students to use lifelong learning techniques.

The strategy also contains an action plan with clearly defined operational plan activities, competent persons/bodies for each activity and deadlines for realisation. Areas of strategic action and planned activities were:

A. Improving the formal-legal and organisational environment, ensuring sustainability,
B. Human resources development,
C. Teacher support,
D. Student support,
E. Development of educational content,
F. Development of basic and specific infrastructure. (University of Zagreb, 2007)

The E-learning Centre (CEU) was established at the University Computing Centre of the University of Zagreb in 2007. The Centre holds a central role in the systematic implementation of e-learning at the University of Zagreb and supports other higher education institutions in Croatia (University in Dubrovnik, Zadar, Rijeka, Osijek, Sever, etc.).

The basic objectives of the E-learning Centre are:

- to provide support to teachers, students, e-learning teams, and institutions,
- to provide and maintain a reliable and generally accessible university platform for e-learning,
- to support the university network of people involved or interested in e-learning,
- to promote and foster the e-learning implementation. (SRCE, 2007)

The systematic implementation of e-learning continues through the Strategy of Studies of the University of Zagreb 2014-2025 (University of Zagreb, 2014), and the part related to e-learning is specifically elaborated in Chapter 2 Creativity, Innovation and a Motivating Learning Environment.

Drivers and motivators

While higher education institutions need to develop higher education strategies in the digital age to take full advantage of digital technologies, public policy should ensure that the environment, in which higher education institutions operate, supports digitalisation. The digital transformation of the university is thus a priority, and as part of the Digital Europe project, even entire graduate studies on certain topics such as, for example, artificial intelligence, high-performance computing, and data sciences will be encouraged and funded.

Through the development strategy, the university coordinates the process of harmonising study programmes with the standard of the profession, while the design of digital curriculum proposals is left to the departments as holders of individual studies.

It is important to provide systematic and quality support to teachers and identify and concretise their needs for improvement and acquisition of new knowledge, skills, and competencies not only in relation to new technologies but also in developing methodological approaches to know which technologies and tools to choose for their teaching and improve their study methods (Andric & Boras, 2012).

E-learning requires a different approach to pedagogy, especially in areas such as individual and group interaction and online evaluation. However, these skills are not completely unknown to teachers, distance learning has been present for decades.

To monitor the implementation of e-learning in the educational process, the Ministry of Science and Education, in cooperation with SRCE 2015, established the Catalogue of e-courses of institutions in the higher education system in the Republic of Croatia. The catalogue is conceived as a central place where basic data about all e-courses and lectures will be located. In addition to providing a single overview of data on e-courses, the Catalogue also increases the availability and "visibility" of data on e-courses and e-courses themselves. At the same time, the Catalogue enables simpler monitoring of the implementation of e-learning at higher education institutions, planning further actions related to the systematic implementation of e-learning at the level of higher education and individual components, as well as at the national level and ensures greater availability of existing data. Data on e-courses are entered in the Catalogue from the 2014/2015 academic year and so far, 101.794 e-courses have been enrolled, of which for the 2019/2020academic year 24.520 e-courses. The Catalogue contains data on e-courses that are in the system (SRCE, 2022).

In 2017 research was conducted (Kubina Softić, 2020) that aimed to determine the attitude of teachers towards e-learning and what digital competencies they need to apply e-learning in the educational process in a quality way. The research also sought to find out how much the lack or possession of digital competencies affects the willingness of teachers as well as their motivation to integrate new technologies into the educational process.

The research included teachers from the University of Zagreb and higher education teachers who use the Merlin e-learning system. The results of the survey indicated that teachers have a positive attitude toward the application of ICT and e-learning technologies in teaching, that the majority (72.7%) of teachers believe that they are digitally competent to apply e-learning in teaching in higher education, but they need professional training in digital pedagogy and to a lesser extent in modern technologies. Also, 78.0% of teachers believe that ICT-related training and education programmes that are available do not meet their needs. The research also confirmed that the availability of e-learning technologies and tools, and support in their application have a positive effect on the motivation of teachers to implement e-learning in the educational process. Participants assessed the situation at their college as extremely convenient (12.2%), convenient (55.9%), neutral (25.1%) and unfavourable (6.8%) (Kubina Softić, 2020).

According to the results of the survey, 90.1% of teachers have a positive attitude towards the application of ICT and e-learning technologies in teaching, 9.1% abstained, and only 0.8% have a negative attitude. Most teachers (63.7%) believe that e-learning is important for improving the quality of the educational process; 8.4% believe that it is crucial, and 55.3% that it is an essential contribution (Kubina Softić, 2020).

Barriers and obstacles

Croatia recognises education and science as its developmental priorities, they can provide the country with long-term social stability and economic development, as well as safeguard its cultural identity. The reasons for this are that Croatia is facing dynamic changes in its society, economy and culture in a globalised context where no country exists as a separated community; facing challenges such as the application of new technologies, environmental protection and ageing population, which can only be resolved through science; faced with limited human, material and natural resources, meaning that each of these resources must be used in the best possible way; faced with limited possibilities of predicting long-term development and has to be prepared to adjust. (MZO, 2014)

One aspect of this changing reality that has become evident during the early months of the pandemic is that digitalisation alone cannot solve issues of inequity. Indeed, limited access to technology clearly inhibited learning for people from different societal groups, with disadvantaged communities in both inner city and isolated rural regions being among the most severely affected during the pandemic. The rapid shift to online teaching has increased awareness of the need for mentoring, guidance, and support to alleviate problems and prevent drop-out rates from increasing. Working out and targeting support to improve the quality of the learning experience will be a key challenge going forward.

It is important to understand digitalisation issues in the context of equipping individuals for lifelong learning in a fast-moving environment. Higher education institutions will themselves need support – including peer support – in making optimal use of digital technologies for learning and teaching and helping to develop digital skills more broadly in society.

It is also important to reflect carefully on the way in which online or blended learning may change the nature of a higher education experience and indeed the nature of higher education institutions. Will campuses continue to exist as a main model for the organisation and delivery of higher education in a digital age? Will the kind of facilities found in many higher education institutions today – accommodation, sports facilities, social services etc. – continue to be an integral part of higher education?

The attitude of the administration on the systematic introduction of new technologies and e-learning methods also affects the attitude of teachers, so it is likely that if the administration has teachers who do not apply these technologies in their teaching, such projects and changes will not support or initiate. (Kubina Softić, 2021)

The challenges of digital transformation can be grouped into five categories: learning styles and cultures, digital pedagogy, technology, technical training, and time management challenges.

Lack of basic methodological and broader andragogical education of higher education teachers. Most teachers use ICT to prepare classes and less to work with pupils and students. The reason for this is that they do not have the necessary competencies for the pedagogical use of ICT in teaching.

In the process of systematic implementation of e-learning, universities have faced several challenges in promoting and encouraging the application of technology in education and providing appropriate, quality, and sustainable support to teachers and students. To implement a digital transformation, universities need clear visions and good strategies for new education and e-learning.

Policy and practice

In implementing digitalisation, the priority of the Ministry of Science and Education (MSE) was to ensure teachers' digital independence, which meant ensuring that teachers have their own laptops and classrooms are equipped with overhead projectors or interactive/smart whiteboards, so that various types of content and multimedia can be used in all classes. Thus 26.000 laptops were bought for teachers in 2019, and as many will be bought this year for the remaining teachers; projectors and smartboards were provided for classrooms without them.

After that, we focused on equipping students through the Comprehensive Curricular Reform project funded by the EU. The plan was to digitalise schools in line with the age of students, based on evidence collected in experimental schools and international comparisons. This meant that students in lower grades (6 to 10 years of age), who need to develop graphomotor skills, should only use tablets for activities such as group work, and thus get four to five tablets per class. In higher grades, when students (11 to 15 years of age) have subject classes, the principle was to provide each student with a tablet, thus encouraging the use of digital content and materials, and providing students with an opportunity to learn to use the learning technology responsibly. So far, tablets have been bought for all students in 5th and 7th grade of primary school (around 90.000 tablets), and 10.000 tablets were given to schools to use with their lower primary students under teacher supervision. In secondary schools, equipment was provided only to students from lower socio-economic backgrounds, as the research in the experimental phase of the curricular reform showed that the majority of secondary school students already own equipment with Internet access.

Strong emphasis was put on developing teachers' digital competences and enabling them to work in a virtual environment. Teacher training for curricular reform was launched online in 2018, via virtual classrooms on the Moodle platform (Loomed) which enabled continuous professional development and online cooperation for teachers. In almost two years more than 50.000 teachers participated in these trainings. This was the key experience that later enabled teachers to establish virtual classrooms and communicate with students and other teachers without difficulty. All those virtual classrooms are now used as a support network for teachers, sharing learning resources, ideas, and information and for direct communication with the Ministry. The trainings and support are provided by Mentoring teams that were established in 2017 and continuously prepared and organised trainings and support as part of the educational reform.

All of this contributed to the swift and effective establishment of distance learning in the context of the COVID-19 crisis.

When school closure was announced as a potential measure, at the beginning of March, the Ministry started preparations for distance learning. It took two weeks to move all classes online, and distance learning was successfully launched on March 16th 2020.

The concept was based on two key principles:

1. Access has to be provided for every student, considering student age,
2. Backup for every solution needs to be prepared.

The priority was to create the content needed to launch distance learning, so that teachers would have time to establish the communication infrastructure and adapt to online teaching.

For upper primary and secondary level students, 15-minute videos were created based on a national subject schedule which should enable all students to reach all learning outcomes planned in the curriculum by the end of the school year. Mentoring teams immediately started developing video lessons so by March 15th learning content for a whole week of learning for all 8 years of primary and 4 years of secondary education was prepared. Another priority for upper primary and secondary level students was to equip and provide Internet access for all of them.

Higher education institutions also received guidelines to transfer to distance learning, and SRCE University Computing Centre centrally provided software and support through its distance learning centre. The higher education institutions can autonomously determine how these will be implemented in practice.

Technical support to primary and secondary schools has been successfully provided by CARNET.

While preparing for distance learning, the Ministry published instructions for schools (Instructions to all primary and secondary schools for the organisation of distance learning and Guidelines for distance learning for primary and secondary schools) focusing on:

- establishing communication channels,
- equipping students from lower socio-economic backgrounds,
- instructions for the age-appropriate use of the pre-prepared content,
- monitoring and support.

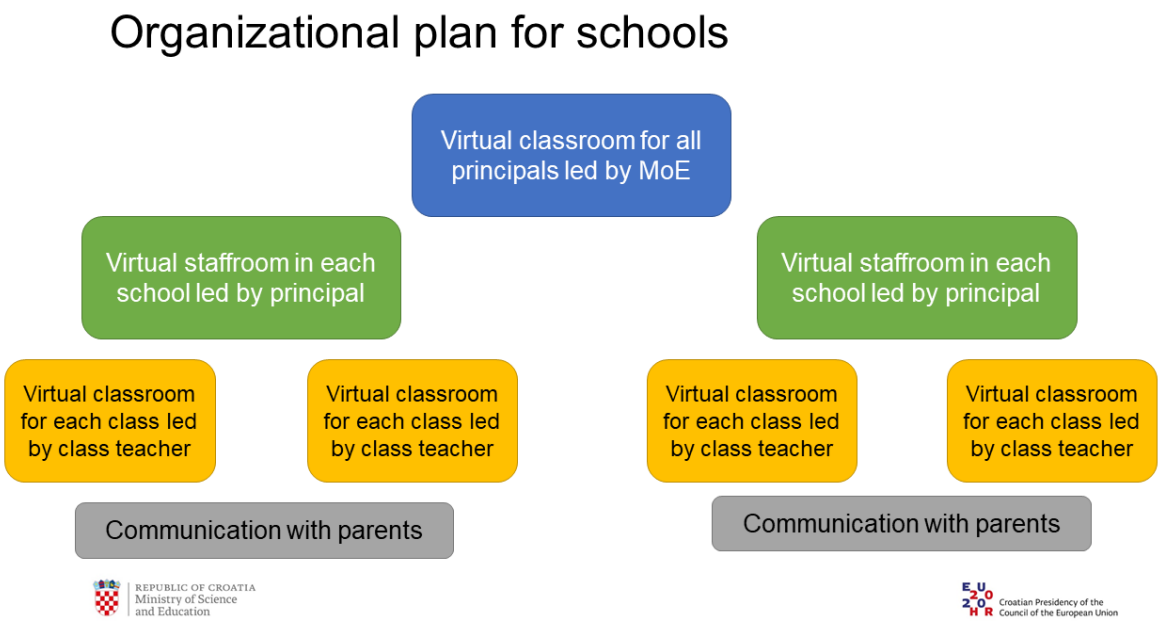

Figure 1: Organisational plan for schools

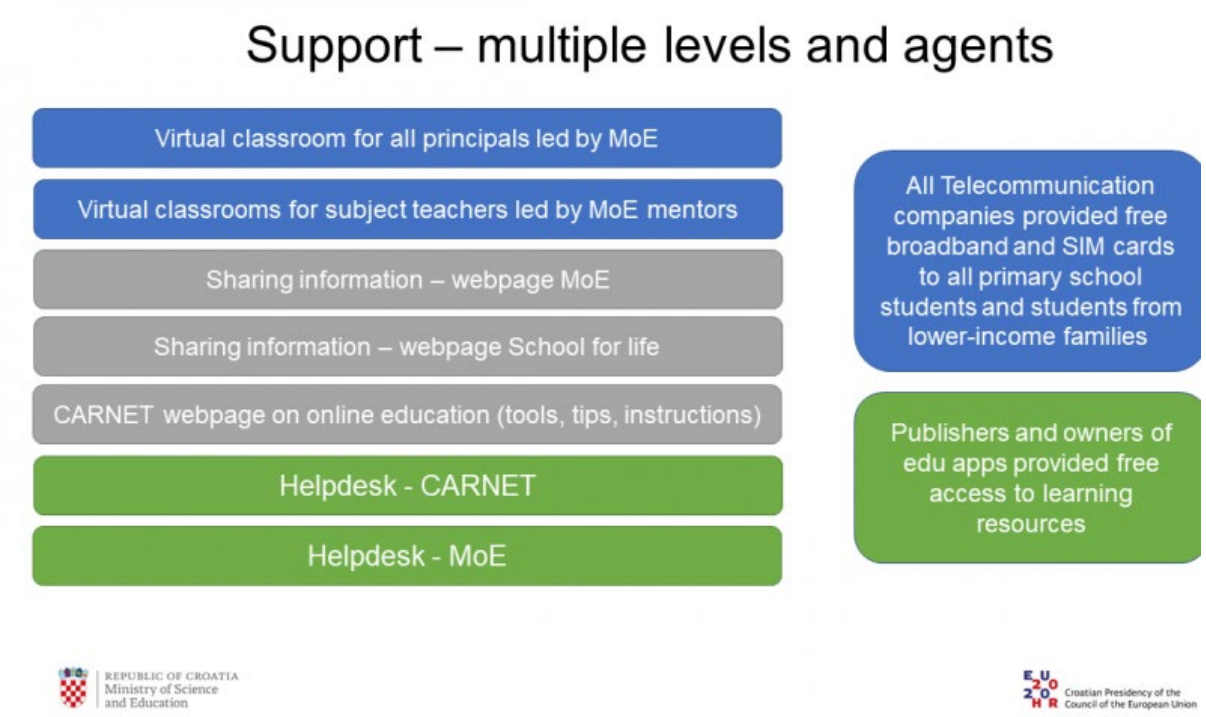

Figure 2: Support for schools

On the School for Life website guidelines and tutorials how to organise virtual staffrooms and virtual classrooms were published.

The backup principle was implemented as follows. Using multiple channels for publishing and sharing information:

- Three TV channels: HRT3, SPTV, RTL2,
- Several websites: MSE, School for life, agencies,
- YouTube channels,
- E-Mail,
- Messaging apps,
- Social networks.

Technical solutions:

- AAI@Edu.Hr nation-wide authentication protocol is used by all primary and secondary schools for all students and teachers,
- different platforms accessible with AAI@Edu.Hr:
    - Moodle
    - Teams
    - Yammer
    - Google classroom
    - Edmodo
- distributed set of systems, not a single platform – distributing the load,

- we used to have 100 registered access/minute, now we have 1100 registered access/minute.

National school schedule, learning scenarios, teaching resources and video lessons for all 12 years of primary and secondary education were continuously published on School for life website and on dedicated web site of Agency for vocational education and training. From the first day of distance learning, direct communication with a helpdesk was established, and various media were used to answer frequently asked questions and provide guidelines to schools and higher education institutions. In addition to that, the questions frequently asked by schools, teachers, parents, and students were answered. For example: vocational schools, secondary school graduates, practical subjects and student participation. (MZO, 2020)

By the end of the first week, more than 50.000 virtual staffrooms and classrooms were established, with the participation of 450.000 teachers and students. In addition to that, more than 70.000 higher education students used the systems provided by SRCE, and the number does not include other distance learning systems, which are used by higher education institutions.

In the second week the emphasis was on psychological support to students (via phone and email) and topical guidelines for other stakeholders in the system.

At the Ministry of Science and Education, a short questionnaire was prepared on distance teaching and learning, to get teachers' feedback. The questionnaire was available in virtual classrooms for a week, including 2nd April 2020 (closed one day before the Instructions for evaluation and grading were published).

The sample is related to the current situation, but it can be useful as a marker for further work and the planning for distance teaching support. Teachers had access to the questionnaire with their AAI identity, and so access was denied to others, everyone could fill out the questionnaire only once, the data were not linked to a person (they were anonymised). The questionnaire was accessed 4139 teachers in total. Nearly all teachers (95%) are entirely or mostly satisfied with the way they perform distance teaching. As many as 93% of the teachers think that they have managed better than they had expected before the beginning of distance teaching. A vast majority (90%) think that their students manage well or mostly well with distance teaching and learning. The teachers are mostly satisfied with the equipment they have. The results are similar in the evaluation related to provision of support. Namely, 87% think that the support they get from CARNET and the Ministry is good. The teachers are very pleased with the fact that video lessons and television programmes are available.

Concerning higher education, the results of the questionnaire that the Ministry conducted with the HEIs in Croatia, demonstrate that most higher education institutions (80%) implement their study programmes by using different digital tools. However, some modules are more challenging for distance education, in particular, clinical practice, work-based learning, or work in laboratories. The Ministry requested open access for all digital resources in HE. The most challenging again is the student assessment. But the majority of HEIs in Croatia have already set up assessment procedures or are in the process of doing so.

Croatia – how we introduced distance learning?

An action plan for the implementation of distance education was published in June 2020 proposing some models for implementation of distance education for the next school year (MZO, 2020).

Although most study programmes are accredited for the physical classroom, in the first phase it was necessary to ensure continuity of teaching by switching to emergency distance learning, but in the second phase (the early academic year 2020/2021) it was necessary to consider how to improve the quality of teaching. In the first phase, we had the transition to emergency distance learning, in the second phase from April to June 2020, after the initial shock, we started to secure the end of the academic year. In addition to classroom lectures held online, efforts are being made to provide other forms of teaching in the online environment. In the third phase, which ran from August to December 2020, although many hoped to return to classroom teaching, higher education institutions also had to be prepared for distance learning throughout the semester. It is now expected that classes will be prepared for distance learning and that the quality of teaching will be raised. In the fourth phase, which began in 2021, a higher percentage of online teaching is expected than before the COVID-19 pandemic (Kubina Softić, 2021).

Recovery & resilience plans

The overall digital transformation of higher education is being carried out in line with the Digital Education Action Plan and in the light of the Council Conclusions on digital education in European knowledge-based societies from December 2020.

The digital transformation of the Croatian society and the entire economy opens space for more intensive investment in strengthening the capacity of Croatian higher education institutions, which will enable the launch of new and increase existing study programmes with a strong digital component. The digital transformation of higher education implies investment in digital teaching infrastructure and digitalisation of administrative processes.

Through the project Preparation for the digital transition of Croatian higher education envisaged through the EC Technical Assistance Instrument, an analysis of digital maturity and readiness of the Croatian higher education institutions will be made and recommendations for necessary investments and development activities will be the basis for further investments. Recommendations for investments at the national level and recommendations for investments at the institutional level are planned for 2022. Based on the recommendations that will result from this project at the national and institutional level, further investments are planned within the NPOO and other sources.

Digitization of administrative processes includes the development of a digital register of diplomas. The Digital Register of Diplomas will be based on the concept and technical specification of the platform for the digitization of diplomas and additional study documents to be developed through the ERASMUS+ TRACER project and will consider the University of Split's experience in piloting digital student documents, the Europass platform and through participation in the European Universities of the Seas alliance.

Education will benefit from investments to support digital skills development with particular attention to the digital shift of higher education. Reforms and investments in the education system aim notably to increase access to early childhood education and care, introduce a full-day teaching model in primary schools, increase the percentage of pupils in general secondary education, which could lead to improved tertiary education attainment, modernise higher education, and increase the labour market relevance of curricula for vocational secondary education and higher education, and improve adult learning.

Second, under the Education component, the digital transformation of higher education is expected to stimulate and accelerate the stronger involvement of higher education institutions in cross-border and multinational projects, in particular projects for which digital maturity is a necessary condition for participation.

Investments under this component also aim to support the digital transformation of higher education and facilitate e-learning. This includes investments in digital infrastructures for teaching and the development of digital teaching tools. Skill acquisition is also partially addressed through component 4.1 by implementing a voucher system for re- and up-skill aimed at vulnerable groups, through component 1.6 with measures to educate students and unemployed persons to strengthen knowledge and skills in tourism, and through component 1.1 by funding a voucher system that will cover training for improving digital skills. C4.1. R3-I1. b Implementation of vouchers for the education of employed and unemployed persons – digital jobs (11,9 mil).

The overall envelope of the labour market component (4.1) amounts to EUR 179 million, with most of the allocation geared towards creating the adult education voucher system focused on reskilling, upskilling or uptake of new skills related to green and digital transition.

Investments under this component include the funding of vouchers for accredited adult education, training, and upskilling programmes to acquire the skills needed in the labour market. These measures have the potential of increasing the competitiveness and employability of the labour force in line with labour market needs and with a particular focus on the activation of the long-term unemployed and the inactive population.

The plan includes measures to support businesses in adapting their operations to the digital environment, with a special focus on the cultural and creative sectors which were hit particularly hard by the COVID-19 crisis. Measures include a voucher system to support SMEs that want to develop a digital business model, strengthen their capacity to digitalise, or improve their cybersecurity. The voucher system will cover training for improving digital skills, adapting business models to the digital transformation, digital marketing, cyber resilience and the deployment of complex digital products and services. The plan also includes measures to provide grants to companies for the deployment of digital solutions in their business operations, such as the purchase of digital tools and equipment, for strengthening digital skills to develop and deploy new products, services, and processes.

In the education sub-component (C3.1) Modernisation of higher education, the investment for the digital transformation of higher education (C3.1. R2-I1), tagged at 100% with an allocation of EUR 84 million, also makes a significant contribution to the digital target.

The plan includes the development of a strategic framework, “Croatia’s 2030 Digital Strategy”, which will steer the digital transformation of Croatia’s society and economy for the next decade. It will set the frame for investments in the digital transition and will define strategic objectives in the following areas: (a) digital transition of the economy, (ii) digitisation of public administration and justice, (iii) digital connectivity/development of broadband electronic communications networks and (iv) development of digital skills and digital jobs.

The recovery and resilience plan include investments to support the development of digital skills. In complement to the ongoing “e-Schools project” aimed at upgrading teachers’ and students’ digital skills, the plan includes the continuation of the reform of the education system. The reform is expected

to, inter alia, improve the basic skills of pupils through increased instruction time and strengthen the link between vocational and adult education on the one hand and the labour market on the other. Part of this reform includes the development of new curricula, which will include a focus on the digital transition.

The plan also supports the digital transformation of higher education, with investments to equip public higher education institutions with modern teaching digital infrastructures and support online learning. At a time of expansion of digital learning and teaching tools, Croatia is confronted with insufficient and uneven equipment of higher education institutions, affecting the quality of higher education. The plan includes investments in digital teaching infrastructure and digital teaching tools. The plan also supports the development of a digital register of diplomas, which will be a significant step in the development of a graduate tracking system and aid to their integration into the labour market.

Infrastructure investments aimed at increasing the availability of higher education and, consequently, increasing the share of people with higher education qualifications are aimed at increasing accommodation capacities by building student dormitories, and investing in digital teaching infrastructure is essential for a comprehensive digital transformation of higher education and expansion teaching capacities in priority scientific and educational areas.

The digital teaching infrastructure will include the equipping of public higher education institutions based on recommendations given by independent experts engaged through the European Commission's Technical Assistance Instrument. The purpose of the investment is to provide the necessary teaching infrastructure and open digital teaching resources for quality higher education, development and implementation of e-learning, online learning, and active learning. Investing in the digital transformation of higher education will help recover from the crisis and support the long-term and sustainable development of higher education. The rapid transition to distance learning and teaching will be an opportunity and impetus for the development of quality digital tools and resources.

This investment includes the development of open digital teaching resources with the purchase of active equipment (equipping classrooms with a projector, computer, sound system, and video recording studio) and improving the passive network (lighting, optics, electrical installations, switchboards, connectors, etc.) that will support new technologies and digital teaching resources.

Elements of infrastructure investments that will support new technologies and digital teaching resources:

- network-LAN - access to the network and educational resources for employees with a reliable fast connection, on every teacher's desk, in every laboratory, in every institution. It consists of a passive network (wire), active equipment and electrical reconstructions,
- network-Wi-Fi - network access for students who use laptops, tablets, smartphones, in all learning spaces and other work and living spaces, in each institution. It consists of active equipment, power supply and socket for powering mobile devices,
- equipping projectors, computers, sound system and other equipment of each lecture hall in each institution,
- procurement of cameras and audio equipment to be able to record live classes in front of an audience,

- central equipment used for archiving digital teaching resources at the central institution, SRCE. It consists of a video server, a network content server and related software. (Croatian Government, 2021)

Drivers and motivators

Although the impact of the pandemic on higher education institutions was stressful and, in most cases, there was no contingency plan, higher education systems responded in solidarity, and acted uniformly on a global scale: they continued teaching using pedagogical modalities that did not require physical presence. As there was no time to prepare for these conditions when the University closed and the online environment, participants in education (teachers and students) sought their own paths and showed creativity and innovation and accelerated the entry into a new era of teaching and learning.

How to provide support to teachers and students in working with digital technologies and teaching in the online environment is a question that most universities faced at the beginning of the pandemic. At that time, most higher education institutions in the Republic of Croatia turned to the SRCE and the Centre for e-learning, which has been operating for more than 13 years. Some institutions have their own resources and e-learning offices and can provide support to teachers. The SRCE e-Learning Centre is continuously working on in-service teacher training in the field of e-learning. In courses and workshops, teachers learn to work with e-learning technologies and how to implement them in teaching. In addition to the courses, teachers have access to manuals describing how the technology is used and providing examples of how to implement certain activities and resources in teaching.

A significant part of the work with teachers also involves a helpdesk through which teachers ask questions when they encounter problems in working with e-learning technologies. Teachers and students can communicate with the staff of the e-Learning Centre via e-mail, online form, or telephone.

The role of the Centre for the development of digital competences and e-learning technologies is therefore aimed at ensuring and improving the quality of teaching and training of competent professionals for the needs of the real economy. An important task of the Centre is to encourage innovative approaches to the implementation of study programmes and to develop services based on educational technologies (e-learning) and to promote modern approaches to teaching, with continuous methodological changes.

Numerous teachers and higher education institutions turn to SRCE and the e-Learning Centre, move their teaching entirely to the Merlin e-learning system and use the SRCE webinar system, as well as numerous other video conferencing systems. On March 1, 2020, the number of open e-courses for the 2019/2020 academic year were 14.143, while already in the week of March 16, 6.000 new e-courses were opened. At the same time, there was a significant increase in demand for the webinar system, because, through it, online teachers in real time could still give lectures. Most higher education institutions and teachers managed to ensure the continuity of teaching. Classes are held as far as possible, except for the parts related to practical classes that could not be done at that time (Kubina Softić, 2021).

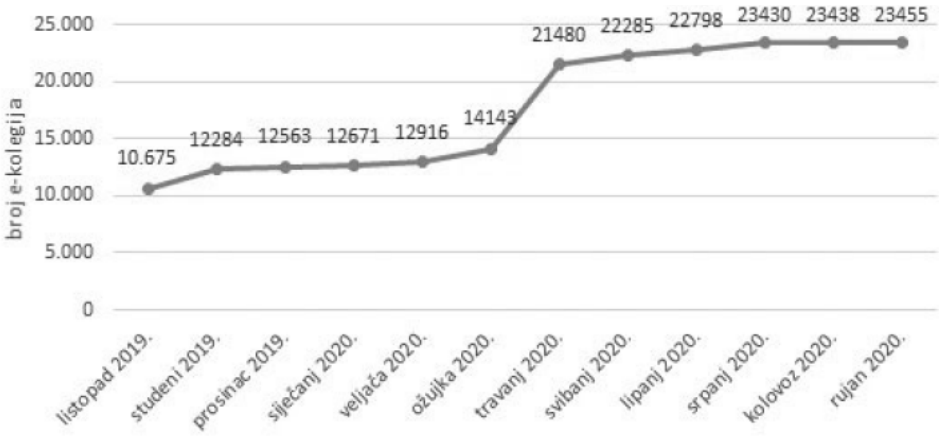

Figure 3: Number of e-courses in academic year 2019/2020

The 2019/2020 academic year ended with 23.626 e-courses that 9.380 teachers taught 85.978 students. By mid-March of the 2020/2021 academic year, more than 26.000 e-courses were opened. However, the use of digital technologies to hold classes that could not be held physically in the classroom does not become online education. This is a classic teaching held in a virtual environment due to extraordinary circumstances with the help of digital technologies, or emergency distance learning.

Research conducted in Croatia indicates that teacher motivation is the strongest factor for the application of new technologies. Those who have already used digital technologies and introduced e-learning in teaching have found it easier to design teaching in an online environment they are already familiar with. But those who have resisted change have faced a major challenge - which technologies to choose and how to use them.

During the summer, professional training of teachers is organised, policies are changed, study programmes and curricula are refined and adjusted for a higher proportion of teaching in the online environment (up to 50%), the necessary e-infrastructure is provided, activities are designed to provide students computers at a better price. An example of such a higher education institution is the University of Rijeka, which is ready to welcome autumn. The realization of priorities requires infrastructure and digital equipment, effective planning, and development of digital capacities, including appropriate organisational skills. We need digitally competent and confident teaching staff, as well as high-quality educational content and tools tailored to users and secure platforms in line with privacy and ethical standards (Kubina Softić, 2021).

Barriers and obstacles

Lack of reliable data and records in higher education is an obstacle to effective policy management and strategically targeted financing of higher education (Croatian Government, 2021).

The quality of higher education largely depends on the availability of quality teaching resources available to all students. At the time of expansion of digital tools for learning and teaching, there is insufficient and uneven equipment of higher education institutions for quality higher education, which is why effective investment in digital transformation of higher education institutions is necessary

(Croatian Government, 2021). Higher education from the student perspective is about more than academic learning. It is also a place and a time to develop social and civic skills, as well as confidence in personality and identity. These societal functions of higher education are vitally important.

In the weeks following the suspension of classical face-to-face classes in the classroom, shortcomings in the competencies of digital and methodological skills of working in the new environment became apparent. To improve the teaching competencies of the current teaching staff and introduce a system of competency development for new employees, the Centre for the development of digital Competences and e-Learning technologies has designed a programme that will directly contribute to improving quality.

Although many teachers and higher education institutions use digital technologies as an adjunct to teaching, some teachers are encountering online teaching for the first time. One of the major problems was that some students do not have the technical prerequisites to follow classes in an online environment (stable and strong internet connection, computer / laptop). Also, some teachers are facing technical problems, especially teachers in Zagreb who after the earthquake in March cannot go to college and use university resources or their apartment was damaged in the earthquake. In addition to technical shortcomings, the lack of digital skills, the question of which tools and technologies to use, as well as the lack of pedagogical skills to work in a virtual environment were noticeable.

Students also find it difficult to learn in an online environment, organise time, lack concentration, social contact, and digital skills. It can be said that the new circumstances hit freshmen the most - first-year students because they failed to get acquainted with academic life for the faculty - get acquainted with the study and its infrastructure, colleagues and teachers and make new friends, which is extremely important for them to adapt more easily to the transition from high school to higher education and gain belonging to the academic community. Students have most of their classes at a distance, so they spend their days indoors and find it difficult to cope in that environment. Practical classes at faculties cannot be held or are held on a much smaller scale and with delays, which especially in some faculties additionally affects the quality of teaching (Kubina Softić, 2021).

The crisis has shown that distance learning is crucial, lectures are placed in e-learning systems and exams are organised in the online environment. After the lecture, the challenge faced by higher education institutions was knowledge testing. Due to the improvement of the pandemic situation, some of the institutions held part of the knowledge tests as before, on the premises of the institution, but most of them were held online. The Agency for Science and Higher Education has noticed that in these extraordinary circumstances, additional attention and care should be provided to students, but also to teachers because of their mental health, because the situation in which they find themselves is unexpected, unknown, and uncertain.

Barriers to teacher participation in in-service training exist at the individual, institutional and systemic levels and are interrelated. Teachers' lack of interest in in-service training to improve their teaching and lack of time also stem from universities expecting teachers to focus on research. As long as teachers' research work and results are more important than their teaching work, it is unlikely that teachers will spend more of their time on professional development.

There was no strategy that would say what and how in crisis situations, nor were there programmes and obligations for professional development of teachers for new ways of working and for the process of evaluating students' knowledge and skills.

Libraries were a particular problem during the lockdown, mostly due to the lack of digital learning materials and digitised literature necessary for learning and teaching.

Future Outlook and Opportunities

The digital transformation that refers to the university as the umbrella institution of higher education brings changes brought by the ubiquitous use of digital technologies, that brings opportunities but also threats, social anxieties, and feelings of insecurity. Teacher preparation must go in the direction of continuous professional development in the technological and pedagogical-methodological direction.

Currently, it is extremely important to provide teachers with continuous professional development to acquire digital skills, but also to know how to implement digital technologies in the educational process.

This strategic paradigm implies:

- approaches to teaching that encourage an active attitude towards the field of study,
- teaching methods that develop students' intrinsic motivation for learning and research,
- teaching situations that facilitate the transfer of theoretical knowledge and models to problem solving,
- system of continuous monitoring and application of multiple methods of achievement assessment.

The outcomes of such approaches in teaching are:

- programmes that rely on the results of science and encourage the development of science, technology, and social relations,
- programmes that enable effective integration into the labour market,
- teaching that engages teachers more, encourages two-way communication with students and provides better insight into their understanding and achievement,
- teaching that provides the student with in-depth understanding. (Kubina Sofitć, 2021)

The university teacher must be ready to develop and improve in both areas of activity: research and teaching, realising that being a competent researcher is not a sufficient condition to be a good teacher.

The Bologna Digital 2020 document (Orr & Ram pelt, 2018) states that the new tools and learning opportunities provided by digitalisation should be used as much as possible to reach their full potential. This requires improvement in three directions: educational content, learning experience and learning recognition.

Today, every university strategy must have a clearly defined plan for responding to crisis situations, as well as a programme and obligations for professional development of teachers for new ways of working for the process of evaluating students' knowledge and skills. It is especially important that the digital strategy is linked to other strategies at the institution level and directions of development. The digital strategy should cover all areas that want to develop or change in higher education, as well as explain the reasons why they need to change.

The areas most found in a digital strategy are:

- teaching, learning and evaluation in the digital environment,
- digital content,
- research infrastructure and services in the digital environment,
- stakeholder engagement and communication in the digital environment.

It is also important to develop an action plan for the implementation of the strategy with measurable goals. As part of the digital strategy and action plan, the higher education institution should ensure that staff have the necessary skills to be fully involved in the opportunities offered by digital resources (Kubina Softić, 2021).

Conclusion

Croatian education institutions started with digital transformation almost fifteen years ago, with Higher Education institutions leading the way. In meantime, strategic measures and projects were implemented in pre-tertiary education too. Thee-Schools and Comprehensive curricular projects were leading changes in primary and secondary school delivering equipment and training to all schools. All those significantly helped the Croatian education system when the COVID-19 pandemic started enabling establishment of distance learning and teaching in just two weeks in March 2020.

Further steps in digitalisation are expected as part of the National Recovery and Resilience plan which started in 2021. Besides ensuring modernisation of equipment and network infrastructure, modernisation of university programmes is expected. It is also important to develop an action plan for the implementation of the strategy with measurable goals. As part of the digital strategy and action plan, the institution should ensure that its staff have the necessary skills to be fully involved in the opportunities offered by digital resources.

Country Report: Germany

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Executive Summary

The research paper revealed that digitalisation pre-COVID and (post-)COVID in higher education, VET/LLL has been a complex issue. In both periods digitalisation has been put on the prominent level by policymakers, with obviously more prominence being given in the post-COVID era. The accent on digitalisation in the pre-COVID era was driven more by the need for innovation (digitalisation has been perceived as inextricably linked with innovation, either as a vehicle or end in itself), while in the COVID and post-COVID era the digitalisation was more need-based (during the pandemic the digital modes of education were the only way to continue with providing education services).

Though there has been a clear commitment on the government level, the implementation aspects have been exacerbated by issues such as underfunding, scepticism in academia, lack of competent/trained staff and lack of institutional commitment (among others).

Pre-COVID-19 Status Quo of Digitalisation of HE/VET/LLL in Germany

Policy and practice

Higher Education

In the pre-COVID 19 period digitalisation in the context of higher education in Germany started gaining more attention in the 2000's. The federal government sees digitalisation as an important driver in fostering knowledge transfer and innovation in science, but it also has expectations of its citizens to be digitally literate, to be able to fully participate in education and society. To take just one example, in 2000, funds from the auctioning of UMTS licenses were used to finance the major funding programme "New Media in Education" of the Federal Ministry of Education and Research (BMBF) with a total of 185€ million (Sawicki-Richter, 2021). Digitalisation has been perceived as a critical challenge by policymakers (Hochschulforum Digitalisierung, 2016). The agenda of digitalisation has been pushed primarily through three different angles in the context of Germany: Federal Digital Agenda (2014-2017), the think-tank Higher Education Forum on Digitalisation (Hochschulforum Digitalisierung), and various calls for research proposals by the federal government, which foster research on digitalisation in HE through funding by the German Ministry of Education and Research (BMBF) (Bond et al., 2018). BMBF pushed for the Higher Education Forum on Digitalisation to develop and accelerate concepts, tools, and expert groups to drive the topic of digitalisation at German universities. It was founded in 2014, and is a joint initiative by Stifterverband, CHE Centre for Higher Education and the German Rectors' Conference (HRK) sponsored by BMBF. It has mobilised more than 70 experts placed in six subject groups dealing with key issues of digitisation, ranging from innovative teaching, and learning scenarios to questions of university governance.

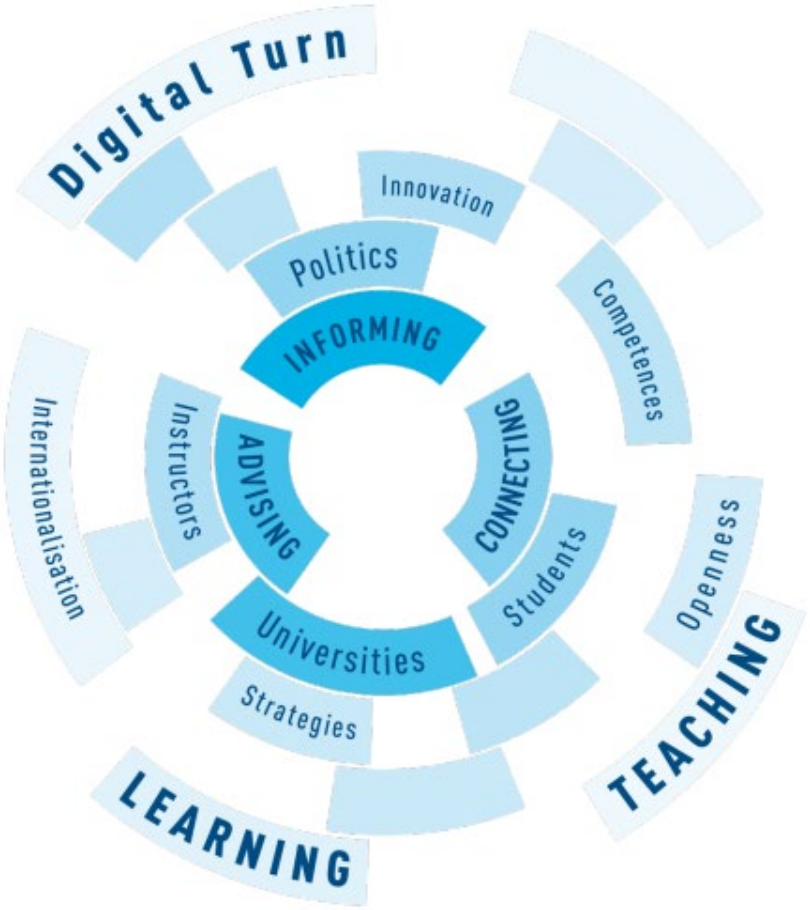

Figure 1: Conceptual frame of digitalisation in German HE (Higher Education Forum on Digitalisation, 2016)

Governance

Speaking about the governance of HEI in the context of digitalisation, various theses and working papers initiated by Higher Education Forum on Digitalisation clearly stated that for any sort of genuine digital transformation needs to come from the strategic level. DAAD argued that a comprehensive digital strategy needs to "evolve at higher education institution management level, in order to reduce obstacles in the introduction and use of digital learning environments by teaching staff" (DAAD, 2019). An important factor in the development of digital higher education is appropriate organisational and professional development. This in turn demands a clear commitment coming from the university management and must be nourished by all the stakeholders following the stipulations of the university-wide strategy. If German universities are to harness the full potential of digitalisation (not just in teaching), the push needs to come from different stakeholders, and it needs to be steered top-down. (Higher Education Forum on Digitalisation, 2016). Some of the universities in Germany saw the use of digital tools and strategies to improve internationalisation efforts, such was the case with one of the oldest universities in Germany, University of Göttingen.

While there were some good cases of instilling digitalisation strategies in universities pre-COVID, majority of HEIs were still slowly waking up to the importance of digitalisation at HEIs. An inspection

of digitalisation strategies was carried out in 2017 by Bond et al., 2018 among doctoral degree granting universities in Germany (n = 155) which showed that only four have publicly available digitalisation strategies in place, with another six at the time of the sampling (2017/18) were engaged in a peer-to-peer coaching process, to develop their respective strategies (Bond et al., 2018).

Enabling services

In 2019, the Council for Scientific Information Infrastructures (RfII) focused on the academic job market in its recommendation paper on digital skills. It stated that, no personnel capacities will be freed up in publicly funded research because of the digital transformation. In its paper RfII called on central infrastructure sectors to employ more academically qualified personnel to further improve the quality of services (HRK German Rectors' Conference, 2021). Apart from the obvious need of IT experts to push the digital transformation, it was stated by HRK that experts in media didactics and course design are needed, particularly those who work with concepts (ibid.).

Teaching and learning

Digitalisation in teaching and learning was discussed lively before COVID-19 and in what many studies and thematic groups often wanted to discover was how digital formats could act as an added value to the existing physical offerings and how the quality could be ensured. Tied to this, the researchers and practitioners also sought to discover what skills and competencies the staff needed to ensure the abovementioned.

In one of its reports from 2016 Higher Education Forum on Digitalisation made these conclusions in relation to higher education teaching and learning and digitalisation:

- "Innovations in digital teaching are not just technical innovations but rather academic, curricular, organisational and structural innovations",
- "The use of digital media contributes to the improvement of higher education teaching",
- "Technological change not only creates new virtual learning environments but also alters existing physical learning environments",
- "There is no shortage of digital teaching and learning innovations at universities but their structural and strategic advancement is deficient",
- "The integration of digital media in teaching and learning is a complex process of negotiation between different stakeholders within the universities".

(Higher Education Forum on Digitalisation, 2016)

Figure 2 Learning Scenarios Overview (Higher Education Forum on Digitalisation, 2016)

As part of the work done by the thematic group "Innovation in Learning and Examination Scenarios", 7 scenarios were developed fitting for digital age (see Figure 2). The 7 seven scenarios include: Enrichment, Integration/Blended Learning, Online Learning, Interaction and Collaboration, Open Education Practice, Game and Simulation, Personalisation and Self-directed study (Higher Education Forum on Digitalisation, 2016).

Infrastructure

Council for Information Infrastructures was established in 2013 to aid research and education entities in their digital infrastructure efforts by providing advice and recommendations. It referred to both research and education, and improving infrastructure such as archives, libraries and research and publication databases, but also digital media strategies and tools to aid universities in their learning and teaching efforts (Digital Agenda, 2014). Digitalisation at HEIs was seen as inextricably linked to harnessing innovation potential and boosting regional and national growth and competitiveness.

The digital infrastructure such as stable and reliable bandwidth and WLAN was seen of essential importance. The same was seen for Cloud and data space infrastructure as well as various software licenses. These however are not often present or are present for limited period. Many HEIs have secured their infrastructure needs for digitalisation through third party funding from the states, federal government, or the EU. This strong dependence on third party funding creates difficulties in ensuring stable and sustainable digital environment (Higher Education Forum on Digitalisation, 2016). The creation of stable digital infrastructure requires strong financial commitments as well as capable and determined HEI management involvement to ensure that the inner HEI structures are well integrated and connected in the digital sphere.

Speaking about students and infrastructure they possessed at the time to execute successfully digital learning, Zawacki-Richter, Dolch & Müskens (2017) found that more than 99% of students have Internet access and are furnished well with digital devices and gadgets. On average a German student owns five different devices, while a third of the sample owns even six devices. Therefore, it can be concluded that pre COVID-19, there was a reasonable demand climate on the side of students, but the supply side was lacking on the side of HEIs. In general, students ardently supported the introduction and acceleration of digitalisation, but voiced concerns on data privacy (Weisflog & Böckel, 2020).

German universities have established a cooperative company, HIS Hochschul Informations System eG, Hannover, to develop administrative software solutions that operate according to EU data protection and privacy regulations (Kerres, 2020).

VET

Before onset of COVID-19, digitalisation was on the agenda of VET in Germany. Digitalisation was put prominently in connection with the "future skills" emerging from Industry 4.0. In the Economy 4.0 scenario, 2.542.000 jobs would be lost on the one hand while 2.768.000 jobs would be created at the same time. The Federal Ministry of Labour and Social Affairs forecasted that due to digitalisation and shifting landscapes of occupation, there would be a massive shortage of skilled occupations. Also, it was expected that there would be an increasing complexity of some occupations. Therefore, it was crucial that VET education could also adapt and anticipate these.

With its umbrella initiative VET 4.0, the Federal Ministry of Education and Research (BMBF) and the Federal Institute for Vocational Education and Training (BIBB) have been tackling since 2015 issues in research, training, skilling, and practice, related to the digital transformation of the world of work and VET. VET 4.0 has been adding value to the implementation of the digital agenda via exchange of information on an ongoing basis between academia, policy-makers and industry and practice (BIBB, 2020).

With another initiative, namely "Digital Media in Vocational Education and Training" support programme (Digitale Medien in der beruflichen Bildung), the idea was to strengthen vocational education and initiate structural changes with the aim of significantly increasing the use of digital tools for initial and continuing training in vocational education (The Federal Government, 2014).

The Vocational Training Pact (VTP, 2018) has been a formal effort stemming from the federal government and the states to modernise VET by harnessing digital tools, upgrading equipment, and

increasing flexibility and permeability between tracks. An amendment (2019) to the Vocational Training Act saw the introduction of "a minimum training allowance, and C-VET qualifications to give greater equivalency between general and vocational studies and expanded part-time training" (OECD, 2020).

Drivers and motivators

There are several drivers and motivators before COVID-19 that pushed for digitalisation at HE and VET. Those include:

- pressure to innovate and bring novelties to different areas of education,
- foster inclusion and access to education,
- foster flexible pathways in education,
- prepare better people for demands of 21st century and digital professions,
- strengthen digital literacy in the digital era,
- include citizens more in education,
- include different stakeholders as co-creators in education.

Barriers and obstacles

Before COVID-19 pandemic, digitalisation in Germany was on a thorny path. Despite digitalisation being placed on the radar of the policymakers and finding itself in the public and academic discourse, its development was slow and hindered by several factors. In 2019 the Expert Commission on Research and Innovation (EFI) noted the processes underlying digitalisation were jeopardised by growing complexity and structural underfunding, among other things (HRK German Rectors' Conference, 2021). Further barriers and obstacles included:

- lack of strategic commitment on the top level (e.g., lack of Digitalisation Strategies),
- lack of connectedness, communication and collaboration among different stakeholders who are critical in making digitalisation cross-cut entire institution in a smooth and holistic manner,
- lack of structural support to properly guide students through counselling,
- lack of structural support to properly guide staff in leveraging digital opportunities,
- discrepancy between perceived importance of digitalisation and its implementation,
- scepticism in attitudes,
- resistance to change,
- concerns about data protection and privacy and accent on data austerity,
- marginalised and vulnerable students less likely to be included/use digital services.

Post-COVID-19 Status Quo of Digitalisation of HE/VET/LLL in Germany

Policy and practice

Without doubt, the COVID-19 pandemic significantly changed the landscape of higher education, and of studying and teaching. After the pandemic hit, the semester start was delayed until after Easter holidays in 2020. In the meantime, university buildings and all its facilities were closed (apart from some lab activities and exams), internships were either cancelled or postponed, exchange semesters were cancelled. At the same time, students faced other challenges such as ability to finance

themselves (due to lost/reduced part-time jobs), changes in their living arrangements (some students were forced to move back with their parents, etc.). Many students in Germany admitted that due to the disruption in their ordinary schedule, they had less time for studies (Stammen, K.-H. and Ebert, A., 2020). Similarly, the new status quo posed challenges for the HE staffs, as well in blurring the lines between professional and private spheres of lives with many having to balance child upbringing and home-schooling with their jobs. The new normal had a significant impact on social, psychological, and economic aspects of individual lives, which in turn impacted the spheres of studying and learning. The situation was unprecedented in so many ways.

With HEIs closing their doors and students and teachers being forced to continue their learning and teaching from their own home, the digital tools posed the only way forward. However, the rapid shift in how teaching and learning is executed revealed that many HEIs are not ready and that there is a lot more effort to be poured. The fault lines in digital readiness showed that the work previously done to push the digital agenda in higher education was not enough.

Governance

The general, knee-jerk reaction, when confronted with unprecedented COVID-19 pandemic without ready/comprehensive digital infrastructure was to just learn by doing it. As Michael Kerres mentions in his paper, there are no managerial strategies, teacher training, debates on technology and design and no analysis on advantages and disadvantages – the idea was that "we just do it" (Kerres, 2020).

This "walk in the dark" without strategy and a bigger vision by the management opened the doors to a lot of challenges such as insecurity/confusion on the part of the students and staff as well as inefficiencies and ineffectiveness in transferring knowledge online. This digital semester experiment revealed that for successful and effective online/digital learning different systems need to get connected. It is not all about digital pedagogy, but a lot of other offices and departments need to come together for student experience in the digital environment to be executed successfully.

German Rectors' conference outlined clear need for a comprehensive framework under which digitalisation is to be implemented. Now "framework conditions required for the continued dynamic development of digital teaching do not yet exist" (HRK German Rectors' Conference, 2021). The key aspects of digitalisation, namely teaching, services, infrastructure are in dire need of personnel boost and upskilling if the change in these 3 areas is to be sustainable.

Apart from obvious resources and commitment needed for executing digitalisation at universities, having the legal framework conditions are of imperative importance. HRK German Rectors' Conference federal government and states are urged "to create tariff structures that are appropriate to qualifications, suitable regulations on teaching hours and curricular standards, legal protection for digital examinations, appropriate regulations for data protection and more science-friendly copyright legislation" (HRK German Rectors' Conference, 2021). In another study carried out by Institute for higher education development (HIS-HE) titled "Expert survey on Digital Sommer Semester (EDiS)" a call was made for formalising management structures more to aid in digital learning and teaching environments. It was made clear that teachers and staff universities needed an improvement of the framework conditions when it came to conceptual, legal and personnel aspects (Seyfeli, Elsner, & Wannemacher, 2020).

Furthermore, the unprecedented situation at German universities made it clear of how critical it was to have a good crisis management strategy to tackle not just COVID-19 pandemic but also be crisis-proof when other unexpected crisis hit and have a good response (both digital and non-digital).

The survey data carried out by DigiTransformEdu partners reveal that only 57% of teachers/trainers are satisfied with the way their HEI responded to the pandemic. When asked why, some of them mentioned poor adoption of technology, poor policy to adopt technology, weak or no communication, too many platforms with lots of changes and no good tools for pedagogy. Compared to teachers/trainers, students have a slightly more positive outlook, with 67% of them stating that they are satisfied with the way their HEI responded to the pandemic. When asked why they were not satisfied, some mentioned that the communication was confusing and there were no clear guidelines, while others mentioned lack of facilities such as libraries and no appropriate substitute was put in place.

Some of the qualitative insights from teachers reveal that online education should have been on the agenda of the top management before COVID-19.

Enabling services

In a study conducted by University of Hildesheim (Stu.diCo) more than 3000 students from various universities in Germany were asked to reflect on their studying experience in the first fully online semester (Summer semester 2020). They were specifically asked about what services they would like to have to help in learning processes. Students from Stu.diCo study stated they would like support with subject-related questions about course content (55.7%), in preparing for exams (55.4%) and in obtaining literature and other research (45.9%). Respondents would also like further advice and support in organising their learning and studies.

The research has revealed that students require much more support and counselling in the digital environment. Particularly important are psychological counselling, study progress counselling, counselling for students with children, and much more. The need for counselling is still there and - according to the results of this study - it is increasing in the current situation (Stammen, K.-H. and Ebert, A., 2020).

Looking into the finding of another student survey carried out at the University of Hildesheim, it is recommended that the infrastructure at universities is digitally and analogously and that advisory services are set up and improved. Particularly highlighted is that staff capacity is needed (therefore more funding) for the counselling services, which include technical but also psycho-social and student counselling services (University of Hildesheim, 2020).

In another study carried out by the Institute for higher education development (HIS-HE) titled “Expert survey on Digital Sommer Semester (EDiS)” a call for expanding services was reiterated by students. Students outlined that there was a clear need for expanding communication, professional, technical and social support services to assist in the digital learning environment (Seyfeli, Elsner, & Wannemacher, 2020).

One of the important further points with respect to enabling services that the Conference outlined in their address to the Federal Government, referred to the call for collaboration between internal university departments or faculties when it comes to communication services, support structures or comprehensive campus management systems (HRK German Rectors’ Conference, 2021).

Teaching and learning

The digital push forced quite substantial changes in delivering modules and lectures. Many lecturers were said to have put a lot of effort and dedication into setting up online modules, recording interactive videos, developing learning materials, quizzes, and tests, adding innovative elements (to some extent), creating learning paths, moderating forums, and holding consultation hours via video calls. Up until then the Learning Management System was primarily used for course management or as a place to provide readings and presentations, but due to COVID-19 it started being a new teaching and learning environment (Zawacki-Richter, 2021). It has been said that the arrival of the new normal pushed the teachers to the innovation edge. Some managed to go over it, some not. The influx of changes made things easier for some, while for others it made it more challenging, both from student and teacher perspectives.

Despite the efforts the first digital semester was far from perfect, when looking through the lens of students.

The Stu.di Co study revealed that on average students attended fewer classes than it was the case with their physical semester done the year before (6.6 classes per week compared to 7.6 classes in the semester done before). 44.5% of the total respondents stated that they were able to attend fewer classes than last semester. Within that respondent group, the most common reasons for attending fewer classes included the increased workload in the semester (42% of this respondent group), more distractions (37% of this respondent group) and lack of desired classes (33% of this respondent group) (University of Hildesheim, 2020).

Gründe für den Besuch von weniger Lehrveranstaltungen (n = 1046)	Prozent
Ich muss keine Lehrveranstaltungen mehr belegen	18,5
Weil die Arbeitsbelastung dieses Semester höher ist	42,1
Weil es dieses Semester mehr Ablenkungsfaktoren für mich gibt	37,8
Weil ich neben dem Studium mehr arbeiten muss	12,9
Meine gewünschten Lehrveranstaltungen werden nicht angeboten	33,1
Weil ich mit technischen Problemen zu kämpfen habe	16,2
Weil ich meine Abschlussarbeit schreibe	13,9
anderes	20,3

Tabelle 3: Gründe für weniger Lehrveranstaltungen

Figure 3

On the other hand, 15% of total respondents said that they attended more classes than the previous semester, with the most common reasons including increased flexibility during the day (50% of this respondent group), reduction in commuting time (47% of this respondent group) and lack of other activities such as sports, jobs, parties, etc. (25% of this respondent group).

When asked how the students would find the idea of studying one more semester online, 59.4% said they would find this bad (36.5% very bad, 22.9% bad), 18.3% of respondents were neutral and 22.3% of students would find it good (11.5% good and 10.8% very good).

The study conducted by DigiTransformEdu project revealed that 60% of students surveyed believe their digital competencies are better now compared to pre-COVID time, while 86% believe their lecturers' digital competencies are better compared to pre-COVID times. Teachers/Trainers report also high levels of competence after COVID, though slightly less positive outlook compared to students. 71% of teachers/trainers believe their digital skills are now better than before COVID and 57% of them believe that digital skills of students are better than in pre-COVID times.

Looking at the student perspective and experiences of the online semester, it is evident that the fully online semester led to several problems. One of the major problems outlined was the social isolation, decreased wellbeing and lack of human contact that made the fully online semester extremely difficult to carry out (see figure 4 (only in German)). Almost 60% of students in the Stu.diCo survey said they strongly agree that that they were missing personal contacts with other students. Almost 40% of students said they strongly agree that they were worried more now than before (University of Hildesheim, 2020). The same study also outlined further potential issue in digital studies that should be addressed in the didactical approaches, which is student self-regulation (how students manage their time and workload without external influence) with more than 50% stating they struggle in planning their day.

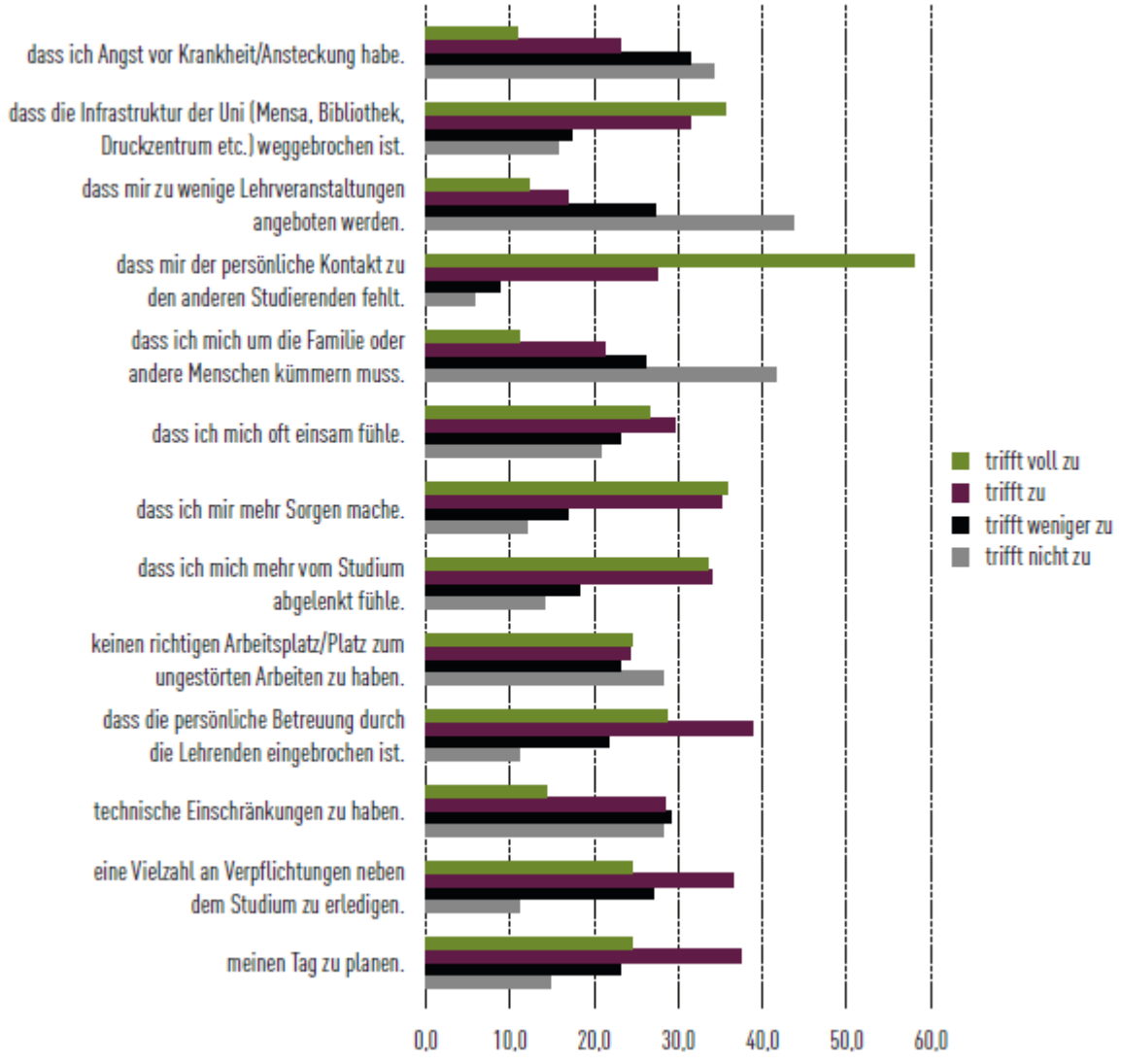

Figure 4

Infrastructure

The switch to the digital environment called for more investments into technical infrastructure and services. Big investments were made also into upskilling teachers into media technology. The Learning Centres gained more prominence and use of computers and software was accelerated with the introduction of e-assessments and online examinations (Zawacki-Richter, 2021).

Some infrastructure problems were identified in individual studies that focused on how some university students were coping with the first online semester. At the University Duisburg-Essen, for instance, 20% of students voiced they urgently needed specific devices to be able to effectively carry out their learning process. At the University of Götingen, 16% of students stated they did not own devices to meet their needs to carry out the online semester (Stammen, K.-H. and Ebert, A., 2020). What was further emphasised as lacking in the online semester in terms of infrastructure was the lack of resources, such as printers and scanners (which were freely available in the premises of HEIs before the pandemic), which led to more challenges in carrying out the semester (ibid.).

In their address to the Federal Government, the German Rectors' Conference stated the matter of digital transformation in the German higher education goes beyond IT infrastructure. Of course, IT infrastructure is essential, but it is not the only piece of the puzzle for smooth and sustainable digital transformation. They elaborated that a distinction could be made between digital generic IT services, digital scientific services and cloud services on one hand, and a need to recruit staff for executing as well as maintaining and developing further the services and provisions. They also made an important appeal to the establishment of fail-safe backup structures for all services.

The survey conducted by DigiTransformEdu found that 93% of students were happy with the way exams were organised during the pandemic, while 71% of teachers/trainers reported their satisfaction. When asked about what their institution could have done better to respond to the pandemic in terms of online education, some of the qualitative answers from teachers/trainers reveal that there should have been better preparation, there could have been training to educators and more resources available. Some of the comments also noted that some of the platforms and IT solutions provided were not particularly user-friendly and tailored for the purpose.

VET

The COVID-19 crisis has shown that there is no digital inclusion without social inclusion when it comes to VET education in Germany. Looking into the results of CEDEFOP study, while digital education has been seen as a solution to continuing VET education in the face of adverse situation such as COVID-19, it is important to bear in mind that not all students have equal access to digital education. Marginalised, and vulnerable learners are less likely to be involved in distance learning procedures and disconnecting for a longer period may lead them to drop out from their VET programme (CEDEFOP, 2020).

1. A bonus payment (EUR 2.000 per trainee) for SMEs which keep their apprenticeship placements stable in the next year,
2. A bonus payment (one-off payment of EUR 3.000) for SMEs (economically affected by COVID-19) which increase their apprenticeship placements in the next year,

3. Financial support to SMEs (economically affected by COVID-19) which continue in-company training without interruptions or reductions by keeping trainers and apprentices in full time employment,
4. Financial support to SMEs or inter-company facilities that absorb trainees from other SMEs unable to maintain their training offers or collaborating in joint training initiatives,
5. A bonus payment (EUR 3.000 per trainee) for SMEs which take over trainees from insolvent companies.

When it comes to digitalisation and VET, the government provided the following alleviating mechanisms to tackle adverse effects of COVID-19:

- funding of EUR 600 million for the expansion of IT infrastructure in the states,
- (länder) on top of the EUR 5 billion of the already existing programme "Digitalpakt Schule",
- expansion of the "HPI-Schul-Cloud", providing learning platforms during the lockdown, for schools which lack digital infrastructure,
- extra funding of EUR 500.000 for German community college.

(German Office for International Cooperation in Vocational Education and Training (GOVET), 2022)

All of this aimed to ensure "learning and training anywhere, anytime", an idea central to the concept of lifelong learning, but often quite distant from traditional VET practices that are strongly rooted in the physical presence of the learner in a specific VET establishment.

In Germany, national teacher survey regarding the experience with distance learning indicated that most schools were technically ill-prepared for the COVID-crisis in terms of digitalisation. This was not only due to lack of necessary equipment and gadgets, but also due to lack of experience and knowledge in creating digital didactical content (CEDEFOP, 2020).

Drivers and motivators

Drivers behind digitalising higher and vocational education during/after COVID-19 were primarily need-based. Digital environment was the only way to keep the educational provision alive. However, this is only one part of the story. Digitalisation was already on the agenda in the German context, and it can be said that COVID-19 accelerated already existing drivers. To sum up, the following have been seen as a driving force behind digitalising different aspects of education during/after COVID-19:

- need for internationalisation without being able to travel,
- need for assessments and examinations done online,
- need to provide more flexibility,
- need for different innovative tools to foster better pedagogy,
- need to have online administrative processes in place to enable smooth functioning of the educational system as a whole,
- need for fostering partnerships between institutions,
- need for carrying out apprenticeships and on-the-job delivery online,
- need for things such as simulators, augmented/virtual reality, artificial intelligence to emulate work done in physical environment,
- need for online platforms to teach skills not just for students, but also staff.

The DigiTransformEdu empirical research reveals that some of the main drivers for pushing online education are the facts that online education is more flexible; it is more timesaving and more productive.

Barriers and obstacles

There were several barriers that precluded the successful digitalisation during and after COVID-19. Furthermore, the digitalisation also raised some concerns on the pitfalls of digitalisations that should be considered. The following barriers/pitfalls have been observed in the context of education in Germany (both higher education and VET):

- lack of appropriate digital infrastructure (stable connection) to carry out effective digitalisation,
- lack of competence and skills on the part of staff implementing digital content,
- lack of time and motivation on the part of teaching staff to create attractive digital and engaging educational content,
- lack of engagement of students to follow attentively the online lectures (particularly so if the lectures are not engaging),
- lack of comprehensive methodology/approach to effectively convert non-digital content into digital (often teachers merely created a pdf file of their lectures),
- digital exhaustion and lack of focus, particularly after long-hours in front of the screen,
- increased workload for both students and staff,
- problems with inclusion: some students do not have appropriate devices and equipment for successful and positive online learning experience,
- lack of social contact and risk of isolation and loneliness,
- disruption of work-life balance,
- unsustainable funding models for digitalisation,
- problems related to data privacy and protection,
- remote areas do not have adequate infrastructure for digital learning and teaching.

DigiTransformEdu empirical research reveals that some of the main drivers for hampering online education are the facts that online education is more distractive, it makes working with others more difficult and requires more personal workload. Further barriers included online fatigue, distraction, decrease in motivation and internet/technical problems.

This quote captures qualitatively the struggles of German students in the digital semester of 2020:

I can't understand at all why the studies should become digital. For me it's a disaster and it makes me really unhappy. I feel very lonely, isolated and have no motivation in digital. I never say anything in digital classes, it's terrible. Schools are open, offices too, people travel and we're stuck in front of the laptop. It's so unfair. (Stammen, K.-H. and Ebert, A., 2020).

Future Outlook and Opportunities

Digitalisation in Germany has been on a thorny path, but it certainly has good prospects in the future. Irrespective of how COVID-19 pandemic ends, digitalisation is here to stay in all levels of education. When it comes to the higher education, the German Rectors Conference for instance logged a request

to the German government that all universities get the so-called “digitalisation allowance” to permit stable investments in digital infrastructure at all universities. The amount requested is around 270 million per year for around 2.9 million students. It has been calculated that each university receives 92 euros per student per year for digitalisation transition. For more details see the following figures.

	Propor-tion	Costs
Total sum		
Digitalisation allowance of €92 per student per year		€92
Number of students (press release 11/12/20)		2,891,547
Total digitisation allowance		**€266,022,324**
Basic amount	**20%**	**€53,204,465**
Number of universities		390
Basic amount per university		€136,422
Digitalisation allowance minus basic amount	**80%**	**€212,817,859**
Digitalisation allowance per student (reduced due to basic amount)		€74
Distribution among higher education sectors	**100%**	**€212,817,859**
Digital learning and teaching (40%)	**40%**	**€85,127,144**
Add-on for classroom teaching, asynchronous/synchronous digital teaching, blended learning (e.g. inverted classroom)		
Teaching of individual digital sovereignty (digital literacy)		
Digital literature for teaching and studying		
Interactive learning environments		
Learning and campus management systems		
Software licences, including licences for authoring systems		
Studios, makerspaces, real-world laboratories		
Cameras, whiteboards, notebooks		
Open educational resources, micro-degrees and badges, MOOCs (possibly on the basis of cooperation)		
Student life cycle: Information portals, e-assessment, study services		
Personnel for didactic support and further training (possibly on the basis of cooperation)		
Teaching support services (30%)	**30%**	**€63,845,358**
Remote access, bring your own device		
Sync and share services, web-based office tools		
Integrated communication channels for video conferences, chats		
Interactive websites and forums		
Institutional digital sovereignty (possibly on the basis of coopera-tion)		
Overarching services/platforms (on the basis of cooperation)		
Services for academic work		
Cloud services (possibly on the basis of cooperation)		
Personnel and material resources for development, provision and operation (possibly on the basis of cooperation)		
Teaching support infrastructure (30%)	**30%**	**€63,845,358**
Information infrastructure		
Comprehensive local WLAN coverage		
Increase in bandwidths		
High-availability server and storage infrastructure		
Cloud strategies and cloud services (possibly on the basis of coop-eration)		
Information security: Awareness measures, personnel for computer emergency response teams (on the basis of cooperation)		
Material resources (including for licences)		
Personnel resources		

Researchers and practitioners have further asked for more comprehensive digitalisation framework, which is now lacking. So, it is expected that this will be tackled soon as well.

It is expected that many teachers develop more digital skills and do so continuously to stay on the pulse with the latest trends. It is expected that there will be a push for this, but also that there will be a push-back from teachers, as many them is expected to resist this.

Conclusion

Looking into the timeline from before COVID-19 to after COVID-19 pandemic, it is evident that there is acceleration in digitalisation offerings and efforts in higher education and VET, which is in line with the trend evident in the rest of the EU. Specific efforts have been put in place both in higher education and VET prior to onset of COVID-19. The government has been making quite a push as part of the modernisation agenda, but the implementation was often sluggish and sporadic.

The push for digitalisation in education through COVID-19 pandemic accelerated the process, but still many issues remain that hamper proper and comprehensive leveraging of digital potential. Often the underfunding is a problem, but also mindset and resistance to change and uptake of new skills. Digitalisation also raises further issues such as ethics, privacy, and social factor. While digitalisation can be a rich space for education, it appears that the literature suggests that a balance between offline and online modalities may be a way forward. Sense of community and social connection may be challenging to recreate in the digital domain.

Country Report: Italy

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Executive Summary

Despite the efforts, programmes and financial resources devoted by the Italian Government since 2008 for speeding up the digitalisation process, the school system in Italy at secondary and VET levels, up until the pandemic had been strongly characterised by an "in presence approach". The pandemic was the real change maker since schools were literally obliged by law to guarantee the delivery of teaching and learning activities during the lockdown via DAD (Didattica a Distanza - Distance Learning).

Schools made an amazing effort for moving in a blink of an eye all their activities online, despite the existing technological constraints (i.e. the schools were not equipped with digital learning platforms, not all the students could have access to the needed devices, the connectivity was an issue in some peripheral areas, etc.) and unpreparedness of the staff and teachers (appropriate teaching methods and ICT skills).

While DAD presented a series of limitations (i.e., disengagement of students given the use of passive teaching methods, higher workload for teachers for re-designing lesson plans, difficulty with the assessment) it was the first real attempt made by Italian schools to implement the digital transition. Nonetheless research revealed that with DAD "in the face of a great workload, the evaluation of the results appears not commensurate with the perception of learning effectiveness and inclusion". Therefore, the MIUR came up with Linee Guida per la Didattica Digitale Integrata (DDI - Digital Integrated teaching) (MIUR 2020), providing schools with any order and grade detailed guidelines and suggested methods for redesigning the teaching activity in blended learning and on how to prepare the Digital School Plan (DSP).

Linee Guida per la Didattica Digitale Integrata represents the turning point from the "experiment phase" determined by the Covid pandemic to the "new normal" where digital learning should be compulsory embedded in school practice and presented in the school PTOFs (Piano Triennale dell'offerta formativa - 3 years plan of the educational offer) as a standard complementary service, and managed according to guidelines and organisational principles defined by the MIUR on the basis of the lessons learned from the pandemic.

Despite the Linee Guida, we might argue whether the schools would be able to ground their plans for DDI rather than just look for formal compliance in their PTOFs. Whilst PNRR will channel a consistent financial resource to complete the infrastructure development, we believe that school's/headmasters' organisational preparedness and teachers' pedagogical preparedness will play a major role in completing the digital transition.

The Italian University system is guided by the principle of organisational, economic, and didactic autonomy of universities, a principle that is provided for in art. 33 of the Constitution and which is implemented by the reforms that have taken place in recent years, in line with the Bologna Process,

to overcome the existing gaps in the Italian system and ensure the quality and didactic performance required by the economic and social development of the country.

Looking at the university system, the main players involved (alongside the MUR, the Italian Ministry of University and Research) are the single universities, the Rectors' Conference (CRUI) and the AGID (National Agency for Digital Italy). The latter was created to support the achievement of the Italian digital agenda objectives, to contribute to the diffusion of digital technologies and to support digital innovation.

The digitalisation of universities concerns the organisational and operational levels of each single university and the system, as well as the innovation and development of digital teaching and learning capabilities, needed to innovate, and giving a boost to the development of human capital of the country. Concerning the first aspect, the indications and guidelines deriving from the policies and impacting on the governance of the universities are included in the CAD (Codice dell'Amministrazione Digitale – The Digital Administration Code) and are expressed in the CRUI / AGID collaboration protocol. As for the second aspect, this is the field of action of didactic and pedagogical innovation, and it contributes to the attractiveness and competitiveness of each university.

During the pandemic the universities have shown a great response capacity and resilience; they have held up during the long months of the emergency. At the same time, teaching with the DAD instead of taking a leap forward from a pedagogical point of view, has rather taken a step backwards, anchoring itself widely to frontal teaching, albeit online.

The university system with the GARR network and the pertaining digital services system is equipped with a modern, widespread, and effective infrastructure, capable of ensuring infrastructural resources and technological security standards.

The challenge of the university system stands in the capability to adapt and enhance the teaching quality and to provide de-bureaucratisation to freeing up resources to be dedicated to innovative education offers and to design and implement research networks, which are priorities valued in the PNRR, in particular in Mission 4.

Methodological note

On the research area

To provide more in-depth information on the current state of play, which will represent the starting point for devising our project products/results, it has been decided to limit the analysis of the pre-covid situation to the main actions/projects implemented at national level for fostering the digital transformation of the public education system and existing limitations. Such analysis, although not exhaustive, will offer sufficient insights to understand the speed impressed by the pandemic to the digitalisation process of the Italian education system.

On the target groups

Since the main target groups of our project are respectively HEIs and VETs and considering that LLL in Italy is a very different and highly fragmented market managed mainly by private institutions and subject to different development dynamics compared to HEIs and VET (both showing a prevalent presence of the public sector) it has been decided to limit the analysis to HEIs and VETs.

Pre-Covid-19 Status Quo of Digitalisation of HE/VET in Italy

Main government support and actions to foster digitalisation of Italian primary and secondary schools (including VET) and limitations to digital transition.

Since early 2008 the Italian Government (MIUR) has launched a series of programmes to stimulate the digitalisation process of the educational system. Below the main programmes are presented.

LIM Action promoted for the first time in 2008, provided for the widespread diffusion of the Interactive Multimedia Blackboard (IMB - LIM) in teaching in class. The IMB-LIM was seen as an object by similar appearance to the slate blackboard that had to enter the classes, without upsetting them and allowing a gradual familiarisation of teachers with technologies. With this action 35.114 IMB-LIMs were assigned thanks to a total allocation of 93.354.571 euros, of which 80.937.600 euros for the purchase of IMB-LIM and 12.416.971 euros for training of 72.357 teachers in both technical and educational use of IMB-LIMs.

Action Cl@ssi 2.0 characterised by the slogan "No longer the classroom in the laboratory, but the laboratory in the classroom" had the aim to stimulate ideation and creation of innovative learning environments. In the period 2009-2011 the project involved, 416 classes of different order and grade, for a total funding of 8.580.000 euros for the purchase of technological equipment and 1.944.857 euros for support and training.

Scuol@ 2.0 Action launched in 2011 with an allocation of 4.500;000 euros allowed 14 educational institutions to walk a line of very advanced innovation, through strategies that combine innovation in didactic programming with new models of organisation of human resources and infrastructure of the educational institution.

Action Digital publishing for schools started in 2010 and aimed at the production of digital content in 20 schools of different orders and grades with funding of approximately 4.400.000 euros.

MIUR (minister of Education University and Research) - Regions agreements to accompany the digital innovation process via greater synergy and collaboration between the central level and the regional one. These agreements, signed on 18 September 2012 for additional investments of 33 million euros, made it possible to assign further 1.931 IMB-LIM, and to set up 905 Cl@ssi 2.0 and 23 Schools 2.0.

Action for Digital School Centers (CSD) was born for meeting the needs of schools located in territories particularly disadvantaged and disconnected/peripheral and made it possible to activate 45 initiatives of support for schools located on small islands or in mountain areas, providing them with infrastructures and technology and linking them to schools in urban centres.

Wi-fi action Article 11 of the decree-law n. 104 of 2013 allocated 15 million euro for wireless connectivity in schools and 1.554 projects have been financed.

Training Poles Action identified some educational institutions (so-called training poles) for the organisation and management of teachers training (peer training) on digital learning. Following a specific national call for proposals, public schools (both as a single organisation or as a consortium) were invited to present their training pole projects. The best ones were selected to take the role of national Training Poles with the task of organising and managing teacher training. Appointed training poles made use of competent teachers on the subject identified based on provincial lists prepared by

the respective regional school offices following the submission of voluntary candidacies by interested teachers. For the functioning of the training poles, 600.000 euros were allocated for the year 2013 (decree of the MIUR h 11 October 2013, n. 821), which allowed the creation of 38 interprovincial training poles and 1 million euros for the year 2014 (decree of the MIUR 2 October 2014, n, 762), which allowed the establishment of 18 regional training poles. 25.056 teachers received training by the appointed training poles, delivered by 2.473 selected trainers, chosen from the provincial lists of expert teachers of different school order and grade.

Despite the programmes, funding and actions promoted by MIUR and implemented at school level for speeding up the digitalisation of the Italian education system; before the pandemic the schools practices were still affected by several constraints preventing the digital transition, such as the lack of high speed connections, the lack of proper school infrastructures (i.e. laboratories), the non-preparedness of teachers (most of the training was on specific tools rather than on new pedagogies for digital learning) and the cultural resistance of both teachers and headmasters toward digital teaching and learning practices. Their mindset continued to be strongly characterised by an "in presence approach" built around the centrality of the classroom as a ruled environment:

- allowing compromise between discipline and self-regulation by regularising the different individual routines in the collective life within the school,
- articulated around the unit of the lesson, a standard time at teachers' disposal to teach their lessons to students,
- managed by the teacher being the 'governor' of such a space.

The pandemic was an opportunity for unleashing different modes of thinking about the reconfiguration of the school in a "blended mode", mediated by digital devices and/or platforms.

Main government support and actions to foster digitalisation of Italian universities and limitations to digital transition.

In Italy, universities are autonomous legal entities. According to article 33 of the Italian Constitution, they have didactic, scientific, organisational, financial, and accounting autonomy; they have their own statutes and regulations. Furthermore, the Bologna Process[10], born in 1999 as an intergovernmental collaboration agreement in the higher education sector, was established with the aim of building a European Higher Education Area based on principles and criteria that further enhance and promote the principles academic freedom, institutional autonomy and the participation of teachers and students in the governance of higher education.

This premise is important because the government actions that support the digitalisation of Italian universities are generally formulated within the framework of measures that aim at promoting the digital transition of public administrations.

[10] The Bologna Process (1999) and the European Higher Education Area https://education.ec.europa.eu/education-levels/higher-education/higher-education-initiatives/inclusive-and-connected-higher-education/bologna-process

Keeping in mind that Italian universities operate autonomously[11], let's see a few numbers[12]: the Italian system is made up of:

- **97 university institutions**, including: 67 state universities, 19 legally recognised non-state universities.

11 legally recognised telematic (fully online) non-state universities: their courses can be attended online, remotely, without being physically present in the classroom during lessons.

The telematic universities, established in 2003 by the Ministry of Education, University and Research, are university entities officially recognised by the ministry itself, whose teaching is fully based on e-learning: their lessons are mainly held online, and the teaching materials are available 24 hours a day on their own university platform to which each student has fully access. They were born mainly to provide flexible, cutting-edge teaching innovation, to cope with different needs of an enlarged target audience, such as those of working students, who do not intend to give up higher education even though they already have a job. This was one of the drivers to establish them. Telematic universities were initially conceived as an educational offer to be mainly addressed to working students, however over time they have contributed to the didactic innovation and to the digitalisation of universities[13].

The university system nowadays is called to face new challenges, such as for example students and teachers' international mobility, new research projects, as well as the need to achieve higher quality standards such as to stand up to comparison and competition at an international level. Lastly, the need to improve the related governance operational organisation, to be efficient and take charge of their own performance targets[14].

In this context and keeping in mind the complexity of the challenges to be faced, the digitalisation of service and teaching processes for the Italian university system could really be an important driver for overcoming current drawbacks: Italy is next to last in Europe for young people with a tertiary qualification. In 2019, Italians aged between 25 and 34 with a tertiary education qualification were 27.7% of the total, or 13.1 percentage points less than the EU 28 average, equal to 40.8%. According to the third Censis report ("Italia sotto sforzo. Diario della transizione 2020/21"), Italy would need about 7 thousand more enrolments per year to be in line with the European average.

The **digital transition of universities shows up as a systemic process**, closely linked to the digital transition of the entire society and the production system. Being aware of this, CRUI - Rectors'

[11] Figures: professors, including full professors, associates, and researchers, are over 57,000. Of these, 53,500 are in service at public universities and 4,100 at private ones. In total in Italy there are 14,800 full professors, 18,800 researchers, 23,500 associates and 400 extraordinary professors. Students enrolled at the universities are 1,681,146. There are 1,057,079 students enrolled in a three-year degree course, those in a single-cycle cycle are 324,412 and those in specialist courses are 299,655. Of these, there are 749,361 male students and 931,785 female students. (Ministry of University and Scientific Research, 2020)

[12] https://www.miur.gov.it/istituzioni-universitarie-accreditate; https://www.universitaly.it/

[13] Nel 2018 il numero degli studenti iscritti alle università telematiche ha superato le 90.000 unità, numero ulteriormente cresciuto durante la crisi pandemica.

[14] "Come cambia la governance. Università italiane ed europee a confronto", Fondazione CRUI, 2015 (The Foundation of the Italian University Rectors)

Conference - and AGID – National Agency for Digital Italy[15] - signed a collaboration agreement (2019) which **represents a general and governmental measure aimed at promoting the digitalisation of universities.**

Through this collaboration agreement, the Conference of the Italian Rectors and the National Agency for Digital Italy decided to co-operate on the following objectives:

a) promote and disseminate a digital culture, developing the needed skills of the Digital Transition Managers that will be in charge to support the digital transformation of the public administration,
b) make information assets and skills available to a wider target audience by maximising the synergistic effects of the co-operation between the two entities,
c) promote and support the building of a cooperative network of Digital Transition Managers in the public administration,
d) involve the university system in supporting AGIC in the development and update of technical guidelines,
e) define a common regulation[16] for the use of digital resources by universities to standardise and adapt to the existing norms and better the management of the digital resources,
f) foster the third mission of the universities and promote public engagement by providing mutual support for technology transfer activities to public administrations,
g) define and launch common initiatives on issues related to digital transformation, also aimed at encouraging the implementation of gender and inclusion policies through university training and the use of ICT technologies; promote the adoption of enabling technologies for accelerating the digital transition,
h) strengthen managerial and digital skills of executives, public employees and enterprises through training courses, seminars, conferences, training schools and innovative shared methodologies.

An important boost to the digitalisation of universities is coming from the implementation of the PNRR (The Italian Recovery Plan) which dedicates a specific line of intervention and important funds (Mission 4), to the university and research system. These funds will be made available to the universities according to an adequate schedule and they will be selectively distributed. Priority is given to initiatives where the use of digital technologies and innovative methodologies allow to increase the flexibility of study courses, empower interdisciplinary paths to respond to the emerging competences needs, reduce skill gaps and all the opportunities in the STEM area paths[17].

The Covid-19 pandemic has forced universities into a whirlwind computerisation, which showed some critical issues as well as new opportunities. Universities proved to be quick and efficient in dealing

[15] AGID – The National Agency for Digital Italy - is the technical agency of Italian government and has the mission of supporting the achievement of the objectives of the Italian Digital Agenda, disseminating the use of ICT (Information and Communication Technologies) and fostering innovation and economic growth.

[16] These common regulations will help the universities to co-operate and work as an organic system by respecting at the same time their autonomy.

[17] In Stream 1 of mission 4 of the PNRR, the Ministry of University and Research is the owner of investments for approximately 2 billion euros, aimed at facilitating access to university education, guidance, teaching skills, including digital ones

with the emergency, however in a full operational situation they are struggling to reorient programmes, teaching, methods and studies, administrative processes.

During the pandemic, the significant growth of private telematic universities and the digital gap of non-telematic universities has highlighted the need to speed up digitalisation. This new awareness can improve the university's attitude towards new training channels that the digital revolution is making available, such as open access, open educational resources, massive open online courses (MOOCs)[18].

In this complex and articulated framework, the **digital transition of universities is lead and implemented through the legislative scheme of the Digital Administration Code** (CAD)[19] that is the single law that brings together and organises all the rules concerning the computerisation of the Public Administration. Established with the legislative decree of 7 March 2005, n. 82, it has been subsequently modified and integrated first by the legislative decree 22 August 2016 n. 179 and lastly by the legislative decree 13 December 2017 n. 217 to promote and make digital citizenship rights effective. The CAD supports, among other measures, the integration and interoperability between public services provided by public administrations, to guarantee citizens and businesses the accessibility to public services and right to use them in a simple way. The CAD designs and sets the profile and the organisational role of the **Digital Transition Manager**, who also in universities must be introduced with the task of leading and coordinating the development of ICT services, IT security, digital inclusion, assuring alignment between organisational needs and the planning of technological investments.

The university system, whose development phase is at present subject to the pressure from the growing and changing needs of the production system and the ongoing social, cultural, and demographic change, shows some main limitations to the digitalisation process apparently connected with three main challenges:

- adaptation to new organisational and service models,
- availability of managerial skills and cultures to support and manage change,
- innovation, pedagogical-wise, of training and teaching approaches and methodology.

During/Post-Covid-19 Status Quo of Digitalisation of HE/VET in Italy

Policy and practice (national/federal, regional, local) – VET

VET governance

During the pandemic, the digitalization of the ecology of educational practices and policy in Italy, the EU and all over the world was accelerated. Digital technologies and platforms have provided and are still providing an emergency solution for making possible a form of schooling or education at a distance, in a situation where social distancing has become the basic norm.

Before and during the pandemic the Italian government offered a series of policy provisions and guidelines to boost the digital transition of the schooling system. Nonetheless such digital acceleration

[18] Position Paper by CRUI (Conference of the Italian Rctors) november 2021, “Università: per un Paese a prova di futuro”

[19] https://www.agid.gov.it/it/agenzia/strategia-quadro-normativo/codice-amministrazione-digitale

was not always accompanied by the epistemic rethinking of the underpinning pedagogies (programme design, teaching, and learning).

In Italy the schooling system moved from DAD (Didattica a Distanza - distance learning) which was during the pandemic the only way (alternative to the class-based setting) to deliver education in the lockdown; to the DDI (didattica digitale integrata - Digital Integrated teaching), which is now considered as complementary to, and integrated with traditional class-based activities. The shift from DAD to DDI is mirrored in the *Linee Guida per la didattica integrata* presented below, which offers clear guidelines on how DDI should be organised and managed within the school as a complementary "new normal" service, if there would be the need to contain again the pandemic, as well as if should be necessary to suspend again the in-presence didactic activities due to contingent epidemiological conditions.

In order to understand how VET Governance has changed to support the digital transition of the system during and after the pandemic, it is important to analyse first the main related Italian Policy framework which determined some of the schools' organisational decisions:

- **Piano Nazionale scuola Digitale** (MIUR 2015) is the official document of the Ministry of Education University and Research presenting the innovation strategy for a new Italian school system in the digital era. The strategy revolves around the following 9 main pillars for which dedicated programmes and financial resources have been allocated in the period between 2016-2020: 1) *Access* - for providing high speed connections in all schools 2) *Learning spaces* - for refurbishing the school buildings and infrastructures such as digital laboratories 3) *Digital administration* - for improving the school digital services for students and families and for the internal administration 4) *Digital identity* - for providing to the school staff and learners a unique digital identity for accessing the school virtual environments , content and services in a simple, safe, sustainable way 5) *Learners competences* - for developing the information and digital literacy of students 6) *Digital, entrepreneurship and job* - for developing the transversal skills requested by the labour market 7) *Digital contents* - for access, production/co-production and distribution of OERs 8) *School staff/teacher training* - for teaching and organisational innovation 9) *Support* - for monitoring the progress and share good practices.
- **Piano Nazionale di Ripresa e Resilienza** (PNRR) is the plan presenting the investments to be done in the period 2021-2026 related to the Next generation EU funds. The plan revolves around 6 main missions, with the Mission 2 addressing, among others, the need of refurbishing the school buildings and its infrastructures; and the Mission 4 devoted to improving the educational system offer for inclusiveness and consistency with the labour market needs; and upskilling teachers and school managers as far as digital learning and the twin transition (green and digital) are concerned.
- **Linee Guida per la Didattica Digitale Integrata (DDI - Digital Integrated teaching)** (MIUR 2020) provides to schools of any order and grade detailed criteria and methods for redesigning the teaching activity in blended learning and on how to prepare the **Digital School Plan (DSP**). The Linee Guida says in this regard "The design of teaching and learning in digital mode must take into account the context and ensure the sustainability of the proposed activities and a general level of inclusiveness, avoiding contents and methodologies to be a mere transposition of what is usually done in presence". The Plan contemplates Distance Learning no longer as emergency teaching but as integrated digital teaching which considered learning technologies as a useful tool for facilitating curricular learning and promoting cognitive development. The

DSP aims therefore at detailed design of the school provisions for DDI considering the specificities of the blended mode. It should be developed, following the provided Linee Guida, by each school of any order and grade and included in the "Piano triennale dell'offerta formativa" (Three years plan of the school training offer), the official document presenting to the community the school's educational offer.

As indicated in the Linee Guida, the DSP should present the following:

- *Governance*: a) how in-presence and online didactics will be organised in terms of hours (i.e. for VET schools it is compulsory to provide at least 20 hours per week either in presence or synchronous at a distance teaching) and blending of synchronous and asynchronous activities b) which communication tools will be available for both students and families (i.e. web site, online registry, etc) c) the platforms and tools (i.e. OERs repositories, online books, ect) in use for digital learning.
- *Teaching methods:* the guidelines emphasise the importance of using teaching methods appropriate for digital learning and mentions some of them (i.e., flipped classroom, debate, cooperative learning, ect)
- *Assessment methods and tools:* the guidelines recommend the use of both summative and formative assessment with the aim to assess and stimulate several dimensions including: the quality of the processes activated, the willingness to learn and to work in groups, the autonomy, personal and social responsibility, and the process of self-evaluation.
- *Need analysis:* the guidelines invite the school to make an ex ante analysis of the enabling services and infrastructure already available in the school and among students in order to figure out "recovery plans" to secure the proper infrastructure and enabling services and their equal access for all (i.e. the BYOD "Bring your Own Device" national initiative for example allows schools to borrow to students laptops and iPad if they do not have and cannot afford to purchase a new device).
- *Teacher's training:* the guidelines require schools to appoint a *digital animator* with the responsibility to develop the school action plan and oversee its implementation, starting from the contents of the Digital School plan and according to its indications. The digital animator should identify purposes, objectives and actions within three main areas: a) Internal training (the training to ensure that managers, teachers and administrative staff are equipped with the necessary skills to govern the digitalization process of the school) b) Involvement of the school community (actions that promote new digital skills of students, the standards of online environments for teaching & learning, the promotion of OERs) c) Creation of innovative solutions (actions related to connectivity, new spaces and environments for teaching and school's digital administration).

As said, according to Linee Guida each school is required to identify and appoint an **Animatore digitale (digital animator),** to stimulate the uptaking of digital practices by the internal staff and manage the school digital transition. The "digital animator" is a teacher who, together with the headmaster and the administrative director, will have a strategic role in the dissemination of digital practices in the school, starting from the contents of its Digital School Plan. It will be prepared through a dedicated training course (relying on the resources of Ministerial Decree no. 435/2015), on all the themes of the National Digital School Plan, to support the overall vision.

VET enabling services

According to the report "Impatto della pandemia sulle pratiche didattiche e organizzative delle scuole italiane nell'anno scolastico 2020/21" (*Impact of the pandemic on didactical and organisational practices in Italian schools in 2020/2021*) conducted by INDIRE, the most diffused enabling services in schools were:

- "all in one" platforms (78.9%),
- the electronic register (75.8%),
- e-mail (52.4%) and instant messaging Apps (44.4%) such as WhatsApp, Telegram...,
- videoconferencing platforms and applications (36.2%).

Schools have opted for integrated solutions by limiting the use of stand-alone tools that might offer functionalities already present in "all-in-one" platforms. In almost all cases (74.7%) the technologies have been chosen at the institutional/school level; only in residual percentages have been used heterogeneously (18.8%), or in relation to the students' equipment (17.9%) or, according to the digital animators' proposal (18.3%).

The most diffused platforms in the schools are:

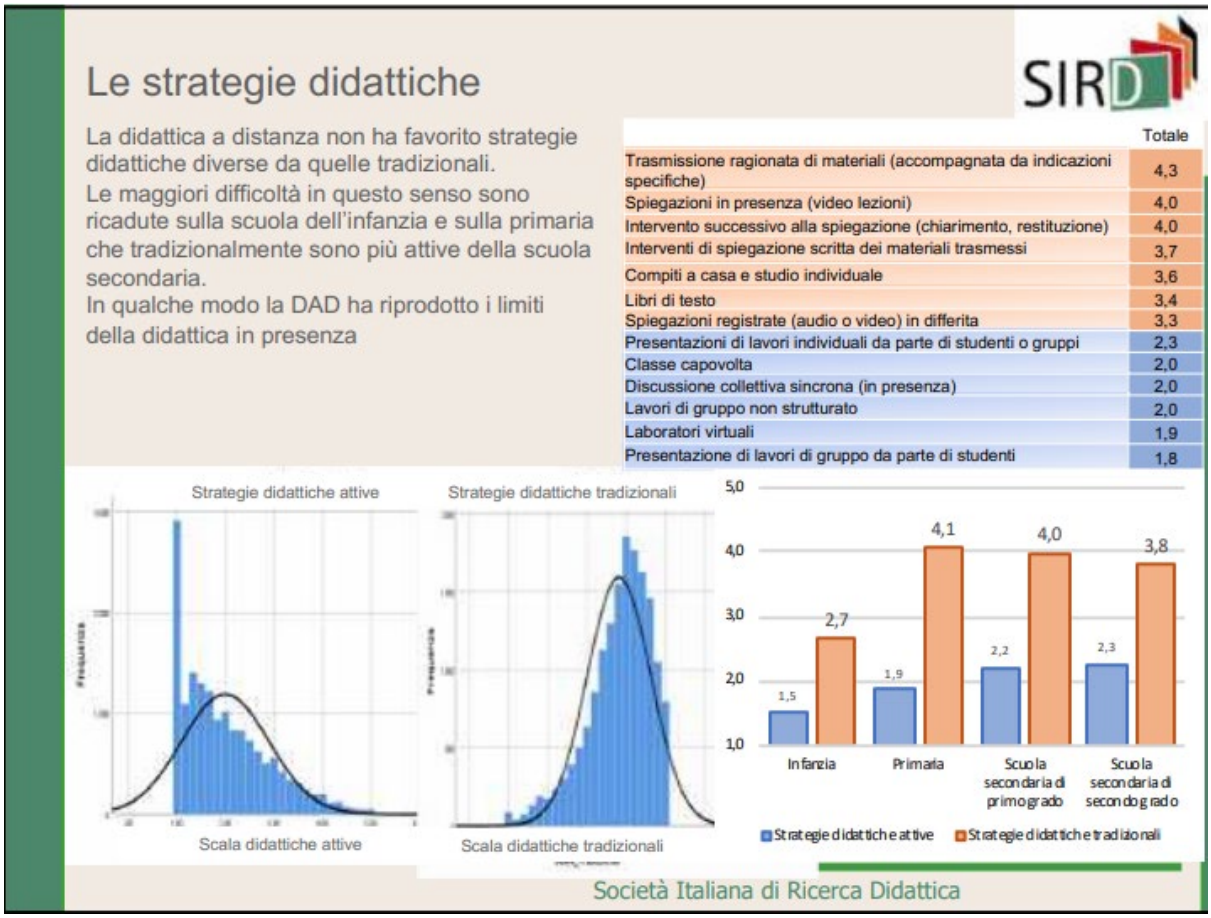
- Classmill
- Docety
- Edmodo
- G-Suite for education
- IO+ Giunti Scuola
- Moodle
- MyEdu
- Office 365 Education
- Redooc
- Schoology
- Socloo
- WeSchool
- Zoom
- ZTE – Zanichelli

VET teaching and learning

In June 2020, while Italy was experiencing one of the most rigorous general lockdowns in the western world, DaD **(Didattica a Distanza - distance learning)** was presented as the only possible way to keep schools 'open'. This produced an increasing demand from the schools for digital devices, apps, platforms, and infrastructures. A partnership of the Ministry of Education with leading national and international ed-tech companies, like Microsoft, Google, and TIM, was arranged to offer ready-made digital solutions to schools. Educational apps usage doubled during the lockdown, with some platforms downloaded more than others.

As far as *teaching and learning methods* are concerned, the recent national research carried out by SIRD (Società Italiana di Ricerca Didattica – *Society for didactical research*) in 2020 involving 16.084 teachers of primary and secondary schools including VET from 1834 cities, revealed that teachers

adopted mostly traditional *passive teaching methods* based on synchronous lessons and asynchronous individual homework activities (see box in orange of the image below), replicating the same methodological approach used in a class-based setting and ignoring the specificities of the online setting. Only a minority of teachers opted for more active learning methods most suited to the new medium used, based on flipped classroom, group-work and collaborative learning (see box in blue of the image below). This confirms the non-preparedness of teachers in making the transition pedagogical-wise: before and during the COVID only 30% of the teachers from secondary schools participating in the SIRD 2020 research, declared to have attended courses on Digital learning.



Furthermore, digital teaching and learning is also affected by a limited digital/ICT savviness of both teachers and learners. The European Commission's DESI 2020 index (referring to 2019 data) reports Italy is in Europe: at 17th place for Internet connectivity; it is in the last position in people digital skills (in Italy only 42% of people aged between 16 and 74 have at least basic digital skills compared to 58% of the EU average and only 22% have advanced digital skills, compared to 33% in the EU); at 26th place of the ranking in the use of the Internet. Furthermore, despite the use of ICT being included in teacher training, only **36.6% were prepared to use it effectively in teaching at the end of 2019**. Moreover, investments in digital infrastructure and tools have not always been adequately accompanied by proper teacher training.

Concerning the digital competences of young learners, contrary to popular belief, they are not innate. According to the International Computer and Information Literacy Study (ICILS) in 2018, as many as 62.7 % of Italian pupils failed to pass the sufficiency threshold.

VET infrastructure

According to AGCOM (Autorità per le garanzie nella comunicazione – The National Authority for communications) on a national level, out of 75.351 schools (from primary to secondary including VET), only 17% use a FTTH connection (Fiber To The Home - high speed connection), compared to 42% of the use of FTTC technology (Fiber To The Cabinet). High speed connection is still a critical issue for schools.

Policy and practice (national/federal, regional, local) – Universities

University governance

As previously mentioned, from the governance standpoint, each university has ample managerial, didactic, and scientific autonomy, also sanctioned by our Constitution (art. 33). Based on this autonomy, the link between universities and local production systems and international networks is developed by each university and represents a differentiation and competitive aspect when the university considers its positioning within the country and internationally[20].

In recent years, many reforms have taken place, especially to support systemic governance as indicated in the Constitution. An important step towards affirming autonomy for universities has been Law no. 168/1989 which provides "guided autonomy" for universities, by identifying specific areas of regulatory autonomy for them: the Law attributes to every single university the power to regulate, through their own statutes, a series of specific areas, as well as teaching, financial and accounting autonomy.

Law no. 240/2010 provides an organic reorganisation of the Italian university system, based on the priority of promoting efficiency and sustainability. With this reform, the autonomous status of the universities is accompanied by precise indications on the composition and functions of the management bodies of each university, in particular:

- The Rector, elected from among the full professors serving at Italian universities, in charge for a non-renewable six-year term.
- The Board of Directors composed of a maximum number of eleven members.
- The Academic Senate, established on an elective basis, as a representative body of the academic community.

Autonomy is precisely the lever used by universities to establish their partnerships at a national and international level, with other public or even private entities, through the participation in tenders. For example, recently the Ministry of University and Research (MUR, March 2022), published a tender[21] worth 1.61 billion euros for the creation of 10-14 large partnerships extended to universities, research centres, companies throughout the country. This tender comes into the framework of Mission 4 of the

[20] Each year the QS World University Rankings by Subject draws up an international ranking in which Italian universities are also positioned (over 1500 universities in 88 countries are analysed). In the latest report, 2022, 10 Italian universities are at the top of the ranking: Alma Mater Studiorum - University of Bologna, La Sapienza - Roma, Polytechnic of Milano, State University of Milan, University of Padua, Polytechnic of Turin, the University of Pisa, the Catholic University of the Sacred Heart, the Ca 'Foscari of Venice and the University of Naples Federico II.

[21] https://www.mur.gov.it/it/news/mercoledi-16032022/pnrr-mur-pubblicato-bando-su-partenariati-attivita-di-ricerca

PNRR and aims at funding basic research projects to strengthen research chains at national level and promote their participation in European and global strategic value chains.

University Enabling services

At the outbreak of the pandemic in Italy, with the first total national lockdown, already from 22 February 2020 the ICT group of the CRUI (the Conference of Italian Rectors) took actions to coordinate and support universities in managing and adapting to the "new reality" of the COVID-19 emergency. The initiatives coordinated by the CRUI allowed universities to rapidly adopt digital tools and transitioning from in-presence teaching to online, remote, teaching.

Thanks also to the "Digital Solidarity" initiative promoted by AGID and the Ministry for Technological Innovation, schools and universities had access to totally free services or to special procurement conditions available for more than a year, to buy services that included:

- connectivity services or Devices,
- e-learning platforms and communication & videoconferences platforms,
- digital contents,
- training webinar for educators,
- tutoring and help services for students.

After the first phase of the emergency, the ICT group of the CRUI continued to carry out the support actions and prepared for the following phases. The initiatives taken by the ICT group included the building of a Web page on the CRUI web site listing all the initiatives designed to support universities. The set up of a Catalogue of available Services was particularly important; the catalogue was prepared with the aim to enhance the digital infrastructures, it included the list of all the universities that gradually were adopting classes with teaching at distance (DAD); webinars for teachers and administrative staff were provided covering all the aspects concerning introduction, adoption, organisational and educational management of digital technologies; the Web page included also surveys for continuous detection of the progress and problems related to the adoption of digital technologies, as well as the catalogue of initiatives aimed at helping universities. Particularly important was the procurement of enabling digital services, in collaboration with the main ICT vendors. Here below a list of the main technologies that have been made available to universities thanks also to framework agreements signed between the vendors and the CRUI[22].

- **ADOBE CREATIVE CLOUD**
- **AWS**

  Financial aid (AWS credits for the design, implementation, and use of AWS services for digital projects related to critical issues due to the pandemic emergency). Consultancy and technical support to help the design, preparation, strengthening or migration of eLearning and distance teaching platforms (e.g., Moodle). Specialised support from Solution Architects Education and AWS Experts, AWS Professional Services, AWS Partners. Distance training for university ICT staff on the use of AWS services and cloud services. Distance training for teachers, researchers, and students on the use of AWS services and cloud services. AWS solutions for

[22] https://www.fondazionecrui.it/primo-piano/corona-virus-strumenti-per-la-didattica-digitale/

teaching, collaboration, distance learning, digital infrastructures of the university and / or research centre (e.g., VDI / Virtual Desktop solutions, WorkSpaces, AppStream Education, Chime...)

- **BLACKBOARD**

  E-learning platform for online exams through the Blackboard Collaborate web conference tool and the Learning Management System (Moodle or Blackboard Learn or other) and virtual classroom.

- **IBM**

  Free trial of SPSS Statistics Subscription for all accounts (active and new), which enriched the three-year agreement signed in January 2020 to allow Italian universities access to innovative services enabling the creation of new cognitive applications for educational purposes, analytics, and research (artificial intelligence, Data Analytics, Public Cloud IBM).

- **CISCO**

  Use of the WebEx videoconferencing platform to organise virtual meetings (voice, video, document sharing) up to 200 participants for a single meeting, up to 200 meetings; use of the Webex Teams application available for PC / tablet / smartphone to create work groups where to exchange messages, files and communicate (video, voice sharing of documents) in a simple and secure way.

- **MICROSOFT**

  Education Transformation Agreement: plan for the adoption of digital teaching tools to support the emergency, with discounted conditions for the purchase of innovative Surface Hub hardware and software.

- **ORACLE**

  Provision of the Oracle Academy, which allows access to Oracle technology and cloud training courses.

- **PANOPTO**

  Video content management platform that allows anyone to create webcasts, record or import videos, edit, view, archive, manage and share multimedia content (video and audio), with automatic generation of Italian subtitles and native integrations with virtual learning environments, such as Moodle and Blackboard, as well as web conferencing solutions such as MS Teams and Zoom.

- **TREND MICRO**

  Cybersecurity software applications.

- **MWARE**

  Software products for the management of virtual activities and the creation of secure software infrastructures.

Considering e-learning platforms, some universities had already started experimenting MOOCs (Massive Open Online Courses) as a form of distance learning offer for several years. The 2015 CRUI report on MOOCs draws an initial mapping of the Italian offer, which will be then further investigated and become part of the National Plan for Digital University (2018)[23]. The e-learning platforms adopted (however, at the time by a limited number of universities) to provide a significant distance learning offer, were the following:

- Coursera,
- Iversity,
- Uninettuno – OpenupEd,
- Moodle,
- Federica (proprietary platform by Naples University Federico II).

University teaching and learning

During the pandemic, Italian universities did not stop and continued to train and graduate students. A survey carried out by the University of Turin in collaboration with the Luigi Bobbio center and UNIRES (University Center for Research on University & HE systems)[24] through interviews via an online questionnaire on a sample of 3.398 professors and researchers from state universities, trace the picture of the lights and shadows of the DAD (Distance Teaching) experience in Italian universities. Thanks to DAD:

- 72% of teachers managed to activate remote teaching within a few days from the start of the lockdown,
- the lesson hours overall did not differ much from those foreseen. In the three-year degree courses, 86% of teachers held the same number of hours, 7% even more. In the master's degree courses, 89% held all the scheduled hours. In the master's and doctoral courses, the totality is touched upon,
- the majority of teachers was thus able to carry out the entire teaching programme. 80% completed the entire programme. Only 11% reduced it, while 9% increased it by making more materials available to online students,
- the majority of teachers have adapted their teaching strategies to distance teaching. 67% have slightly changed both the content and the structure of their teachings. 24%, on the other hand, kept them unchanged,
- the lessons were mainly held in live streaming. 66% of teachers attended live streaming lessons; 15% held both live and pre-recorded lessons; 12% recorded the lessons (in audio or video) and then made them available. 52% made teaching materials available online (handouts, slides, etc.) with or without audio commentary. Only 7%, however, provided only teaching materials or did other activities without streaming or recorded lessons. Most of the teaching was carried out from home, with a sufficient technological infrastructure to guarantee the conduct of the lessons,

[23] https://www2.crui.it/crui/magnifici_incontri_crui_2018/Tav3A%20%20MOOC%20Sfide%20e%20opportunit%C3%A0.pdf

https://www.crui.it/images/demo/crui_web/pubblicazioni/crui_mooc_2015.pdf

[24] https://www.dcps.unito.it/do/home.pl/View?doc=/cps_eccelenza/studi_ricerche.html

- 68% of teachers gave their lessons from home, 17% from other places used for personal study,
- the number of attending students has not decreased,
- the exams were held regularly. At the time of the survey, 92% of teachers had already held at least one online session: 37% of them exclusively an oral exam; 51% an oral exam with the addition of a written and / or other final exam (exercise, report, project, etc.); 12% a written exam and / or another final exam (exercise, report, project, etc.). 61% of teachers believe that they have adequately assessed the preparation of students.

The aforementioned survey highlights that:

- most of those who played coordination roles at universities, departments or within degree programme levels, were very busy in organising meetings, coordinating teachers, and communicating with students,
- most teachers declared an increase in the time needed to prepare lessons and the time needed to organise and conduct exams,
- it should be emphasised that the emergency has led to a drastic downsizing of the most innovative experiences and teaching has been simplified, returning to the traditional model, the transmissive one, enriched -when possible- by discussion with students,
- a substantial minority of teachers reported logistical problems related to the lack of adequate space at home, the need to provide technical assistance to students, or privacy problems due to the fear that the materials created for teaching could be used and disseminated improperly, and that academic authorities could exercise greater control thus reducing the teaching autonomy,
- finally, a small minority had technical problems related to the quality of the internet connection or the IT equipment.

In summary, below is the self-analysis of the teachers interviewed:

- 75% of respondents said they were satisfied with their distance teaching experience,
- 57% of teachers believe they have increased their professional skills,
- Among aspects that were positively evaluated, 51% of teachers said that it has been also an increased awareness of the need for training on teaching methods and techniques, both face-to-face and remotely,
- for 70% of teachers, the time needed to prepare a distance-learning lesson has increased,
- 73% had to increase the time spent for conducting exams,
- 66% said that the distance assessment of students' learning required a huge organisational effort.

The issues encountered by teachers in the DAD during the emergency can be classified into 4 categories:

- **Technological issues**, related to the quality of the internet connection or of the IT equipment. They concerned 14% of teachers.
- **Technical-logistical issues**, connected to the lack of adequate space at home, to the difficulty of balancing teaching and the co-presence and care of one's family members, to technical assistance needed by students. These issues were reported by 31% of teachers.

- **Privacy issues**, related to the fear that the materials created for teaching could be used and disseminated improperly, that data protection is at risk and that academic authorities could exercise greater control and reduce the teaching autonomy. These aspects concerned 31% of teachers.
- **Didactic problems**, connected with the short time available to go live, poor literacy regarding the platforms for DAD, difficulties of interacting with students, lesser access to didactic resources (librarians, etc.), difficulties in adapting own subject to online teaching. One or the other of these problems were reported by 70% of teachers.

Overall, there has been a process of transmitting information that we could define as a "simplification" method. The survey concludes that "**There has been a drastic downsizing of the most innovative experiences. The teaching has been simplified, shrinking around the traditional model, the transmissive one, although enriched by the discussion with the students.**"

The didactic strategies

- The first strategy, transmission-dialogue, has doubled its diffusion. With the DAD it was adopted by 47% of teachers.
- The second strategy, interactive transmission, has remained almost constant. It was practiced by 31% of teachers.
- The third strategy, the collaborative-innovative one, is instead more than halved. It was practiced by 22% of teachers.

The same simplification process was also observed in the conduct of the exams. Where face-to-face teaching allowed richer and more complex ways of verifying learning, with the DAD the latter have been considerably simplified.

Fears and doubts of teachers about further adoption of DAD

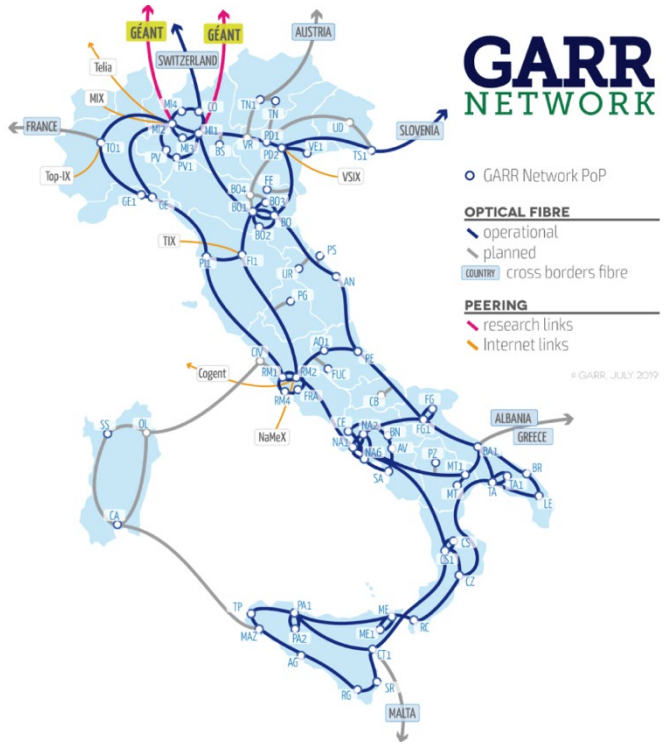
- 40% believe that it could reduce recruitment,
- 57% highlights that it would entail a considerable overload of work and stress,
- 58% believe that it could produce interference by large groups of the technology industry in university teaching.

The pandemic crisis has underlined the crucial importance of teaching in Italian universities. One of the missions that has been taken for granted and neglected in many Italian universities.

The survey focused on relevant issues that emerged during the first phase of the pandemic, highlighting the fragility and challenges to face:

- stress and work overload poured out on technical-administrative structures and on teaching staff already burdened by the innumerable bureaucratic tasks,
- training gap of university teachers, both on teaching in general and on new technological platforms,
- drastic “downsizing” of teaching methods, beyond the best intentions of teachers and the considerable efforts done by universities.

University infrastructure



The technological infrastructure of universities is provided by the GARR network (https://www.garr.it).

As from early 1980s, an ultra-broadband network was conceived in Italy, unified, and harmonised between the different communication networks of universities and research centres, dedicated to the community of education, research and culture**. In 2002 under the aegis of MIUR, the GARR Consortium was born** to manage the network, the founding members are CNR (National research Council), ENEA (National Agency for Energy and Sustainable Development), INFN (National Institute for Nuclear Physics), CRUI (Conference of the Italian Rectors, which represents all Italian universities). The goal of GARR is to provide high-performance connectivity and innovative services to the scientific, academic, and cultural community by fostering international collaboration through interconnection with other research networks and the global Internet. It currently connects over 1000 locations with several million users (teachers, students, researchers) from all study disciplines. GARR offers its community of users both highly innovative services linked to the operation and use of the network, and application services intended for end users:

- **Network management.** GARR-NOC (Network Operations Center) is responsible for the management and operation of the telematic infrastructure. Its activities include the management of any failures, the activation of connections, the collection and publication of statistical traffic data. For this purpose, GARR created the GINS (GARR Integrated Network Suite) monitoring suite which is able to troubleshoot in real time the progress of the network at every level of the infrastructure, simplifying the resolution of problems and allowing interoperability with other systems.

- **Domains, IP addresses, DNS.** GARR – LIR and GARR-NIC are services available for the registration of .it and .eu domains and for the assignment and management of IP addresses.
- **IT security.** GARR-CERT assists GARR users in the field of IT security, managing accidents and preventing their risk.
- **IT security.** GARR-SCARR is a new service for carrying out vulnerability tests on GARR network machines by performing a series of repeated scans on request.
- **Videoconferencing**. GARR Vconf is the multi video conference service that allows to connect up to 80 offices at the same time. The service is free for all users of the Italian academic and research community.
- **Digital identities**. GARR IDEM AAI is the Authentication and Authorization (AAI) infrastructure that allows you to simplify access to online resources thanks to the use of a standard authentication procedure. Choosing a federated approach (IDEM Federation) allows users of member organisations to use their office credentials even when accessing resources from other organisations.
- **Wi-Fi on the go.** eduroam is a service that, in universities and research institutions, offers the possibility of accessing wireless networks all over the world without having to request specific credentials from the host organisation.
- **Personal data storage**. GARRbox is the first cloud storage service reserved for users of the Italian education and research community that guarantees that resources are kept on GARR servers located in Italy.
- **Large file transfer**. Filesender is a web application that allows users to send large files easily and securely to any recipient, obviating the limitations usually imposed on e-mail.
- **Digital certificates.** GARR-CA is the Certification Authority service for issuing digital certificates for people and servers. The use of digital certificates is necessary to sign and encrypt documents and to protect and certify the authenticity of the sites to which you connect.
- **Software distribution.** GARR MIRROR provides the distribution of the most used software available on the net. The GARR ftp-mirror archive is of the order of 240 Terabytes [6].
- VoIP. GARR NRENUM VOIP, in the field of telephony over IP, GARR administers the numbering space for the Italian block +39, valid in the context of research networks, NRENum.net, advises and guides in the implementation of VoIP.

Drivers and motivators

Overall, we might say that the most relevant motivations and drivers toward the digitalization of the Italian education system have been:

- Motivation: via Piano Nazionale Scuola Digitale the Government intended to *build a vision of Education in the digital era, through a process able to tackle all the challenges that our society is facing supporting lifelong learning both as a formal and non-formal process*. The PNSD aims therefore at a *cultural change* toward a renewed idea of school: not just as a physical place rather an open space for learning, a platform that empowers students to develop key skills for working and living in the new society. Digital technologies in this framework are enabling tools to support teaching and learning processes and school administration and management practices.

- For Universities, in addition to the national plan for the digital university (2018), a great boost comes from the PNRR and from the funds that are foreseen in Mission 4, especially for the role assigned to the university and research system to enable innovation and the economic, social, digital, and ecological transition of the Italian society and production system, after the pandemic.
- Drivers:
  - the Covid emergency forced the national government to speed up and complement with additional investments and programmes the actions foreseen in the Piano nazionale per la Scuola Digitale to guarantee continuity in educational provisions during current and future epidemiological emergencies. Consequently, Schools were obliged by law to move to digital learning (DAD initially and DDI after the second year of the pandemic) to continue with the didactics during the lockdown.
  - the PNNR will give a relevant boost to schools' infrastructures and enabling services for the digital transition by offering very relevant investment for renovating the Italian schools' buildings, connections, equipment, and digital services. It will also provide funds for teachers and staff training.
  - The PNRR, the national plan for digital universities, the CAD (the overall set of laws and regulations for the digitalization of public administration) as well as the cooperation protocol with AGID will all be drivers to boost the digital transition of the university system. In addition to all this, the implementation of Mission 4 of the PNRR will further provide funds for research projects aiming at fostering research chains and implementing innovation and digital technology at all levels.

Barriers and obstacles

VET Governance: Barriers and obstacles

VET enabling services: Barriers and obstacles

According to the SIRD research the main obstacles encountered by **students** during the pandemic were:

- the lack / shortage of devices - students might not have devices or do not have enough of them,
- inadequate devices with obsolete technological tools, malfunctioning, not suitable for teaching (lack of microphone, video camera, not supporting certain software),
- difficulties with platforms and apps: not accessible, adequate, and working (apps, software, programmes, classroom, registry, drive).

VET teaching and learning: Barriers and obstacles

According to the SIRD research, the most critical issues related to teaching and learning were:

- an increase in the working time linked to the need to reorganise teaching (revised teaching plans and schedule),
- problems related to managing the virtual learning environments and student engagement. According to the Osservatorio Indire 2020/2021, the active participation of students was a

very critical element for 66.6% of teachers from the upper secondary school together with the psychological situation of the students,

- how to manage the assessment. 87% of teachers said they followed the guidelines provided by the teaching staff, whilst 73.5% the guidelines provided by MIUR. Assessment was carried out mostly via written tasks (71.5%), oral questions (64%), research tasks (63.7%), tests (61%). And in any case, it turned out to be very difficult to activate self-assessment modes (44%) and group work (24%).

Overall, the researchers concluded that *in the face of a great workload, the evaluation of the results appears not commensurate with the perception of learning effectiveness and inclusion*.

Furthermore, carrying out the practical parts of the curricula is particularly challenging in the context of distance learning. This is particularly relevant in VET, where learning from practice and technical training forms a large part of the curricula.

VET infrastructure: Barriers and obstacles

- poor / no connection problems arising during the lessons (lack of internet line, little signal) and which prevent students to participate continuously to the lessons.

Again, it emerged clearly from different research that connectivity (lack of high speed connection) was a major issue for both students and teachers/schools.

University: Barriers and obstacles

Undoubtedly the pandemic and the prompt reaction of the universities that - through CRUI - have signed agreements with the main vendors to introduce and use digital technologies and services to support operations and teaching, have produced a leap forward in digital literacy of teachers, students and management staff.

The CRUI emphasises the need to carry out a resources rationalization process and encourages the adoption of digital technologies; for this purpose, it has strengthened a specific IT working group participated by the universities, which was already established in 2017 by the CRUI. This working group has the task of analysing needs and promoting plans for the digital transformation of universities, also optimizing existing and shared resources and expenditure, thus substantial cost savings, through negotiations and framework agreements with key multinational players of the Information Technology sector. Regular surveys on the needs of each university are strongly recommended to define rational multiannual plans, that can be functional to the strategic plan of the digital transformation of universities[25].

Within this framework and considering the policies adopted, barriers and obstacles can derive from the complex and bureaucratic structure of the universities, where the autonomy they have in the management can also be an obstacle to a rational digital transition process of the universities as a system, whose importance is crucial to the competitiveness of the whole country.

[25] CRUI, REPORT ON OPERATIONS 2020

Future Outlook and Opportunities

Strengths	**Opportunities**
• The pandemic allowed a massive real-life experiment on digital learning and several good practices emerged for blended learning. • The schools and teachers during the pandemic had a massive "on the job" experience and got familiar with digital teaching and learning and related tools. They realised that digital learning is doable and that they can do it. • Same perception from the university teachers, as recorded in the survey conducted during the pandemic.	• Funds coming from Next generation EU (PNRR) for advancing the PA (including VETs/HEIs) digitalisation process (infrastructures, enabling services, teacher, and staff training). • Funds coming from Mission 4 – Line 1 and 2 of the PNRR for the digital transition of the universities. • Codice dell'Amministrazione digitale e collaborazione tra university system and AGID (via CRUI partnership protocol).
Weaknesses	**Threats**
• Teachers are not prepared pedagogical-wise (most critical elements are how to blend digital and in-presence activities, active teaching & learning methods, and assessment). • Most of the schools do not have high speed connection. • Mechanisms/pedagogies for managing effective e-work-based learning for VET are missing. • For universities: teachers are not prepared pedagogical-wise and there is a substantial need of change-management of operations (and related reskilling of employees).	• Schools are overregulated, and this might prevent them from introducing real innovation (opting rather for formal compliance). • Bureaucracy and redundancy of processes, as well as resistance to change of the operations and teachers.

Conclusion

To sum up we might say that whilst the pandemic gave a boost to the digitalization process of the Italian educational systems by experimenting on the ground new organisational, technological and pedagogical approaches, methods and tools for digital learning, there are still some concerns and blockers preventing a systemic digital transition of the Italian education system.

Such concerns and blockers are:

Governance

- The recent policy provisions foresees the appointment of a digital animator inside each school (including VET) with the responsibility, together with the headmaster and the administrative director, to oversee and support the implementation of the Digital School Plan. This is to create proper internal governance for managing the digitalization process and the DDI. Nonetheless there is no evidence yet on whether such a new organisational setting is producing the expected results and will contribute to bringing real innovation inside the schools rather than formal compliance to the national rules.
- The smooth and efficient functioning of the governance structures of the universities that are accountable of their autonomous management both at organisational and didactic level. Italian universities show themselves unevenly to the appointment with digitalization and with the challenges that arise from the increasing pressure to raise quality and adequacy of the educational offer, with the additional challenge of a north-south gap in the country.

Enabling services

- To offer equal opportunities to all students they should be provided with adequate devices to access digital learning from home. Despite the BYOD initiative there are still issues within vulnerable groups and minorities.
- The "all in one" platforms seem to be the best choice for schools. It seems that schools are free to decide which technological solution to adopt among those available on the market and recommended by the government. Although there is no evidence in the document analysed, we might argue that the diversification of technological solutions in schools might represent limitations toward the provision of common national technological standards for DDI.
- Universities have the characteristics of being institutions enjoying wide organisational autonomy, and they can make their own choices and agreements with technology providers: the memorandum of understanding with AGID, the national conventions stipulated by CRUI with the main vendors and the existence of national infrastructure policies (e.g., the national cloud as a public digital infrastructure) create the conditions for systemic action.

Teaching and Learning

- Support the schools in reconceptualizing the blended learning mode, where the centrality of the classroom is reconsidered in favour of more flexible space/time programme design for virtual and blended settings. Specifically for VET providers it would be important to understand whether and how work-based learning could be delivered in digital and/or blended mode.
- Support/training for teachers on active teaching and formative assessment in digital environments. The use of active teaching and formative assessment could also support a recovery of student participation/engagement and motivation with positive effects on actual learning outcomes.
- Support the students with inclusive interventions aimed at their psycho-physical and social recovery, as well as at stimulating their motivation to learn, which was strongly impacted by social distancing and passive teaching methods during the DAD.

- The digital transition of university teaching is still largely incomplete: online teaching models still too often reflect the mere transposition of face-to-face teaching in a remote environment, rather than a true innovation guided by design principles that have to be consistent with the educational technologies available.

Infrastructure

- As of December 31, 2021, ultra-broadband Internet connectivity services were activated at 7690 public schools. The objective is to reach by 2023 a total of 35 thousand schools to be connected. If the goal is reached, important progress could be made by the schools in the provision of digital services.
- In Italy, the GARR consortium was created to provide high-performance networks for teachers, researchers and students of Italian universities and research institutions.
- Over the last few years GARR has also gained in-depth skills for the creation and deployment of cloud technology solutions, which can be managed efficiently and effectively, thanks to the high level of automation that only well-developed information technology can achieve. GARR can thus create and manage virtual servers in a very efficient way.
- In addition to this, a new service has been introduced, called DaaS (Deployment as a Service), which allows those who are not skilled as a system engineer to create applications instances, useful for work on the same cloud platform collaborative, chosen from a catalogue. For example, in a few steps it is possible to activate one's own instance of Moodle (an open-source online learning environment) and then manage it independently.

Case Studies

For what HE/VET is concerned, since early 2008 the Italian Government (MIUR) has launched a series of programmes to stimulate the digitalisation of the educational system. Despite the funding and actions promoted by MIUR and implemented at school level for speeding up the process, before the pandemic the schools were still affected by several structural constraints preventing the digital transition, such as the lack of high-speed connections and the lack of suitable school infrastructures (i.e., laboratories). Moreover, from a methodological viewpoint, teachers were not prepared to facilitate the transitions. Most of the training provided focused on how to use specific tools rather than on new pedagogies for digital learning, and a cultural resistance of both teachers and governance toward digital teaching and learning practices was still prominent. The teaching mindset remained strongly characterised by an "in-presence approach" built around the centrality of the classroom as a ruled environment.

The pandemic was an opportunity for HE to unleash different modes of thinking about the reconfiguration of the school in a "blended mode", mediated by digital devices and/or platforms. The digital transition of universities is a systemic process, closely linked to the digital transition of the entire society and the production system. In particular, the digitalisation of Italian universities has been generally formulated within the same framework and set of measures designed to promote the digital transition of the Public Administration as a whole. The university system has now to face new challenges, such as students and teachers' international mobility, new types of research projects, as well as the need to achieve higher quality standards to be up to par and competitive with other HE organisations at international level. Lastly, Universities need to improve their operational organisation

top-down, starting from the governance, to become more efficient and proactive in achieving their performance goals[26]. An important boost to the digitalisation of universities is coming from the implementation of the PNRR (The Italian Recovery Plan) which dedicates a specific line of intervention and a considerable amount of funds (Mission 4), to the university and research system. The COVID-19 pandemic has forced universities into a whirlwind computerisation, which has showed some critical issues as well as new opportunities. Universities proved to be quick and efficient in dealing with the emergency, however in a full operational situation they are still struggling to reorient programmes, teachings, methods and studies, administrative processes.

To summarise, the university system, whose development is at present subject to pressure from the growing and changing needs of the production system and the ongoing social, cultural, and demographic change, is facing some systemic obstacles to achieve digitalisation. Such obstacles appear to relate to three main organisational challenges:

- adaptation to new organisational and service models,
- availability of managerial skills and cultures to support and manage change,
- innovation, pedagogical-wise, of training and teaching approaches and methodology.

To draw up this report we used a methodology that took into consideration quantitative elements, through questionnaires, and qualitative elements through interviews. We started by drawing up a mapping of institutions at national level and we asked to some of them if they were available to participate in our project through questionnaires and interviews. For the questionnaires we turned to teachers and students and for the interviews we turned to administrators, teachers, IT and/or specialised staff who dealt with the digitisation of institutions before, during and after the pandemic. For our analysis we have intercepted a total of seven institutes including four universities and three HE/VET and we made 20 interviews (of which 8 governance, 3 IT, 8 enabling services), 12 surveys to teachers and 57 surveys to students.

Pre-pandemic status quo - Case study: HE/VET/Universities

Luiss Business School

Luiss Business School is the School of Business and Management of the Luiss Guido Carli University. Its mission is to promote the development of professionals capable of leading the change and innovation processes. The teaching methods are based on the close link between teaching and applied research, experiential activities, and academic excellence, to meet the real needs of the business community.

For Luiss Business School we interviewed Francesca Mastrogiacomi, Professor of Practice and rotating Chair of the Teaching and Learning Lab, a committee that deals with the digital and learning experience where Francesca coordinates the production and design efforts from both strategic and digital product development for: Executive Programmes, Masters and Asynchronous Programmes.

The Teaching staff and students did not partake in the survey; therefore, all information regarding the teaching and the students' experience was drawn from the interviews with the Governance.

[26] "Come cambia la governance. Università italiane ed europee a confronto", Fondazione CRUI, 2015 (The Foundation of the Italian University Rectors)

Motivation and drivers

Starting from 2018-19 Luiss Business School designed the Faculty Digital Transformation Programme to renew pedagogy starting from the professors. Over the years, investments and the production of digital teaching materials have been increased by a unit created ad hoc called Digital Factory, which consists of a digital video producer that produces audio and video materials. Over the years, the Digital Factory has been supported by an office, called LuissX, which deals with digital marketing for the promotion of online and offline programmes, and which is made up of four instructional designers for the delivery of digital materials.

Barriers and obstacles

From the interview emerges that training institutes should make investments in terms of people, software, and resources to develop new ways of working within the organisation. Governance must have a strategy that disregards the COVID-19 pandemic.

Politecnico di Milano

Politecnico di Milano is a public scientific-technological university which trains engineers, architects, and industrial designers. The University has always focused on the quality and innovation of its teaching and research, developing a fruitful relationship with business and productive world by means of experimental research and technological transfer.

Research has always been linked to didactics and it is a priority commitment which has allowed Politecnico di Milano to achieve high quality results at international level as to join the university to the business world. Research constitutes a parallel path to that formed by cooperation and alliances with the industrial system.

For Politecnico di Milano we interviewed Massimo Tadi, Associate Professor of the ABC Department in the Master of Architectural and Building Engineering. Moreover, we submitted a survey test to the students that attends Prof. Massimo Tadi's lessons.

Motivation and drivers

In Politecnico di Milano, the strategy to implement the digitisation of pedagogy, began seven years ago. The innovation of pedagogy has passed through innovative teaching forms (i.e., flipped classroom, courses shared with other universities). The pandemic permitted to rethink about the involvement of students during the lessons that could not be held in presence because they must be at home. Fortunately, Politecnico has given the technological support and tools to be able to bring all the educational programmes online in a short time, also digitising all the in-presence classrooms.

The survey we submitted to Politecnico's Students confirms that the University was prepared to the digital acceleration that we saw during the pandemic.

Barriers and obstacles

For years, Politecnico has been innovating teaching methods that pass from an in-presence approach to an online one that is characterised by advanced mode of interaction with specific tools. Interaction requires a series of communication tools and methods that frontal teaching does not have. There is a problem related to how to create interaction and how to dialogue with students by involving them during the lessons.

For what concerns the opinion expressed by students we can notice also other obstacles regarding the fully online teaching related to the connection or having a silent place where to follow the lessons.

Università di Bari Aldo Moro – Facoltà di Psicologia

Public university located in Puglia. To this day, the mission of the University primarily focuses on in-presence teaching. However, it features a Distance Learning Centre (the ADA Centre - University Services for E-learning and Multimedia), an interfaculty multimedia laboratory supervised by the University Coordinator on behalf of the Dean.

There are several deputy e-learning coordinators. In the Psychology department, the Head of the Bachelor's Programme – a full professor – also acts as Deputy. In this dual role, she coordinates a group of colleagues who are active, on their own initiative, in the development and dissemination of teaching alternatives to the traditional frontal instruction method. The group's activity mainly involves sharing good practices and analysing specific issues, with the aim of creating tangible tools and collaborative solutions. The coordinator has tried to formalise the good practices gathered so far, for example by creating user stories.

The enabling services, both from an IT and administrative point of view, are coordinated in a centralised way. Both before, during and after the pandemic, the ministerial policies are transmitted by the central office to all departments, whose coordinators look after, together with the administrative staff, the application and possible adaptation of the same directives to their respective characteristics and needs. All interviewees are part of the Psychology department and mainly deal with administration and data processing for academic and research purposes, as well as for the University's third mission. The latter include applying participating in research funding calls, as well as stipulating agreements or partnerships with regional, national, and international bodies. Equally important is the orientation provided to both inbound students (regarding the educational offer of the University) and those who are finishing their studies (regarding future career opportunities).

As for IT services, the University IT specialists are tasked with supporting the administrative officers. In addition to the specialists, a considerable number of professors and officers, especially from the central administration, deal mainly with the university's IT service. In fact, the administrative staff refers to them as if it were an operational unit.

<u>Motivation and drivers</u>

Before the pandemic, distance learning was part of the University's strategy on a theoretical level, in that the Governance had set the goal of implementing the first steps for the digitalisation of the University's offer by first experimenting on specific courses. This procedure was the basis for the extension of distance-learning policy during the pandemic. Before the outbreak, the study group negotiated with the Governance and managed to have two IT specialists trained on distance learning, more precisely on how to conduct and facilitate webinars. Such initiative proved useful in persuading a number of colleagues who were initially sceptical towards such opportunity.

<u>Barriers and obstacles</u>

The agency of the study group is however quite limited. Before the pandemic, it asked the department to set up a tutor specifically intended to support distance learning, but the request was not successful due to lack of funds.

Università UnitelmaSapienza – Università degli Studi di Roma

Public telematic university located in central Italy. Because its programmes are offered entirely online, many processes of the educational, administrative and communication areas were already digitised from the start. Following ministerial directives, since 2019 the University has further invested in the standardisation and adaptation of digital teaching.

The didactic coordinator of Unitelma oversees training both faculty and tutors. In addition, the Coordinator defines the teaching model, therefore the methodologies and technologies to be adopted, in particular with regards to the following tasks:

- the design of the curricula on both a macro- and micro-level, (that is, from each curriculum in its entirety to each single class),
- skill assessment and final evaluation.

The operative units of such initiatives, covering the governance, management, and implementation of educational and IT services, including tutoring are:

- the IT, Strategic and Commercial Systems Area (ASISCO),
- the Degree Courses Teaching Support Area.

The departments were created in 2018.

ASISCO is a multifunctional office, as it deals with brand communication, marketing and at the same time with technical support and IT services. The manager mainly works with the faculty concerning the upgrade of Unitelma's platform, based on Moodle, or the creation of online events. ASISCO often interfaces with students too, with regards to technical aspects of the platform and the events.

In addition to the ordinary communication tasks, which are mostly internal and revolve around the management and upgrade of the curricula, work groups are set into place to work specifically on projects related to the area objectives. These projects are launched at the beginning of the year and can concern small groups within the same area, collaboration with other areas, or both.

The Teaching Support Area also deals with the accreditation and quality assurance procedures in compliance with the parameters given by the National Agency (ANVUR, National Agency for the Evaluation of the University and Research Systems) which provides specific criteria regarding e-learning standards.

In coordination with ASISCO, the Teaching Support Area manages the preparation of the Moodle platform year by year, to update the curricular portfolio. This activity includes the creation and adaptation of pages and contents over time.

The Area also provides practical orientation to new faculty members which is subsequently strengthened through further training. Meetings with the area officers are set so to provide faculty with practical support regarding interactive teaching activities, that is, activities specifically targeting the students' needs to consolidate the knowledge acquired using video lessons, textbooks. In this sense, officers act as facilitators because they provide a brief overview of the platform settings, while the teaching staff can freely choose the most appropriate teaching methodologies. Finally, the area deals with the tutoring of teachers and students.

The Teaching staff and students did not partake in the survey; therefore, all information regarding the teaching and the students' experience was drawn from the interviews with the Governance and the Enabling Services managers.

Motivation and drivers

Teaching-wise, from 2019 the University has expanded their team and implemented a range of methodological innovations to enhance both their teaching methods and curricular programmes. The Ministry requires the University to carry out compulsory internal training for the teaching and didactic support staff in all departments. The University has chosen to focus on two key roles:

- the Teaching Coordinator, charged of providing internal training,
- the tutors.

The training provided by the Teaching Coordinator are the following:

- a curriculum design course for the teaching staff, focusing on the programmes, focusing on both the design of the courses in their entirety, and the structure of each class,
- two training meetings a year, featuring guest lecturers, focused on sharing best practices and peer-to-peer teaching.

The tutor is seen as the "beating heart" of the teaching activity. Complementing the course designed by the teaching staff, the tutor manages and aids all remote interactions and activities on the platform, which are the heart of the learning experience. ASISCO and the Teaching Support area coordinate of three sets of tutors:

- the programme tutors, who provide information and guide the students in managing and planning his / her career,
- disciplinary tutors, who support the student in the classroom, provide practical orientation and information,
- tutors in charge of conducting webinars and supporting both teachers and students. Such tutors are charged of orientating the students toward the best way to study the subject, clarifying the teacher's requirements, and explaining the activities that are planned as part of the programme. At the same time, they support the faculty in the design of interactive teaching activities.

The Didactic Coordinator is tasked with training the tutors by strengthening their skills in managing and monitoring the teaching activities, as well as in motivating students.

Before the health emergency, in 2019, these trainings were provided in presence.

Barriers and obstacles

A number of cultural barriers or biases impede the integration of tutors into the staff, as well as the optimisation of their skills. Most notably, a hiring commission will expect of the candidates a good knowledge of the subjects related to the fields of specialisation of the departments and the faculty; whereas a specific set of organisational and methodological skills would be sufficient to carry out the tutoring activities. Consequently, new hires often are unexperienced because their educational background in a specific disciplinary area is prioritised over prior tutoring or working experience. Such choices come from a generalised confusion of the content expert with the teaching methods expert.

There are also areas for improvement in the tutors' teamwork skills because most of their daily tasks are run independently and remotely, thus precluding opportunities for informal exchange, for sharing of knowledge and tools among colleagues, and enhancing the risk of experiencing work-related stress. Furthermore, generally in the academic field, the teaching staff is not so prone to workgroup, except for those colleagues with professional experiences outside the academia and in roles involving collaboration between colleagues.

Fondazione ITS Logistica Sostenibile

Fondazione ITS Logistica Sostenibile proposes itself as a special School of technology, has an autonomous legal configuration in the form of the Foundation of participation, and is appointed to carry out two-year post-diploma courses of high specialisation for the training of High-level Technicians in the technological area of logistics and mobility of goods for the economic development and competitiveness of our territorial system.

For Fondazione ITS Logistica Sostenibile we interviewed Giuseppe Bardelli, general coordinator that deals with organisation and learning. Moreover, we submitted a survey to two teachers. Students did not partake in the survey; therefore, all information regarding the students' experience was drawn from the interviews with the Governance and the Teaching Staff.

Motivation and drivers

Before the pandemic they had no strategic plan regarding the digitisation of education, they only used Skype for one-to-one meetings but not for lessons.

Fondazione ITIS Logistica Sostenibile deals with projects financed by external entities, that many times are public entities, with fixed rules and one of the aspects, on which the Region has focused in recent months, is the return to in-presence lessons allowing institutions to make a maximum of 25% of hours online. Talking about strategy is complex, it is important to have tools and skills to be able to manage the digitisation of teaching.

Barriers and obstacles

In March 2020, when the lockdown began that forced us to stay at home, they were not ready and able to face a situation of this type also because the courses of the Foundation are characterised by practical and laboratory lessons and therefore an alternative distance learning system was not thought of yet. They have been forced to use tools to bring all the education programmes online and this has led teachers and administrators to specialise also in the field of digitisation.

Fondazione ITS Kennedy – Alto Adriatico

Vocational Education and Training Institute (VET) located in Friuli Venezia Giulia, North-eastern Italy**,** offering degrees in software architecture, digital innovation for the 4.0 industry, digitally driven management communication, and production technologies, among which mechatronics and IoT. Head of the Fondazione (Foundation) is also responsible for the didactic planning and is supported by a didactic coordinator. In addition, by virtue of his professional skills, the Head supports the IT area by monitoring and analysing data referring to the engagements and the activities on the Institute's digital platform. The governance of services, and in particular the systemic management of IT services, is carried out in partnership with the Management of the University Consortium (host institution of Fondazione ITS Kennedy).

The management of the enabling services concerns three main areas. The administrative manager follows the selection, enrolment, and orientation of inbound students, as well as the financial reporting and the management of the strategic partnerships. The manager is supported by didactic tutor who oversees managing and of ensuring the quality of the training courses.

The third area concerns specific IT services. The IT governance is led by the President, with the support of an IT specialist with regards to the design of services as well as of the digital tools.

Motivation and drivers

The Institute's digitalisation strategy has been in place since 2011. It has undergone a major push since 2015 and then accelerated in response to the pandemic. Since 2011, students have been equipped with a notebook and, since 2015, the use of Google services has been formalised. As of today, teachers, students and staff use services such as workspace, meet, classroom, and other to carry out a wide range of tasks on a daily base. Moreover, teaching and management documents since 2015 are stored on Google Drive.

The teaching methodology was relatively adaptable to the needs of the transition even prior to the pandemic, as it was already based not on frontal instructions and homework, but on practice and learning. The teachers act and are consulted as collaborators of the didactic managers in case of specific needs or initiatives. Teachers cooperate with and support the management by sharing good practices and technical knowledge of the digital tools.

Barriers and obstacles

Governance and teachers were prepared for the possibility of teaching in a hybrid form, but in reality, they had never taught lessons in asynchronous mode, as such modality was not allowed by directives of the ministry.

Fondazione ITS Alessandro Volta

VET Institute located in Friuli Venezia Giulia, North-eastern Italy offering a wide range of specialisations. Among these, the main teaching areas concern on the one hand digital design and 3D animation, and on the other the biomedical field. The Institute has several interactive laboratories equipped with specific instrumentation, including an operating room and x-ray instrumentation. There are also diagnostic imaging departments. Each laboratory is supervised by a specialist in the field.

In addition to the DiDean of the Foundation, there is an educational area followed by the administrative manager and by two didactic coordinators, one of whom also takes care of the helpdesk. Both coordinators are also in charge of the tutoring activity.

The Institute's Governance also includes a communication manager, an IT services manager, a technical-scientific manager of all laboratories and a supervising specialist for each laboratory. The current IT manager oversees the Institute's computer systems, namely the network and server systems. He has 15 years of experience working on networks and was hired in 2020 to implement the Eduroam service in both locations of the Institute. He subsequently took over the management of the systems. He currently works remotely from abroad.

Motivation and drivers

The didactic services area underwent a substantial reorganisation a few months before the lockdown. In addition to the three current appointees, eight other supporting officers contributed to the first steps of the digital transition and subsequently provided additional support during the lockdown. The team consisted of two people per course: one in charge of managing communication, the other administration.

At the same time, in 2020 the previous manager set up the frame of the current digital platform, testing its functionalities and creating the user profiles. To do this he collaborated with the manager of the didactic area, defining the settings of platform to be used. Thus, the platform was at first created to function as the Institute's internal infrastructure.

In the capacity of the technical-scientific manager, the previous IT specialist had also set up the working groups for each of the Institute's laboratories. Finally, the didactic coordinators were enabled as administrators of the groups and tasked to organise and manage them. As administrators, they additionally instructed the students on the settings of the platform and conducted technical tests with them.

Barriers and obstacles

The institute's situation throughout the pandemic was overall critical in that, when the lockdown went into effect, the academic year had already started and therefore all courses and internships had to be guaranteed.

During/Post-COVID-19 Status Quo Case Studies of Digitalisation of HE/VET/Universities in Italy

Luiss Business School

Policy

There was already a digital strategy before the pandemic that started in 2018-19. The governance of the School already had a defined strategy regarding the digitisation of education with the objective of modernising teaching focusing on students and using digital tools to change the pedagogy. With the pandemic this strategy has taken an acceleration causing the creation of other formats of education called Flex Programmes. This process is going on and, in June, the School launched the Online Programmes. Nowadays, the digitalisation of education is strategic for a Business School like Luiss Business School but it should also be deeply framed in the new way teachers make lessons and students learn. There should be a vertical adaptation on how to train people.

Motivators and drivers

During the pandemic, Luiss Business School structured a digital unit that deals with the development of educational programmes as well as the digitalisation of the school creating tools that have the objective of facilitating the lives of students and of the ecosystem (i.e., administrative staff, teachers). The evolution was moving from internal resources to outsourcing based on peaks. From a strategic point of view, the School used the flip learning methodology to redefine the digital material and make it become a driving force in practice. With the pandemic the digitisation of education was massive because the percentage between asynchronous and synchronous has reversed. They went from a 20%

flip classroom with digital material provided in advance and then discussed in class face-to-face, to a system that was for 80% digital (webinar, asynchronous material always anticipated). Having a strong strategy before the pandemic, the School could use tools that were already available and had to only expand their functionality.

The latest effort was to relaunch the Digital Teaching for Learning in conjunction with the Digital Learning Lab to train teachers and to have an educational offer for students as well. As for platforms, there is Moodle and Fires for some programmes such as online programmes. The objective was to digitise the historical offer.

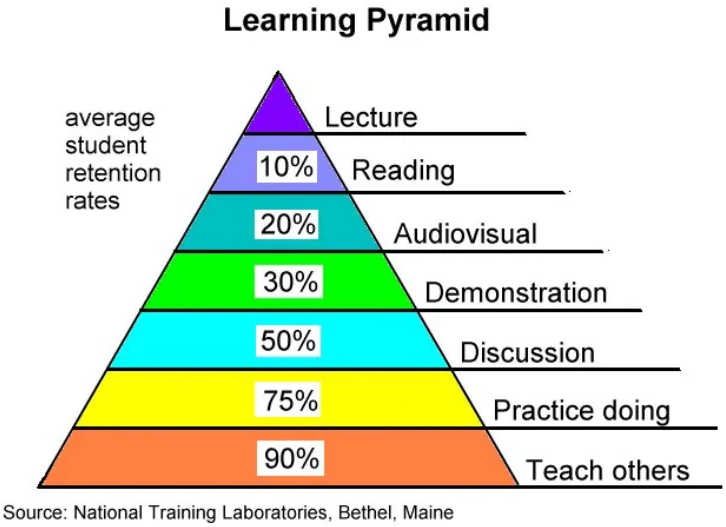
Obstacles and lessons learnt

Platforms must be guided by experience and pedagogy. The challenge is to find the right balance to make the learning experience effective for students in the context and moment they are living. It is a tripod: technology, content, and pedagogy. These things have to be in balance.

Politecnico di Milano

Policy

For some years Politecnico has adopted the blended classroom methodology and flipped classrooms. This has led to a revolution in teaching that is no longer frontal: in fact, the fontal part of the lesson lasts about twenty minutes because students have to do their assignment before the lesson itself. Professors give students digital materials of different nature (i.e., video, presentations, papers) that are provided in advance and permit students to know the topic of the lesson beforehand. To verify if the students do what are asked, it is necessary to implement innovative techniques in the mode but traditional in substance: students have to complete an initial test that measures the level of acquisition of preliminary information. At this point, they come to the frontal lesson that lasts twenty minutes and in which the teacher can deal with specific topics. In Politecnico the lessons last twenty minutes according to the Learning Pyramid.



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[27] The Learning Pyramid: studies show that varying your study methods and materials will improve your retention and recall of information, and enhance your learning experience. The "learning pyramid", sometimes referred to as the "cone of learning", developed by the National Training Laboratory, suggests that most students only remember about 10% of what they read from textbooks, but retain nearly 90% of what they learn through teaching others. The Learning Pyramid model suggests that some methods of study are more effective than others.

During the lessons, the teachers divide the class into groups in which multiple activities are done with a predetermined time and then students are asked to become teachers by showing others the result of what they have worked on. After that, students have to complete another test, the exit test, which has a series of questions that are used to understand the level of acquisition of the activities that took place in the classroom. As last activity the students publish the results of their team works in the Facebook page of the course.

Motivators and drivers

Concerning the tools, those used were those of seven years ago when Politecnico started to change strategy. When the pandemic arrived, the problem was that the process of engagement of the students, which was all based on coexistence and physical interaction, had to go totally online. From this, the necessity to renew the pedagogy working on an interface that had to be shared with people who were in different places. Politecnico, then, had developed a series of new skills because the interaction could no longer be physical and there was the necessity to create different spaces that were online reproducing the in-presence activities. The pandemic made possible to develop these new skills reproducing the same interaction that the students and teachers had in presence.

The pandemic gave outsiders the opportunity to understand that it was very easy to interact, and this greatly changed the interaction between courses and the outside world.

In the survey students have expressed their satisfaction regarding the online services that the University gave them.

Obstacles and lessons learnt

For the future, the challenge is to put together the best of what people were forced to do during the pandemic by taking a technological leap of years. Everyone is much more technologically prepared. There is a heritage that has developed unconsciously with a sudden leap.

Today the presence in a physical space by the students, after two years of being at home, has decreased the desire to go to the in-presence classroom.

The challenge is to understand what the wealth of experience is, knowledge, potentiality that we have acquired declining it to the best we were used to previously.

We asked the students, from now on, if they prefer online or in presence classrooms: the majority of them would prefer blended classroom.

Università di Bari Aldo Moro – Facoltà di Psicologia

Policy

With regards to teaching practices, during the pandemic the University received very strict and precise instructions from the Dean because the request was to standardise distance teaching. The Dean therefore decided to use Microsoft Teams, the platform so far used for staff meetings whenever working from home, although some faculty members already used it to give lessons. Regarding IT support services for distance learning, 75% of the researchers and teachers interviewed took

and that varying study methods will lead to deeper learning and longer-term retention in https://www.educationcorner.com/the-learning-pyramid.html

advantage of the possibility of using a device provided by the University. In the case of students, however, there was no possibility, but in most cases not even the need, to request the devices.

The staff was given instructions on how to use it and operation management passed into the hands of the Central Office. The general guidelines set by the Central Office were very instrumental and technical, and focused on the use of the platform, whereas there was no indication of the teaching method best suited for teaching classes remotely or evaluating the students. That being sad, and besides experiencing more limitations, with the arrival of the pandemic and the directives of the University, the faculty involved in the study group continued with the experiments informally, on its own initiative.

Motivators and drivers

The study group also discussed how to make the assessments more dynamic, for example involving the students in the definition of the assessment criteria and tools. The group also included people who were very critical of distance learning, and the exchange was quite constructive.

From an administrative point of view, the transition initially consisted in the simple transposition of paper documents into digital ones. The staff feared losing track of documents and information; on the other hand, with the construction of a common base of knowledge, the officers have realised the advantages of a digitally driven process, and now the administration is proceeding towards an almost complete digitisation. Such transitions allow the creation of archives of previous procedures that are very useful in the onboarding process of new colleagues and in keeping track of the activities.

The digitisation of the initiatives for the third mission was also a success. Orientation for superiors has been transposed online, reaching an audience of students up to almost ten times larger than in the case of previous face-to-face initiatives, welcoming participants even outside the province.

Obstacles and lessons learnt

Overall, the digital transition has led to greater collaboration and interaction between colleagues, especially for the sharing of good practices. It has also enabled significant time optimisations and brought forth more practical tools to manage existing processes. At the same time, there have been some setbacks relating to the centralisation of the policies on teaching, as requested by the Ministry and implemented by the Dean.

From the viewpoint of didactic experimentation, most activities of the faculty study group on experimental didactics were suspended during the lockdown.

Most importantly, technologies have radicalised opposing biases and behaviours, thus experiences: the teaching staff who were familiar with more interactive methodologies and had a more digitally prone mindset, and who therefore were also familiar with suitable tools and methods, kept on relying on such resources. This choice took place in a very autonomous way, all the while respecting the Ministry's policies. On the other hand, those who had not experimented with this type of modality, relied instead on the frontal instruction method and their experience with remote teaching was quite negative. Such polarised experiences brought forth a paradoxical effect, that is, the biases against distant learning were reinforced with the pandemic, and often enhanced by exhaustion due to the prolonged use of the PC and software such as Zoom.

Similarly, the obsession of controlling the students during tests and evaluations emerged from the policies and in some teachers, with the assumption that cheating and break the rules would be a common practice.

From an administrative point of view, with the digitisation of workflows and documents, the transit of papers, even though it still exists, has eased. In the management of administrative flows, the university has seen both improvements and informal learning initiatives, as well as a stronger impact of initiatives related to the third mission. At the administrative level, several staff members had no prior experience of using the software adopted during the emergency. In fact, at the beginning the problems were mainly related to the lack of skills, which was overcome through self-learning and informal exchange of information between colleagues. Another obstacle was the occasional inability to make the same software and digital tools work with the devices available remotely. Post-pandemic, training has now been structured to respond to needs.

Finally, limitations attributed to digitisation in general emerged, specifically concerning the career orientation events that took place online, in that it is difficult to quantify how many participants are interested in the offer.

Post-emergency, the University has asked for feedback not only from the faculty but also from students. Findings show that distance learning is a point of no return for many students, who now are struggling to go back on site. Those with cognitive and physical disabilities have greatly appreciated distance learning, seeing it as more personalised and accessible. The same is true for students with fewer opportunities to attend courses while living off-site.

The next steps to undertake are not yet clearly formalised. The University will probably go in the direction of blended/hybrid teaching, a strategy for which it seems necessary to introduce supporting roles, such as a tutor, as well as to enhance the existing IT enabling services, which is currently perceived as lacking (for example in terms of technical assistance).

Università UnitelmaSapienza – Università degli Studi di Roma

<u>Policy</u>

Being an online University, the implementation of the teaching activity has not undergone many changes. The only exception concerns the students' evaluation: the pandemic has impacted the way the exams are conducted because, not being able to organise the sessions on site, the University had to set up its own system and a procedure to be able to carry them out remotely.

With regards to teaching strategies and methods, on the other hand, there has been a great effort towards innovation, and trainings have been further enhanced especially for tutors. Following the lockdown, on-site activities, including staff training and administration shifted to remote.

<u>Motivators and drivers</u>

As for the coordination of teaching, in the last year one and a half years the University has further increased the number of training sessions, also involving subject matter experts from other universities. The initiative has enhanced the teaching and support staff's skill level. Moreover, thanks to the tutors, the teaching offer is now much stronger and more interactive resulting in a greater engagement of the students.

In terms of digital tools, prior to the emergency WebEx and Google services were used exclusively by teachers and officers for internal purposed. The pandemic has offered the opportunity to update and share technical and digital knowledge especially with regards to teaching or technical support.

Obstacles and lessons learnt

The faculty's involvement in interactive and blended teaching in all academic fields remains difficult. Especially senior faculty members such as professors are reluctant to be trained on teaching methodologies.

In this new academic year, the University has opted for blended internal trainings and meetings. This strategy allows for keeping a functional, time-saving approach to internal communications whenever most convenient, all the while providing the opportunity for the faculty and staff to connect, share knowledge and provide support in more flexible, context-oriented setting and even in informal, collaborative ways, and thus to elaborate shareable, practical outputs.

From a methodological point of view, there was a step backwards in the evaluations due to regulatory constraints. However, teachers have certainly found new teaching methods through training as well as through informal exchange opportunities. To summarise, the pandemic provided an opportunity to better manage some IT tools and to cope with the constraints imposed by the Ministry.

Fondazione ITS Logistica Sostenibile

Policy

The Foundation is very small and has two offices, one in Bologna and the other in Piacenza. They have no employees, but they use staff training centres that are part of the Foundation. There is not a dedicated staff that deal with the digitalisation of education. Within the Foundation, there is an IT service which gave support, during the pandemic, to the digitalisation of educational programmes.

They use two different products: in Piacenza Cisco WebEx and in Bologna Go to Meeting. By doing funded training they must follow the rules of the funding body related, for example to reporting, so they used products in which the reporting was easily readable by the funding body and therefore also validated by it.

Motivators and drivers

The Foundation realised that some of their users have become accustomed to the online tools and ask to maintain, after the pandemic, this mode of teaching. This fact regards students and teachers who have to travel to follow the lessons and who prefer to stay home to spend less in terms of time and money. Nevertheless, teachers keep on preferring the in-presence methodology because of the better interaction with the students.

This reflects also the fact that teachers do not have the same digital skills and for some of them it is more difficult to create lessons that can be transmitted fully online. The online lesson must also be managed with a certain interactivity and if there is no interaction, the risk is to have a detachment regarding the contents. The lesson learned by the pandemic period is to have tutors that follow the online lessons to understand which professors can manage or not the online mode.

Having educational programmes that are interactive and laboratorial, the Foundation used platforms that have permitted to pass this modality from the in-presence mode to the online one.

After the pandemic the Foundation, following the rules of the funding entities, had to come back to a total in-presence mode but the acceleration of the digitalisation of education permitted them to better manage the meeting that they can do online and the presence of some professors that live abroad or far from the Foundation.

Obstacles and lessons learnt

There has been important information from those who work on the digitalisation issues, that permit to acquire new skills that they spend also today. In fact, they can provide one more service in their programmes: in the didactic planning they are now inserting remote interventions by professors, i.e., if there is a person who has specific skills for a course, he can intervene remotely using the skills acquired during the pandemic and the platforms used. The pandemic has allowed them to insert a new training method.

Fondazione ITS Kennedy – Alto Adriatico

Policy

By the beginning of the lockdown, the Institute's digital transition was already underway. The teaching staff had already been largely trained in the use of Google tools and the platform; the students were already prepared for the change and equipped with the necessary devices, and the teaching materials were already shared on the online platform and via email.

Moreover, the methodology was already focused on "learning by doing", interactive and practical and therefore more easily delivered at a distance. Thus, the Institute's strategy was to integrate internal tools and resources already in use, maintaining the existing key principles with the intent of keeping the student at the centre of the learning process. These additions to the existing method concern the formalisation of practical instructions for teachers, the creation of resources for the micro-planning of each lesson, and the optimisation of the platform in terms of access, functions, and contents. In addition, where necessary, the institute provided both teachers and students with portable devices to carry out and follow the activities.

Motivators and drivers

The first step towards the transition in the context of the health emergency was made with teachers with more experience in distance learning. The Didactic Board shared a practical handbook for teachers. The guidelines aimed to share language and tools to use and access and use instructions; the document created a common base of knowledge, use procedures and good practices among teachers.

For the first two-week period, only expert teachers delivered the lessons. Subsequently, the didactic coordinators drafted with them guidelines for the use of the tools focusing on topics such as security procedures and issues, the management of multiple credentials, and access. They also offered advice on the digital tools best suited for remote classes. Once all teachers were provided with the guidelines, the normal calendar was resumed.

The guidelines also normalised micro-design methods, for example for the structuring of 4-hour classes. Particularly important were the tools to define the structure of the lessons in terms of sequencing of explanations, demonstrations, exercises, and so on; of interactive resources and

activities, to counteract a generalised decreased attention, and the teachers' struggle in reading "the room", that is, the non-verbal and paraverbal feedback of the students.

The shift to distant learning proceeded on a trial-and-error base, first with expert teachers, then by setting up and standardising the formats and delivery methods. The Institute Board decided to go forward with the pandemic response in advance: students were invited to a preliminary online appointment in the virtual classroom, on Google meet, a few days before the distance learning was officially launched.

As for the use of the platform, each of the seven training courses has a reference site that connects the user, via a link, to the folders stored via Google Drive, which are shared by the teachers among themselves, with the students, and by the students among themselves. The didactic managers have also used this platform to share updates on the COVID emergency. All content was entered according to a specific hierarchy based on the needs of users: a link to the calendar, followed by all links for teaching materials uploaded by teachers. At the bottom of the page, there is a folder where students can upload their assignments or projects and the links to the prospectuses of attendance and evaluations. For safety reasons, students were only guaranteed reading permissions.

All online lessons were held with the support of tutors linked together with the teachers and monitored on a sample basis by the regional superintendents. Both teachers and students had the opportunity to use a device supplied by the Institute to follow the lessons.

Obstacles and lessons learnt

Compared to face-to-face lessons, online classes were found to save time; however, they were more distracting for students and stressful for teachers. In general, the students were overall satisfied with the teaching activities, with the evaluation methods and the overall services offered by the institute. In the future, the Institute would like to experiment with the hybrid mode, which was precluded by the Ministry to VETs, but not to other entities during the lockdown.

The best performing teachers in distance learning were those with medium experience, while the others were more resistant to changing their way of working. For this reason, too, the Governance intends to collect and analyse the feedback from teachers on distance learning, to review the micro-design of the lessons, based on the trial and error conducted during the pandemic. A possible output would be a set of methodological guidelines on the sequencing of activities and the use of tools to retain the students' attention and motivation.

Finally, the importance of formalising student activities on the platform emerged. Possible next steps in this direction involve selecting the appropriate tools to monitor the activities carried out by the students, especially in the evening or at night, which for the moment cannot be registered. Based on such findings, the didactic managers plan to formalise these activities and possibly embed them in an asynchronous course.

Fondazione ITS Alessandro Volta

Policy

After the lockdown, regarding the reorganisation of courses, the governance postponed the closure of the school year to the following school year; the teachers were thus able to anticipate all the theoretical contents of the courses, postponing the laboratories to a later moment, when gatherings

would be possible again. Furthermore, the Governance anticipated the theoretical units of some second-year courses. Some teachers experimented with the asynchronous teaching as well.

Teachers had to transfer all face-to-face lessons to the Office 365 5 platform first, and Microsoft Teams began to be used as well. The IT manager created an account for each student and for each tutor, and groups for each course. He also organised the live lessons so that a tutor or didactic coordinator would be always present, as per regional policies. The Institute also provided teachers and students with devices to attend classes; the students at the institute made use of this service, as did half of the teachers interviewed.

Many evaluation procedures and tools have changed as well. Some teachers converted the tests into questions. Having a limited number of hours for the individual modules, however, there were not enough resources, nor time, to interrogate all students; therefore, in these cases the queries have been transformed into online tests using the Form application or dedicated files. On the other hand, cross tests have continued to be used according to the same tools, contents, and modality.

Finally, to ensure continuity, the didactic coordinators contacted partners involved in the internship programmes to adapt the activities according to the new needs and limits set by the context. The Institute managed to keep the programmes unchanged whenever collaborating with IT companies; however whenever practical activities were involved, especially if related to technical equipment, the internship was turned into a project work.

Motivators and drivers

To address the specific criticalities created by distance learning, at the beginning of September - October 2020 the Institute organised a training course for teachers and tutors on how to effectively communicate within the setting of online lessons. Secondly, coordinators and teachers also talked with colleagues who work within the university to understand the methodologies set in place in the academia to carry out exams, and to draw an example from them.

Obstacles and lessons learnt

Overall, the service was guaranteed, but in terms of governance and teaching, a large margin for improvement has been perceived.

In particular, the online tools used for teaching and especially for carrying out the assessments have had a different performance according to the subjects of each class and course. For more elaborate subjects, in which more articulated answers were required, teachers and students experience both time- and tool-related problems.

Secondly, at the end of the pandemic, the administrative and coordination workflow with the region has again turned to the use of physical documents, despite a generalised opinion among the Governance and staff that it would be managed digitally. The need to receive training and have references to know and adapt to the current requirements for data processing has also emerged.

Accounts from Teachers and Students

Both in the case of teachers and students, the most used devices to attend online classes were laptops, followed by desktops. A minority of the students also used smartphones.

Students perceived an improvement in the teachers' digital skills, but this perception is not shared by the teachers themselves, who consider their skills level unchanged compared to before the pandemic. Conversely, teachers perceived an increase in students' digital skills, while only half of the latter share this opinion; the remaining 50% consider their skills unchanged compared to before.

Teachers noticed and had to cope with a drop in the student motivation, linked to lower opportunities for interaction and connection difficulties, which strongly contributed to the increase in student distraction.

The same issues are reflected in the experience of the students, who were easily distracted and suffered from little interaction with teachers, while also facing connection problems and the lack of interaction between peers. Two other diverging points are relevant between teachers and students: the first concerns the lower perception of students of their decrease in motivation; the second concerns the increase in stress related to online activities, reported by a third of teachers but marginal for students.

In conducting the lessons, the most effective strategies according to the teachers consisted in shortened lessons and in group tasks. Others, such as the flipped classroom, followed by online Q&A sessions, work sessions in small groups in the presence of the teacher, and personalised support were perceived as less effective.

Students equally appreciated the tasks to be completed in groups and considered the flipped classroom to be the least effective activity; unlike the teachers, however, they indicated that they preferred work sessions in small groups in the presence of the teacher and structured work plans anticipating the moments of interaction and open discussion.

In general, both teachers and students are satisfied with the quality of the lessons and services provided by the institutions during the pandemic. The strategies implemented have signalled a strong perception of practicality in online lessons, but also the need to reduce connection problems and to improve the overall quality of interactions.

Moreover, both teachers and students consider online lessons to be more flexible and timesaving, but at the cost of causing more distraction than face-to-face and making group work more difficult. On the other hand, they considered them neither more interesting nor more collaborative.

Considering these common perceptions, there is also a common expectation and request to continue with blended programmes - preferred by over 40% of students and teachers. However, whereas teachers report on-site courses as an equally desirable option, students see hybrid programmes as an option only second to blended learning. Furthermore, the surveys show that students do not wish to go back to a single mode of attendance: only 21% of students want to return completely on site, and no one wants to follow the course exclusively online (an option considered by 11% of teachers).

Highlights from the Field Research

To summarise, the findings show the pandemic gave a boost to the digitalisation process of the Italian educational systems. The interviews and surveys highlighted a general satisfaction with the overall quality and efficiency of the services provided throughout the pandemic, especially with regards to the provision of devices and the implementation of the digital platforms. However, there are still some

cultural and organisational blockers preventing a systemic transition, for example the scepticism of the teaching staff towards more interactive ways of structuring their courses and classes, and the overall reorganisation of the activities in a remote mode. On the other hand, teachers, and tutors in HE and especially VET institution demonstrated a stronger commitment to rethinking their teaching and evaluation practices, with the aim of providing a more student-centric, engaging learning experience for their students.

Moreover, based on their experiences – as shown in chapters one to three – all interviewees highlighted specific subjects, methods as key enablers for achieving an effective digital transition of their respective organisations, which they would look forward to being trained in. Such enablers are:

- **Governance**
    - Integrating AGILE methodology in curriculum design
    - Digital Teamwork
- **Enabling services**
    - Digital communication and problem solving in support of administrative and service-related workflows: techniques and tools
    - Digital engagement for events and partnerships: techniques and tools
- **Teaching and Learning**
    - Digital communication and engagement for remote learning: techniques and tools
    - Collaborative learning activities
    - Course design
- **IT services**
    - Policies on cyber-security and data treatment, as per national and EU policies
    - Major software and platforms updates

Overall, the most relevant choices to be observed highlight the need for strengthening soft and transferrable skills, such as communication and problem solving, that the pandemic redefined or expanded in terms of remote or blended working as well as learning settings. Equally important seem to be a periodical update on the technical features as well as best practices, as well as a specific upskilling of the teaching staff (namely, tutors and faculty within the university system) with regards to more interactive, dynamic, and inclusive ways of engaging with students. The impact of more engaging methodologies seems to stretch beyond the adaptation of traditional academic teaching to virtual settings, towards a comprehensive redefinition of goals and modalities to achieve meaningful, sustainable learning experiences.

Methodology

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Scope of the Research

The DigiTransformEdu project explores the digital transformation in the educational systems mainly above level 5 (from 5 to 8) in accordance with the International Standard Classification of Education (ISCED) but also touches upon developments in the other levels of education including primary, secondary, and vocational education and to some extent lifelong learning (LLL). The research considers two dimensions of the digital transformation in the tertiary education:

- governance and enabling services (referred as digital strategy and administration),
- teaching and learning practices and infrastructure (referred as digital pedagogy),

and three target groups of respondents:

- management and administration roles in an organisation,
- pedagogical staff,
- students/learners.

International Standard Classification of Education (ISCED)

Tertiary education builds on secondary education, providing learning activities in specialised fields of education. It aims at learning at a high level of complexity and specialisation. Tertiary education includes what is commonly understood as academic education but also includes advanced vocational or professional education. It comprises ISCED levels 5, 6, 7 and 8, which are labelled as short-cycle tertiary education, Bachelor's or equivalent level, Master's or equivalent level, and doctoral or equivalent level, respectively. The content of programmes at the tertiary level is more complex and advanced than in lower ISCED levels.

Tertiary Levels

ISCED 5: Short-cycle tertiary education

Programmes at this level are often designed to provide participants with professional knowledge, skills, and competencies. Typically, they are practically based, occupationally specific and prepare students to enter the labour market. However, these programmes may also provide a pathway to other tertiary education programmes. Entry into ISCED level 5 programmes requires the successful completion of ISCED level 3 or 4 with access to tertiary education.

ISCED 6: Bachelors' or equivalent level

Programmes at this level are often designed to provide participants with intermediate academic and/or professional knowledge, skills, and competencies, leading to a first degree or equivalent

qualification. Entry into these programmes normally requires the successful completion of an ISCED level 3 or 4 programme with access to tertiary education. Entry may depend on subject choice and/or grades achieved at ISCED levels 3 and/or 4. Additionally, it may be required to take and succeed in entry examinations. Entry or transfer into ISCED level 6 is also sometimes possible after the successful completion of ISCED level 5.

ISCED 7: Master's or equivalent level

Programmes at this level, are often designed to provide participants with advanced academic and/or professional knowledge, skills, and competencies, leading to a second degree or equivalent qualification. Typically, programmes at this level are theoretically based but may include practical components and are informed by state-of-the-art research and/or best professional practice. They are traditionally offered by universities and other tertiary educational institutions.

Entry into ISCED level 7 programmes preparing for a second or further degree normally requires the successful completion of an ISCED level 6 or 7 programme. In the case of long programmes that prepare for a first-degree equivalent to a Master's degree, entry requires the successful completion of an ISCED level 3 or 4 programme with access to tertiary education. Entry into such programmes may depend on subject choice and/or grades achieved at ISCED levels 3 and/or 4. Additionally, it may be required to take and succeed in entry examinations.

ISCED LEVEL 8: Doctoral or equivalent level

Programmes at ISCED level 8, or doctoral or equivalent level, are designed primarily to lead to an advanced research qualification. Programmes at this ISCED level are devoted to advanced study and original research and are typically offered only by research-oriented tertiary educational institutions such as universities. Doctoral programmes exist in both academic and professional fields.

Educational Institutions related to tertiary education

Belgium, French Community

- Université, Haute école, École supérieure des arts, Haute école, École supérieure des arts

Belgium, German-speaking Community

- Hochschule

Belgium, Flemish Community

- Universiteit, Hogeschool, Hoger Beroepsonderwijs (HBo5)

Bulgaria

- Universiteti, Specializirani vischi utchilishta, Kolezhi, Tsentrove za profesionalno obuchenie (VET centres)

Germany

- Universität, Kunsthochschule, Musikhochschule, Fachhochschule, Berufsakademie, Verwaltungsfachhochschule, Fachschule, Fachakademie

Croatia

- Sveučilište (sveučilišni studiji), Veleučilište/visoka škola (stručni studiji)

Italy

- Università,Alta formazione artistica / musicale / coreutica – AFAM, Scuola superiore per mediatori linguistici, Istituto tecnico superior

Phase 1: Desk Research

Timeframe: January – April 2022

All partners look for research publications, national or regional strategic documents, reports, studies, articles, etc. (at least three per project partner) that deal with the impact of the COVID-19 pandemic on the transition to digital education and were published or made available in their institutions, countries or at European or international level. Each partner summarises the main findings from their desk research in national reports for Bulgaria, Croatia, Italy, and Germany, following a common template. EFMD as an international association conducts the research at European and international level. The findings are further analysed by MUAS and NBU as activity leaders and included in a synthesis report.

In addition, project partners go through publicly available information and websites to identify other institutions from their countries to include in the survey. The total number of surveyed institutions should be at least 30 (project partners included), which can be tentatively distributed like this: 12 HEIs (NBU, Algebra, MUAS + 9 other HEIs or university faculties), 12 tertiary VET institutions (Gruppo Pragma, Fondazione Giacomo Brodolini, ESI CEE + 9 other VET institutions), and 6 continuous education providers (EFMD, DNA, Institute of Mathematics, and Informatics at the Bulgarian Academy of Sciences + 3 other providers).

Phase 2: Survey Administration and Data Collection

Timeframe: March – July 2022

Partner Questionnaire

To get a better insight into the institutional realities and tendencies of the project partners and help further shape the research into the right direction, the partner institutions complete an online questionnaire that is answered only once on behalf of each project partner. The questionnaire can be accessed at: https://survey.zohopublic.eu/zs/yLDH1u and includes the following questions.

1. Name of the partner institution:
2. My institution provides the following sort of education and training: *(multiple choices possible)*
    - Doctoral programmes
    - Distance doctoral programmes
    - Master programmes
    - Distance master programmes
    - Bachelor programmes
    - Distance bachelor programmes
    - Certificate programmes and courses (6-12 months)
    - Distance certificate programmes and courses (6-12 months)
    - Short certificate programmes and course (1-6 months)
    - Distance (online) short certificate course (1-6 months)
    - Master classes (1-2 weeks)
    - Distance (online) master classes (1-2 weeks)
    - Seminars (1-5 days)
    - Online webinars (1-5 days)

- Others, please specify…

3. The target groups of my institution are: *(multiple choices possible)*
    - Undergraduates
    - Graduates
    - Doctoral students
    - Professionals
    - Managers
    - Senior executives
    - Others, please specify…
4. Please, explain shortly the changes that were introduced in the provision of education and training in your institution as result of the COVID-19 pandemic e.g., continuation, novelties, modifications, discontinued programmes, and courses, etc. *(open question)*
5. My institution has devoted service units/departments for students and participants
    - Yes
    - No
        a. If Yes, what are these service units/departments (this concerns only internal services not dealing with external stakeholders)? *(multiple choices possible)*
            - Student administration
            - Consulting services for candidates
            - Enrolment services
            - Consulting services for students and participants
            - Recognition of courses and diplomas
            - Scholarships and student loans
            - Placements and internships as compulsory parts of the curriculum
            - Support to students with special needs
            - Others, please specify…

        b. If No, how these services are regulated in your institution? *(open question)*
6. My institution has the following service units/departments: *(multiple choices possible)*
    - General administration
    - Finance and accounting
    - ICT services
    - Project management
    - Erasmus mobility office
    - Career services
    - Alumni services
    - International relations
    - Library
    - Research centre
    - Incubator
    - University-business centre
    - Others, please specify…
7. Please, explain shortly the changes that were introduced in your institutional services as result of the COVID-19 pandemic e.g., continuation, novelties, modifications, abandoned services, etc. *(open question)*
8. Anything else you would like to add. *(open question)*

<u>Governance (strategic level)</u>

The survey targets people (1-2 representatives per surveyed institution) able to evaluate institutions' response at the level of **governance** and responsible for strategic management and planning,

budgeting, performance assessment or similar. For example, rectors, vice rectors, deans, vice deans, administrative directors, administrative support structures.

This respondent cluster is surveyed using semi-structured interviews or written interviews with open questions in local languages (qualitative data). The questions below are guiding questions and can be reformulated to fit to the occasion and/or the respondent.

1. Tell us a little bit about your role and responsibility at this institution.
2. How is the digital education organised in your institution? (e.g., Who is responsible? Who is doing what? Is there a Digital education unit/centre at your institution? Have you entered in any strategic partnership with external providers to implement digital services/pedagogies?)
3. Was your institution accredited/officially approved to provide digital (distance) education before the pandemic?
4. Did your institution have a strategy/strategic plan for digital education before the pandemic?
    a. If yes, what are the main pillars of the strategic plan (i.e., services, competences, etc.)? Was the plan helpful for the overnight transition to digital education? Was it necessary to adapt the strategy and how?
    b. If no, do you have a digital strategy now or are you working on one?
    c. If you are not working on it, do you have plans in the future to work on one?
5. What has changed in relation to digital education in your institution since the pandemic?
6. What are some key challenges that the overnight transition to digital education caused at your institution?
7. What are the lessons learned (both dos and don'ts) that have to be considered by the university management on strategic level?
8. What are your plans for the future in terms of digital education?
9. Would you be so kind to share with us some relevant documents, good practices within your organisation, or digital resources?
10. May we contact you for more in-detail information if needed?

Documentation: Partners produce a single word file consisting of the questions and the answers received and send to MUAS and NBU, R1 and R2 lead partners. The names or at least the number and type of surveyed institutions are specified.

Enabling services (services for students/learners and candidates)

The survey targets people (2-3 representatives per surveyed institution) able to evaluate institutions' response at the level of **enabling services**. The survey focuses on services that are internal and more or less compulsory to have at each institution, such as:

- Student administration
- Consulting services for candidates
- Entrance exams and requirements
- Enrolment services
- Consulting services for students and participants
- Recognition of courses and diplomas
- Scholarships and student loans
- Residencies, restaurants, and cafeterias for students and lecturers
- Placements and internships as compulsory parts of the curriculum
- Support to students with special needs, etc.

This respondent cluster is surveyed using semi-structured interviews or written interviews with open questions in local languages (qualitative data). The questions below are guiding questions and can be reformulated to fit to the occasion and/or the respondent.

1. Tell us a little bit about your role and responsibility at this institution.

2. How were the enabling services and administration organised in your institution before and during the pandemic? (e.g., Entirely/partially digital? Who was doing what? How was the communication with students organised? Is there an IT support unit/centre dedicated only to enabling services?)
3. To what extent were the enabling services digitalised before the pandemic? What is the situation now?
4. Please, explain shortly the changes that were introduced in your institutional services as result of the COVID-19 pandemic e.g., continuation, novelties, modifications, abandoned services, etc. Were the changes effective?
5. What are some key challenges that the overnight transition to digital organisation and administration of the educational process caused at your institution?
6. What are the lessons learned (both dos and don'ts) that have to be considered when digitalising the enabling services?
7. Would you be so kind to share with us some relevant documents, good practices within your organisation, or digital resources?
8. May we contact you for more in-detail information if needed?

Documentation: Partners produce a single word file consisting of the questions and the answers received and send to MUAS and NBU, R1 and R2 lead partners. The names or at least the number and type of surveyed institutions are specified.

Teaching

At **teaching** level (lecturers and trainers), the use of digital pedagogy and assessment as well as digital competence and adaptation are explored. This respondent cluster is surveyed through the use of an online questionnaire sent to lecturers and trainers in local languages. The non-HEI project partners include their trainers in the survey.

Questionnaire for teachers and trainers

Dear participant,

We highly appreciate your interest in this study. This project "Digital Transformation of Higher Education and Training: DigiTransformEdu", is a 26-month Erasmus+ project (2021-2023) that aims to foster the digital transformation of HE and tertiary VET institutions by mapping the digital readiness and resilience of educational and training institutions in response to the COVID-19 crisis among other objectives. The project is centred on the transformation to digital/online education that is defined as a distance form of education, in which digital tools and information and communication technologies are used to enable teaching, learning, assessment, certification, and the organisation of the educational process while learners, teachers, and administrators might be located in different places and the process might be either synchronous or asynchronous in time. This questionnaire is part of a transnational survey that covers Bulgaria, Croatia, Germany, Italy, and the EU in general and attempts to understand the role of the pandemic in accelerating the transition to digital education and what good practices and lessons can be learned from it. Therefore, your cooperation is important for the successful realisation of this project as you have the relevant information and knowledge. The questionnaire should take you about 15 minutes to complete. The information you provide will be treated strictly confidential and based on the survey results it will not be possible to draw any conclusions to individual persons. If you have any queries or would like to have further information about the research project, please do not hesitate to contact us via: (contact e-mail).

1. What device do you typically use to deliver online classes? *(one choice possible)*
    a. Smartphone
    b. Tablet
    c. Laptop
    d. Desktop

    e. Other, please specify…
2. In case you did not have your own device to deliver the online classes, has your institution provided you with an option to use an institutional device? *(one choice possible)*
    a. Yes
    b. No
    c. I do not know / I did not need one
3. Which of the following online learning platforms and virtual classroom software are used in your institution? *(multiple choices possible)*
    a. Moodle
    b. MS Teams
    c. Zoom
    d. Big blue button
    e. Blackboard
    f. Adobe Connect
    g. Cisco Webex
    h. Canvas
    i. Discord
    j. Other, please specify…
4. Which additional technological tools have you used during the online classes? *(open question, not compulsory)*
5. In your opinion, how technology competent are you now compared to prior the pandemic? *(one choice possible)*
    a. Worse
    b. About the same
    c. Better
6. In your opinion, how technology competent are your students now compared to prior the pandemic? *(one choice possible)*
    a. Worse
    b. About the same
    c. Better
7. Were you satisfied with the way your institution responded to the pandemic?
    a. Yes
    b. No *(if not why – open answer)*
8. Were you satisfied with the way your institution organised the online classes during the pandemic?
    a. Yes
    b. No *(if not why – open answer)*
9. Were you satisfied with the way your institution provided its services online during the pandemic?
    a. Yes
    b. No *(if not why – open answer)*
10. Were you satisfied with the way your institution organised the exams online during the pandemic?
    a. Yes
    b. No *(if not why – open answer)*
11. What could your institution have done better during the transition to online education as result of the pandemic? *(open question, not compulsory)*
12. Please, assess the teaching practices provided below based on their perceived usefulness during the pandemic *(not useful, useful, very useful)*
    a. Flipped classroom (learn at home, practice in class)
    b. Shortened lectures and presentations to avoid online fatigue

c. Videos
d. Tasks to complete individually or in group
e. Online Q&A sessions
f. Work sessions in small groups with the lecturer (with the cameras on)
g. Structured communication plan that in advance announces interaction and discussion moments with the lecturer
h. Personalised (one-to-one) guidance and support

13. Have you encountered any of these problems during the online classes? *(multiple choices possible)*
    a. Internet connection problems
    b. Technical problems
    c. Lack of technical support
    d. Lack of suitable teaching environment
    e. Lack of appropriate digital tools to carry out certain teaching components
    f. Lack of competencies on how to make digital content interesting
    g. Lack of face-to-face contact
    h. Not sufficient skills of the students to use digital tools
    i. Not sufficient interaction with the students
    j. Not sufficient student engagement and participation
    k. Absences and drop-outs
    l. Cheating during online exams and tests
    m. Lower students' performance
    n. Online fatigue and stress
    o. Other, please specify…
14. How did you solve them? *(open question, not compulsory)*
15. Compared with on-site classes, online classes are in my view: *(multiple choices possible)*
    a. more flexible
    b. more timesaving
    c. more interesting
    d. more interactive
    e. more productive
    f. more collaborative
    g. more stressful
    h. more distractive
    i. more difficult to comprehend lessons
    j. more difficult to practice or reflect on what the students have learned
    k. more difficult to work with others
    l. require more personal workload
16. If you had the possibility to choose, you would rather prefer to have the classes: *(one choice possible)*
    a. Fully online
    b. Blended: Part of the classes delivered on-site while others delivered remotely online
    c. Hybrid: Some students on-site while others joining remotely online
    d. Fully face-to-face
17. What would you recommend as dos and don'ts for other teachers? *(open question, not compulsory)*
18. Would you be so kind to share with us some relevant documents, good practices within your organisation, or digital resources? *(open question, not compulsory)*
19. May we contact you for more in-detail information if needed? If, yes please provide your email address. *(open question, not compulsory)*

Demographics

20. What is your country of origin? *(drop list of the project partner countries with the Other, please specify… option)*
21. What is your age? *(one choice possible)*
    a. 20-24 years
    b. 25-34 years
    c. 35-44 years
    d. 45-54 years
    e. 55-64 years
    f. 65 or more years
    g. Prefer not to say
22. What is your main field of teaching? *(one choice possible)*
    a. Arts
    b. Business / Management
    c. Computer sciences / IT
    d. Economics
    e. Engineering (incl. architecture)
    f. Human medicine / health sciences
    g. Arts / Humanities
    h. Law
    i. Mathematics
    j. Natural sciences
    k. Social sciences
    l. Other, please specify…
23. What is your employment status? *(one choice possible)*
    a. Full time
    b. Part-time (50-80%)
    c. Part-time (less than 50%)
    d. Temporary contract / visiting lecturer
    e. Prefer not to say
24. How many years have you taught online? *(one choice possible)*
    a. Less than 1
    b. 1
    c. 2
    d. More than 5

Documentation: Partners translate the questionnaire in local languages, develop it and distribute it using own tools. After that they summarise the results, translate in English the answers to the open questions, produce a single word file with the results including the statistics and send to MUAS and NBU, R1 and R2 lead partners. The names or at least the number and type of surveyed institutions are specified.

Learning

Students are targeted to dip into their perception in terms of effectiveness, adaptation to online provision, engagement, quality of communication and collaboration. This respondent cluster is surveyed using an online questionnaire sent to students in local languages. The non-HEI project partners include their training participants in the survey.

Questionnaire for students and training participants

Dear participant,

We highly appreciate your interest in this study. This project "Digital Transformation of Higher Education and Training: DigiTransformEdu", is a 26-month Erasmus+ project (2021-2023) that aims to foster the digital transformation of HE and tertiary VET institutions by mapping the digital readiness and resilience of educational and training institutions in response to the COVID-19 crisis among other objectives. The project is centred on the transformation to digital/online education that is defined as a distance form of education, in which digital tools and information and communication technologies are used to enable teaching, learning, assessment, certification, and the organisation of the educational process while learners, teachers, and administrators might be located in different places and the process might be either synchronous or asynchronous in time. This questionnaire is part of a transnational survey that covers Bulgaria, Croatia, Germany, Italy, and the EU in general and attempts to understand the role of the pandemic in accelerating the transition to digital education and what good practices and lessons can be learned from it. Therefore, your cooperation is important for the successful realisation of this project as you have the relevant information and knowledge. The questionnaire should take you about 10 minutes to complete. The information you provide will be treated strictly confidential and based on the survey results it will not be possible to draw any conclusions to individual persons. If you have any queries or would like to have further information about the research project, please do not hesitate to contact us via: (contact e-mail).

1. What device do you typically use for online classes? *(one choice possible)*
    a. Smartphone
    b. Tablet
    c. Laptop
    d. Desktop
    e. None
2. In case you did not have your own device to attend the online classes, has your institution provided you with an option to use an institutional device? *(one choice possible)*
    a. Yes
    b. No
    c. I do not know / I did not need one
3. In your opinion, how technology competent are you now compared to prior the pandemic? *(one choice possible)*
    a. Worse
    b. About the same
    c. Better
4. In your opinion, how technology competent are your lecturers now compared to prior the pandemic? *(one choice possible)*
    a. Worse
    b. About the same
    c. Better
5. Were you satisfied with the way your institution responded to the pandemic?
    a. Yes
    b. No *(if not why – open answer)*
6. Were you satisfied with the way your institution organised the online classes during the pandemic?
    a. Yes
    b. No *(if not why – open answer)*
7. Were you satisfied with the way your institution provided its services online during the pandemic?
    a. Yes

    b. No *(if not why – open answer)*
8. Were you satisfied with the way your institution organised the exams online during the pandemic?
    a. Yes
    b. No *(if not why – open answer)*
9. What could your institution have done better during the transition to online education as result of the pandemic? *(open question, not compulsory)*
10. Please, assess the teaching practices provided below based on their perceived usefulness during the pandemic *(not useful, useful, very useful)*
    a. Flipped classroom (learn at home, practice in class)
    b. Shortened lectures and presentations to avoid online fatigue
    c. Videos
    d. Tasks to complete individually or in group
    e. Online Q&A sessions
    f. Work sessions in small groups with the lecturer (with the cameras on)
    g. Structured communication plan that in advance announces interaction and discussion moments with the lecturer
    h. Personalised (one-to-one) guidance and support
11. Have you encountered any of these problems during the online classes? *(multiple choices possible)*
    a. Internet connection problems
    b. Technical problems
    c. Insufficient skills of the lecturer to use the digital tools
    d. Lack of suitable learning environment
    e. Distraction
    f. Decrease in motivation
    g. Lack of face-to-face contact
    h. Not sufficient interaction with the lecturer
    i. Not sufficient interaction with the co-students
    j. Not sufficient opportunity to participate in the classes
    k. Skipping classes and/or being late
    l. Unfair online exams and tests
    m. Lower performance results
    n. Online fatigue and stress
    o. Other, please specify…
12. How did you solve them? *(open question, not compulsory)*
13. Compared with on-site classes, online classes are in my view: *(multiple choices possible)*
    a. more flexible
    b. more timesaving
    c. more interesting
    d. more interactive
    e. more productive
    f. more collaborative
    g. more stressful
    h. more distractive
    i. more difficult to comprehend lessons
    j. more difficult to practice or reflect on what I have learned
    k. more difficult to work with others
    l. require more personal workload
14. If you had the possibility to choose, you would rather prefer to have the classes: *(one choice possible)*

a. Fully online
b. Blended: Part of the classes delivered on-site while others delivered remotely online
c. Hybrid: Some students on-site while others joining remotely online
d. Fully face-to-face

15. What would you recommend as dos and don'ts for other learners? *(open question, not compulsory)*

Demographics

16. What is your country of origin? *(drop list of the project partner countries with the Other, please specify… option)*
17. What is the level of study / programme that you undertook online during the pandemic? *(multiple choices possible)*
    a. Undergraduate (Bachelor level)
    b. Graduate (Master level)
    c. PhD (Doctoral level)
    d. Certificate programmes and courses (6-12 months)
    e. Short certificate programmes and courses (1-6 months)
    f. Master classes (1-2 weeks)
    g. Seminars / webinars (1-5 days)
    h. Others, please specify…
18. Do you work? *(one choice possible)*
    a. Yes, full time
    b. Yes, part-time (50-80%)
    c. Yes, part-time (occasionally, on contract basis)
    d. No

Documentation: Partners translate the questionnaire in local languages, develop it and distribute it using own tools. After that they summarise the results, translate in English the answers to the open questions, produce a single word file with the results including the statistics and send to MUAS and NBU, R1 and R2 lead partners. The names or at least the number and type of surveyed institutions are specified.

Digital technology and infrastructure

Data about the learning platforms and the digital tools used before and during the lockdown are extracted from the desk research and the online questionnaires for teachers and students. Additionally, system administrators and staff responsible for the digital infrastructure are interviewed (1-2 representatives per surveyed institution). This respondent cluster is surveyed through the use of semi-structured interviews or written interviews with open questions in local languages (qualitative data). The questions below are guiding questions and can be reformulated to fit to the occasion and/or the respondent.

1. What online learning platforms and tools were used at your institution before and during the pandemic? Are they custom-made/customised for your particular institution or standardised solutions?
2. What about online platforms and tools for enabling services and administration?
3. What technical support and training is provided for lecturers, students, and administrators?
4. What has been done in terms of data protection and security?
5. What has been done to prevent cheating and plagiarism during online exams and formative assessments?
6. What problems related to online education and administration occurred most often during the pandemic and how were they solved?

7. What should have your institution done differently to facilitate the online classes and enabling services?
8. What are the lessons learned (both dos and don'ts)?
9. Would you be so kind to share with us some relevant documents, good practices within your organisation, or digital resources?
10. May we contact you for more in-detail information if needed?

Documentation: Partners produce a single word file consisting of the questions and the answers received and send to MUAS and NBU, R1 and R2 lead partners. The names or at least the number and type of surveyed institutions are specified.

Overview of Respondents

Category	**Number**
Governance (strategic level)	1-2 representatives per surveyed institution
Enabling services	2-3 representatives per surveyed institution
Digital technology and infrastructure	1-2 representatives per surveyed institution
Lecturers and trainers	5-10 representatives per surveyed institution (depending on the size)
Students and trainees	10-20 representatives per surveyed institution (depending on the size)

Phase 3: Data Analysis and Interpretation

Timeframe: August – September 2022

The findings from phases 1 and 2 are collected and analysed to produce a synthesis report. Essential differences and key lessons learned are highlighted. If deemed necessary, the synthesis report or its executive summary is translated in local languages.

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