ECOLHE

Empower Competences for Onlife Learning in HE

IO1

Digital Technologies in HE: from the European vision to the university governance

Comparative report of national case studies

Authors

Stefania Capogna, Antonio Cocozza, Giulia Cecchini, Maria Chiara De Angelis, Giovanni De Gennaro, Bianca Delli Poggi, Concetta Fonzo, Francesca Greco, Giada Marinensi, Flaminia Musella, Emanuela Proietti

Organisations

Roma Tre University

Link Campus University

Project Scientific Director

Stefania Capogna

Date: 30/12/2022

Erasmus+

ECOLHE - Empower Competences for Onlife Learning in HE | 2020-1-IT02-KA203-079176
Co-funded by the Erasmus+ Programme of the European Union

Co-funded by the Erasmus+ Programme of the European Union

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Introduction

ECOLHE means “empower competences for online learning in higher education”. The project started on the first of September 2020. ECOLHE examines how the idea of e-learning in the European higher education area has been “translated into practice” (Latour, 2005; Freeman; 2009); at the national level by academic bodies. We aim to identify how the digital challenges to promote Lifelong learning LLL through ICT in HE is shaped in specific contexts.

The project is going on by a consortium of five partner countries: Italy, Spain, Ireland, Greece and Finland. Universities involved in the project are Link Campus University, Roma Tre University, University Oberta de Catalunya, University College Cork, University of Patras and Laurea University.

ECOLHE is an action research project, which aims:

- at highlighting experiences, practices and competencies of teachers, researchers and university staff members active in the digital field to foster the dissemination of good practices in training and skills development for “online” learning in Higher Education (HE), according to the new experience of a hyperconnected reality (Floridi, 2015).
- at creating the best conditions for exchanging best practices in
  1) teaching digital skills in higher education;
  2) training courses for teachers and tutors for improving online teaching in higher education in the logic of Lifelong learning, inclusion and innovation recalled by high-level Group of the Modernization HE;
  3) recognition and validation of teaching competencies in higher education for teachers’ Professional development;
  4) recommendations for academic bodies.

The ECOLHE project outcomes are targeted at:

- academic bodies;
- teaching staff (teachers, researchers and tutors);
- students;
- higher education administrative and technical staff;
- local and International higher education.

ECOLHE’s objectives are:

- to analyse six case studies in HE, to examine how the involved universities develop their strategic approaches to digitalisation. Many studies focused on these issues: “the majority of European HE institutions have made little progress in adapting the courses offered to a student-centred learning model capable of integrating developments and opportunities in technology-enhanced education” (Raetzsch et al., 2016). These case studies, using an organisational empowerment approach, aim to take stock of

the current situation and evaluate to what extent there is a deficit in terms of meeting critical challenges in European HE (IO1);

- to implement online training to empower teachers and researchers to perform online and blended learning, more responsive to the qualitative dimensions of human interaction (IO2);
- to develop new online environments for HE, enhancing the gamification logic (IO3);
- to develop a tool for the self-assessment of HE professionals based on the Symbiotic Learning Paradigm (SLP), a novel framework that places the learner at the centre and enables a hyper-collaborative relationship between stakeholders and HE (IO4);
- to provide guidelines in order to furnish Academic Bodies proper instruments and recommendations to run digital transformations in HE (IO5);
- to favour social innovation in online and blended EHEA (European Higher Education Area) through the sharing of best practice experimented among country partners (IO2, IO3, IO5 and C1).

Based on a mix of qualitative and quantitative methodology, the six case studies produced the reconstruction of the national political framework related to the adoption of ICTs in HE by:

- a documentary analysis related to principal documents adopted by case study universities;
- a qualitative analysis based on focus groups and interviews to Academic Bodies focused on: a) primary and most exciting experiences in the field of enhancing ICT in HE; b) strategies and experiences in the field of teachers' professional development for the digital era; c) main and interesting experiences in the field of recognition and validation teaching competences with particular attention to digital skills; d) main and interesting experiences in the field of quality assurance in HE with particular attention to eLearning quality standards; e) strengths, weaknesses, risks or opportunities for Academic Bodies in promoting ICT in HE;
- needs and perspective of improvement;
- a quantitative analysis of the questionnaires' results addressed to students;
- suggestions oriented to outlines the most important efforts and critical issues in organizational and educational processes aimed to enhance digital resources and environment in Universities.

The research aimed at exploring the way in which Universities have transposed into organizational practices, provisions found in European documents concerning the exploitation of ICT for LLL, the implementation of their Third Mission, the development of online and blended learning for HE and their strategies to ensure teachers' professional development.

The objective of this research report is to present the main results of the national case studies realised in the six Universities of the ECOLHE Project, to understand some specific aspects of the evolution in the adoption of Digital Technologies in Higher Education (HE), from the European vision to the university governance.

This research report focuses on the main results of the six case studies. Involved Universities are:

1. ITALY: eCampus University (case study presented by FONDAZIONE LINK CAMPUS UNIVERSITY);
2. ITALY: Roma Tre University (case study presented by CRES-IELPO Research Center of the Department of Education);
3. SPAIN: Universitat Oberta de Catalunya (case study presented by Fundació per a la Universitat Oberta de Catalunya);

4. IRELAND: Adult Continuing Education - University College Cork;
5. GREECE: University of Patras;
6. FINLAND: Laurea University of Applied Sciences.

The objective of the research planned in IO1 (Digital Technologies in HE: from the European vision to the university governance) was to understand the organizational processes in promoting digital innovation in universities to examine: guidelines; best practices; standards and constraints, with the intent of intercepting valuable suggestions for policymakers, decision makers and academic bodies in order to build a European Higher Education Area for e-learning, based on faculty professional development and European quality assurance standards.

HE micro-policies related to how universities have "translated" the digital challenge into practice through

- the promotion of digital resources in teaching activities (online and/or blended);
- faculty professional development on digital transformation;
- e-learning quality standards;
- online/blended university policies.

The main targets of the case studies are to illustrate:

- needs and perspective of improvement of the use of digital technologies in HE;
- emerging teaching and staff skills for the digital era;
- the most essential problems detected and possible solutions.

The objective of the first phase of the case study research is to examine how each university (unit of analysis) involved develops its **strategic approaches to digitalisation**.

In the premises of this research report, it is important to clarify the difference between two important phenomena related to the process of the adoption of ICTs with all its effects.

The term "digitalization" appears massively in the literature only in the last five years, however used to connote phenomena that only partially represent a novelty. This emerges clearly when we distinguish between: a) the process through which physical entities of different nature (three-dimensional objects, documents, sounds, images) are represented through a sequence of numbers (digits), usually in order to manipulate them by means of information technology and b) the series of phenomena that turn around the adoption of the outcomes of this process. **We can refer to the first aspect as digitisation and only the second as digitalisation.** This conceptual and terminological distinction is not always clear in the literature while, on the contrary, it appears fundamental when dealing with the character assumed by concrete work since only in the last few years have the technologies relating to the process of «representation in digits» (digitisation) significantly accelerated, while the adoption of the technologies linked to it already began in the seventies of the last century, classified under the labels of “informatisation” or “computerisation”. The novelty of recent years, therefore, is above all in the process of creating digital data, which has reached ever more extensive processing capacities and which grow at an exponential rate combined with a progressive reduction in costs (Ambra, Pirro, 2017).

To investigate the complexity of the phenomena, the field research adopts a mixed method in which the team combines elements of qualitative and quantitative research approaches.

Digital technologies in educational institutions have the potential to be one of the main means of delivering quality education in line with their mission and vision. For this reason, the adoption of digital technologies and their integration into educational systems is considered a form of educational innovation and implies changes in three basic dimensions: pedagogical, technological and organisational. The qualitative research focuses on these areas, which consider the following seven sub-dimensions of analysis based on the proposal of a **Digital Maturity Framework for Higher Education Institution**[1] which synthesizes the main existing frameworks/models related to the integration of digital technologies in HE (Đurek, Begičević Ređep, Kadoić, 2019) (Fig. 1).

Fig. 1 - The seven sub-dimensions of analysis, based on the proposal of the Digital Maturity Framework for Higher Education Institution

Source: Đurek, Begičević Ređep, Kadoić, 2019.

The seven sub-dimensions of analysis are described as follows (Đurek, Begičević Ređep, Kadoić, 2019) (Tab. 1).

[1] Available on: http://archive.ceciis.foi.hr/app/public/conferences/2017/02/CECIIS-2017_paper_58_final.pdf.

Tab. 1 - The Digital Maturity Framework for Higher Education Institution: areas and elements/references

Area	Elements / References
Leadership, planning and management	▪ The relationship between the HEI and the state, from the aspect of ICT integration ▪ Strategic planning of ICT integration in HEIs ▪ Managing the integration of ICT in learning and teaching at an ▪ Financial investment in the use of ICT in learning and teaching; research and development; the business of the institution ▪ Regulated access to ICT resources ▪ Personalisation and support for under-represented groups by using ICT in learning and teaching
Quality assurance	▪ ICT quality assurance policy ▪ (ENQA; European University Association) ▪ Procedures for determining the needs, development or acquisition of ICT resources and their application ▪ Approved procedures and follow-up of student enrolment, their progress through study and the completion of studies supported by ICT ▪ Monitoring and periodic review of study programmes from the aspect of ICT application ▪ Evaluation of the work of teaching, research, administrative and technical staff ▪ Continuous monitoring of the results of scientific-teaching work and progress ▪ Administrative support for ICT
Scientific-research work	▪ Managing the integration of ICT in scientific research at HEIs ▪ Use of ICT in the preparation and publication of scientific papers ▪ ICT support in the preparation and management of scientific research work and projects ▪ A system of support for researchers at the beginning of their careers for applying ICT in scientific research ▪ Information system for supporting business processes of HEIs ▪ Access to ICT research infrastructures
Technology transfer and service to society	▪ Networking and collaboration of researchers with ICT support ▪ Collaboration with stakeholders (employers, local community, pre-tertiary education) supported by ICT ▪ ICT research (collaborative ICT research on HEI) ▪ Applied research and professional projects supported by ICT and/or ICT ▪ Intellectual property licensing of HEIs ▪ A wider digital environment (monitoring global trends in HEIs) ▪ Continuous training of researchers in ICT application in scientific research
Learning and teaching	▪ Enlightenment and participation of employees in training programmes for the development of digital competences ▪ Planning and implementation of training of HEI employees in the field of digital competencies and ICT application ▪ Employee education on ICT application ▪ Self-confidence and motivation of employees on the importance of ICT application ▪ Informal employee learning ▪ Development of teachers' digital competence ▪ Preparation, storage and use of digital content in learning and teaching ▪ Development of digital literacy and the promotion of innovativeness in ICT application with HEI employees ▪ Innovative learning and teaching methods with ICT ▪ Development of students' digital competence ▪ Ubiquitous learning and open curricula ▪ Use learning analytics to improve learning and teaching ▪ Students' experiences with the application of ICT

ICT culture	▪ The network presence of HEI ▪ Using ICT in HEI promotion ▪ HEI policy in ICT integration and monitoring global trends
ICT resources and infra-structure	▪ Planning and procurement of ICT infrastructures ▪ Network infrastructures at HEIs ▪ Technical support and maintenance of ICT resources at HEIs ▪ Availability of ICT resources (hardware and software) for learning and teaching ▪ Availability of ICT resources for scientific research ▪ Access to ICT resources for students (both in and out of the classroom) ▪ Providing access to and support in the application of ICT infrastructure ▪ Digital environment and information systems for employees and students ▪ Information security systems ▪ Application of ethical standards, copyrights and intellectual property in the ICT field

Source: Đurek, Begičević Ređep, Kadoić, 2019.

The exploration of these seven areas will allow us to identify for each case study the main interesting experiences in the field of:

- enhancing digital technologies in Higher Education institutions;
- academics' professional development paths with a focus on digital innovation;
- quality assurance in Higher Education with particular attention to digital innovation quality standards in teaching-learning processes;
- recognition and validation of teaching competencies with particular attention to digital skills in Higher Education;
- the most important efforts and critical issues in organizational and educational processes aimed to enhance digital resources and the environment in Universities (strengths, weaknesses, threats and opportunities, needs and perspective of improvement).

These areas are investigated through the actions explained in the Tab. 2.

Tab. 2 - Research tools and targets

Research tools	Target	Numbers (for each University)
In-depth interviews	Policy makers, subjects of national institutions	at least 3 key actors
	Academic bodies	at least 3 key actors
Focus groups	Teachers/professors and researchers	5/10 people For each FG
	Professional support figures (tutors, PhD, Post-doc, etc.)	
	Administrative Staff	
Survey online	Students	Minimum 100 students

Each case study report presents a standard structure:

- an introduction;
- a reconstruction of the national political framework related to digital innovation in HE;
- a focus on university micro-policies by documentary analysis;
- a qualitative analysis of the focus group and interviews results;
- a quantitative analysis of the survey online aimed at students.

The comparative research report follows the same index. It is organised in two main parts: the first concerns the description of the national frameworks, thanks to a desk analysis; the second presents the field research's main results (in-depth interviews, focus groups and survey online). Conclusions close the report and present the main key points in terms of strengths, weaknesses, risks, threats and opportunities (by a traditional SWOT analysis method).

I PART. The description of the national frameworks

Introduction

The national report of the case study is a concrete tool for identifying, at the national level, how Universities have adapted the enhancement of ICT resources in their organizations to face digital challenges and promote lifelong learning, inclusion, and innovation in their institutions. That is, a shared research protocol and reporting template for the national data collection and analysis has been prepared, identifying five main dimensions, constituting the national framework:

- The national legislative framework;
- The professional development;
- The national systems of assessment and Quality Assurance in Higher Education;
- The national financing program;
- Universities micro-policies.

The six case studies produced by each country partner, Finland, Greece, Ireland, Italy, and Spain, having the same structure, are summarized, and compared in this chapter benefiting from a flexible approach able to highlight similarities and differences between countries and exploring how Universities have adapted the enhancement of ICT resources in HE in these European countries.

National legislative frameworks

This section describes the national legislative frameworks in higher education in Finland, Greece, Ireland, Italy, and Spain, and compares them to highlight similarities and differences between the cases. Furthermore, it highlights the legislative process for the implementation of the agreements made during the Bologna process for the promotion of Digital Technologies in Higher Education. All the country partners involved in the case studies analysed the national regulation in the last twenty years in order to understand how national policies have transposed the European orientation to promote digital innovation at a national level in HE.

Over the past twenty years, all the countries participating in the analysis have produced laws aimed at regulating HE. In some countries, such as Spain and Italy, a distinction has been made at the institutional level between school education and University and research activities by establishing two ministries, one for the two educational levels. In some countries, such as Spain, the national legislative framework is ongoing since the Ministry of Universities is working on a new university law: the Organic Law of the University System, scheduled for the end of 2021 and relevant changes are expected.

The need for legislative support and effective planning to increase cooperation between higher education institutions from the perspective of digitalisation, development of education and lifelong learning, as stated by the Europe 2020 Programme report, is pursued in all countries, albeit with different tools and levels of development. Undoubtedly, the pandemic has challenged national HE systems testing digital development and highlighting criticalities, hesitating in rethinking the strategies followed until now. For this reason, in some countries such as

Spain and Greece, the national legislative framework is ongoing, while in other countries, the strategies did not involve regulation but rather economic investments, as we will highlight in the next paragraphs.

Tab. 3 - National Legislative Frameworks

Country	National Legislative Framework
Finland	The Finnish National Framework for Qualifications (FiNQF) ▪ The main pillars for Higher Education Institutes in Finland are the core Universities Act, 558/2009 (Amendments up to 644/2016) and Universities of Applied Sciences Act 932/2014 (Amendments up to 563/2016). ▪ The Finnish qualifications framework is based on the European Parliament's and Council's Recommendation on the European Qualifications Framework for Lifelong Learning (EQF). ▪ The Finnish qualifications framework is also in line with the European Higher Education Area (EHEA) qualifications framework (including ECTS). ▪ Provisions on the Finnish National Framework for Qualifications (FiNQF) and Other Competence Modules are laid down in Act (93/2017). ▪ Government Decree on the National Framework for Qualifications and Other Competence Modules (120/2017). ▪ The Council of the European Union development policies and strategies helped Finland to propose "Europe 2020 Programme: Finland's National Reform Programme 2019 (2019/32)". ▪ The Europe 2020 Programme report states the need for legislative and other support "to increase cooperation between higher education institutions from the perspective of digitalisation, development of education and student orientation, and some of it will also be channelled to the development of continuous learning (lifelong learning): Digitalisation, Student-centered and lifelong learning. Legislation to implementation ▪ The Finnish national vision is aligned with European 'Bologna Digital' vision that Digital Transformation is an effective means to solve 21st century higher education challenges to meet modern societal, cultural and business needs (Rampelt, Orr & Knoth, 2019). ▪ According to the Finnish Ministry of Education and Culture official reports, "The digital vision for higher education institutions is a core element of the implementation of the Government Programme under the Prime Minister's office." ▪ The continuous efforts resulted in release of Finnish government's Digital Finland Framework along with other reforms. These reforms contributing towards the Digitalisation of Higher Education. ▪ Finnish National Agency for Education (OPH) is the responsible body for implementation of education legislative frameworks, including digitalisation of the education system. ▪ In practice, OPH launched a project titled Digivision 2030 for higher education institutes. The official project statement says, "The Digivision 2030, a joint project between Finnish universities and universities of applied sciences, will bring greater opportunities for all learners to learn flexibly utilising new ways, technologies and tools". ▪ All Finnish higher education institutions have pledged their contribution to the Digivision 2030 project and signed a participation agreement. ▪ The Digivision 2030 focuses on key areas suggested in "Council conclusions on digital education in Europe's knowledge societies (2020/C 415/10)"
Greece	The National legislative framework referred to HE is composed of two main acts. The first one is Law 1268/1982 (G.G. 87/A/16.7.1982), which was reformed by the second act Law 3549/2007 (G.G.

	69/A/20.3.2007). Both set the general principles concerning the function of HE institutions, their role in Greek society, their administrative structure, their financial support by Greek state and the restructuring and creation of schools and departments. In addition, they set guidelines about academic studies at all levels (Bachelor, Master, PhD). In 2011, another act Law 4009/2011 (G.G. 195/A/6.9.2011) [4] defined the structure, operation, quality assurance of studies and internationalization of higher education institutions. The organization and operation of the Foundation for Youth and Lifelong Learning (I.NE.DI.VI.M) [6] and the National Organization for the Certification of Qualifications and Vocational Guidance were defined by Law 4115/2013 (G.G. 24/A/30.1.2013) [7]. Law 4310/2014 (G.G. 258/A/8.12.2014) [8] setting the National Research Strategy, Technological Development and Innovation furthermore implements the National Council for Research and Innovation (NCRI), which is the supreme advisory body for the formulation and implementation of the national policy for Research, Technology and Innovation Law 4485/2017 (G.G. 114/A/4.8.2017) resets the institutional framework of HEIs and regulates post-graduate studies matters. Law 4777/2021 (G.G. 25/A/17.2.2021) sets criteria for introducing HEIs from high schools, reforming the introduction to HEIs from high schools, and reforming HEIs asylum, among others.
Ireland	The Irish Universities Association - 'the voice of Irish Universities' Enhancing Digital Teaching and Learning (EDTL) Funded through the Higher Education Authority's Innovation and Transformation Programme 2019 – 2021 (Extended 2022) Aim: To mainstream digital in teaching and learning activities in Irish Universities, by addressing the professional development of all who teach or support teaching and learning – to enhance the digital attributes and educational experiences of Irish university students The Department of Education was formed in 1921 and had responsibility for primary, post-primary, further and higher education in Ireland up until 2020 when further and higher education were transferred to a new department. The Department of Further and Higher Education, Research, Innovation and Science was formed on the 2nd of August 2020, and Simon Harris, TD, is the current Minister for Further and Higher Education, Research, Innovation and Science. The Department is responsible for policy, funding, and governance of the Higher and Further Education and research sectors and for overseeing the work of the State agencies and public institutions operating in those areas. Its Statement of Strategy 2021-2023 was published on the 8th of March 2021, and it sets out, among other things, the department's ambition to implement a new 10-year strategy to improve literacy, numeracy and digital skills to ensure nobody is left behind, to put in place a sustainable approach to higher education funding, and to introduce new legislation to reform higher education governance.
Italy	Before Pandemic ▪ 2003 Moatti-Stanca reform regulates open universities and establishes the certification standards ▪ The decree-law 7 March 2005, n. 82, "Code of digital administration", establishes the position of digital transition manager, which is required to grant the digital transformation of Public Administration

	▪ 2010 Gelmini Law, n. 240, establishes the National systems of assessment and Quality Assurance in HE (ANVUR) and regulates the universities organization, academic staff's roles and recruitment procedures ▪ Until 2020, the legislation in effect for universities essentially stays while the legislation for the digitalisation of the school gets developed (Law 107/2015 about "Good school" and the "National Digital School") From the Covid-19 pandemic onward ▪ The decree-law of 2020, n. 1 "Urgent dispositions for the institution of the Ministry of education and the Ministry of university and research", institutes two different ministries for school and university and research (MI & MUR) and their functions are redefined ▪ The decree-law 23 February 2020 "Urgent measures on the matters of containment and managing of the epidemiological emergency of COVID-19» and further decree-laws and Prime Minister's Decrees from March 4th onwards also regulates the universities activities switching to online and blended procedures. ▪ Budget law 2020: 40 million are foreseen for the digitalisation of schools (education, administration, and students) but not for universities.
Spain	Currently, the education system is governed by the 1978 Spanish Constitution, while some laws have implemented constitutional principles. Here we highlight those related directly with the university: ▪ 1983: Organic Law 11/1983, of 25 August, on University Reform (LRU from the Spanish). ▪ Great power to university departments in promoting faculty. (Alarming increase in endogamy in university centres) ▪ 1985: Royal Decree on the regime of university teaching staff (RD 1985) ▪ 2001: Organic Law 6/2001, of 21 December, on Universities (LOU) ▪ 2007: Organic Law 4/2007, of 12 April (LOMLOU) Following again Martel (2018), "Organic Law 6/2001, of 21 December, on Universities (LOU) and the 2007 (LOMLOU) amendment thereof establish that the function of universities is to serve society through: ▪ the creation, development, transmission and criticism of science, technology and culture; ▪ the provision of training for the exercise of professional activities requiring the application of scientific knowledge and methods and for the creation of art; ▪ the development of science and technology, as well as the dissemination, assessment and transfer of knowledge to promote culture, quality of life and economic development; ▪ and the dissemination of knowledge and culture through university extension and lifelong learning". On October 29, 2007, the Royal Decree 1393/2007 was published establishing the organization of official university education for its adaptation to the "Bologna Process" and the initiation of the European Higher Education Area. Since the beginning of 2020, in Spain, a new Ministry has been in charge of university management: the Ministry of Universities is responsible for proposing and carrying out the government policy on universities as well as representing Spain in the European Union and other international organizations regarding universities. Currently, the Ministry of Universities is working on a new university law, the Organic Law of the University System (LOSU), scheduled for the end of 2021. Profound changes are expected with the approval of the new law

Professional development

The case studies comparison highlights relevant differences among countries. While in Finland, teachers should have pedagogical competence and, consequently, they can leverage digital tools, in countries such as Greece, Italy, and Spain, the university teaching profession is characterized by a double purpose: research and teaching. Teachers' training, having the dual function of teaching and researching, focuses mostly on their branch of knowledge and not on pedagogy. Thus, they are not trained to teach, leading to self-made practices. Moreover, the evaluation of these professionals is influenced by their double role.

In countries such as Ireland and Italy, there are national academic organizations, the CRUI in Italy and the Irish Universities Association in Ireland, which support the development of digitization in the HE. This function is delocalized to the university level in Greece, Spain and Finland , and in Finland there is the National Qualification Framework. Finally, in all countries, the digital methodological competencies in higher education are promoted, although unbalanced professional development in digital competences remains among education professionals.

Tab. 4 - Professional developments comparison

Country	Professional development
Finland	Empowerment of digital competencies. There are four key categories of professionals and their upskilling and development with higher education. All these four pillars must be strong to demonstrate significant progress: management and policymakers, educators, support services and student/learners. The European Digital Competence Framework (DigComp) and Digital Competence Framework for Educators (DigCompEdu) are key guidelines to follow. Teachers should have pedagogical competence at the first place. When teachers have needed pedagogical competency, they are able to leverage digital tools. National Qualification Framework demands every teacher working in higher education in Finland must have valid pedagogical studies. If not, then teachers are supported to gain teachers' pedagogical education. The same applies to student support services and counsellors. Both professional education offers digital competence modules in their training and working life project (integrating work-relevant development projects in studies)[2]
Greece	In Greece, there is no University Faculty or Department with the sole purpose of providing initial education to the academic/teaching staff. However, a PhD title, as well as the relevance of the candidate's doctoral thesis or research work to the cognitive field of the position announced, constitute the formal qualifications required from the candidates to pursue teaching or research work in HEIs (Higher Education Institutions).

[2] About this point, during the field research, one of the respondents reported, "Teachers are more like equivalent researchers with students. Increased skills and competence of teachers make challenges in work balance". Another respondent consolidated his experience with the following comments: "Focus on organizational and educational aspects: bureaucracy, logistics, timing, training models and pedagogical teaching methods. Teachers have to improve their own competence (all time); this is challenging- maturity of students and maturity of teachers". Finnish study finds that current students are more adaptable to technologies and digital education environments. ECOLHE students survey confirms majority (more than 50%) confirm good online education offerings. However, further data analysis helps to identify key development matters. Key findings is unbalanced professional development and digital competences within individual professionals (all four categories). Especially, management professionals need lots of catch-up with digitalisation and modern needs.

	Law 4009/2011 pertains, inter alia, to issues of appointment and advancement of the academic – teaching staff. According to the said law, HEIs' Teaching and Research staff belong to the following ranks: professors, associate professors, assistant professors and lecturers. In addition to the three above-mentioned academic staff categories, adjunct professors are employed by institutions under a fixed-term contract governed by private law lasting from one to three academic years and subject to renewal without exceeding five academic years . Adult Trainers, as well as other levels of staff, receive initial education at HEIs and are required to have the educational aptitude. After their educational aptitude is recognized and certified by the National Organization for the Certification of Qualifications & Vocational Guidance (EOPPEP), adult trainers are registered in the Trainers Register. All members of the Greek society as potential beneficiaries of quality counselling and vocational guidance services at the regional and national level. The "*Foundation for Youth and Lifelong Learning*" takes all the necessary steps for its employees' professional education and continuous vocational training, which also includes Adult Educators.
Ireland	Irish Universities Association Enhancing Digital Teaching and Learning (EDTL) Funded through the Higher Education Authority's Innovation and Transformation Programme 2019 – 2021 (Extended 2022) Aim: To mainstream digital teaching and learning activities in Irish Universities by addressing the professional development of all who teach or support teaching and learning – to enhance the digital attributes and educational experiences of Irish university students
Italy	INDIRE (National Institute for Documentation, Innovation and Educational Research) INDIRE is the Italian Ministry of Education's oldest research organization, and it is a public body, scientifically independent. It is the Italian National Agency for Erasmus+, the National Support Service for eTwinning, Epale, and Eurydice, and it is part of the EUN Consortium European Schoolnet It boasts consolidated experience in the in-service training of teachers, administrative, technical, and auxiliary staff as well as headmasters, and has been a leading player in some of the most important e-learning experiences in Europe It looks towards Europe also through its many collaborations which allow the creation of a network for cooperation, contacts, information flows and experience exchanges involving pupils, schools, enterprises and institutions in all European countries. CRUI (Italian Universities Council of Rectors) CRUI is the Italian Association of private and public universities It establishes agreements with public institutions such as MIUR, MITD AgID, CONSIP, and the Activities with the Authority for the Protection of Personal Data, the relationship. It negotiates the agreements between national and international ICT service providers and universities reducing their costs (Microsoft, MongpDB, etc.). It has developed and manages the GARR network through the GARR Consortium. The GARR network interconnects effectively universities, research centres, libraries, museums, schools and other places where education, science, culture and innovation are carried out all over the country.

	CRUI intend to be the tool for directing and coordinating university autonomies, the privileged place for experimenting with models and methods to be transferred to the university system, the laboratory for sharing and disseminating best practices, and the centre for modern service available to universities. It carries out seminars, webinars and initiatives dedicated to the national university system, research institutions and university hospitals; technical courses for university staff in collaboration with the major players of the ICT market; training activities for Public Administrations in collaboration with other Institutions, such as the one with AgId e-Gov 2012 Plan & National Digital Plan The e–Gov Plan 2012 developed guidelines to encourage universities in the adoption of procedures to facilitate the dissemination and accelerate the process of digitization and administrative simplification of universities with the introduction, strengthening and standardization of different services: ▪ the implementation of the digital recording process of the exams; ▪ the student records; ▪ the implementation of cooperation; ▪ the adoption of VoIP (voice over IP) systems; ▪ federated authentication for internet access and network resources; ▪ digitization of degree and theses; ▪ online payments. Moreover, the National Plan for public administration IT (three years plan) aims to support the digital transformation of the country and particularly of the public administration
Spain	The university teaching profession in Spain is characterized by having a double purpose: research and teaching. However, having the dual role in their profession, teacher and researcher, the training of university professionals' focuses on their branch of knowledge and not on teaching: "The initial training of university teachers has been focused on preparing to do research from the doctorate, having in the best of cases some particular teaching assignment. On the other hand, permanent training is organized from university programs, some of them focused on teaching skills, although they are not a mandatory requirement for teaching performance" (López, 2016).

National systems of assessment and Quality Assurance in HE

Two models of National systems of assessment and Quality Assurance in HE emerge: one internal and the other external to HEIs. In Finland, higher education institutions are primarily responsible for the quality of education they organise. HEIs are responsible for evaluating their education, research and artistic activities. At the same time, in other countries, a national accreditation system supports HEI in developing stable programmes of growing academic and professional quality. Then, accreditation is an external evaluation process based on specific, predetermined, internationally accepted, and ex-ante established quantitative and qualitative criteria and indicators, all harmonised with the Principles and Guidelines for Quality Assurance of the European Area of Higher Education. While the autonomous HEIs decentralised the quality assessment process ensuring a high level of freedom to individual institutes for educational innovation, it brings challenges of its own. In contrast, the national accreditation system supports HEIs but reduces their autonomy.

Tab. 5 - National systems of assessment and Quality Assurance in HE comparison

Country	National systems of assessment and Quality Assurance in HE
Finland	The Finnish acts clearly states HEIs must regularly participate in external evaluations. These are mainly carried out by the Finnish Education Evaluation Centre (FINEEC). FINEEC has renewed its audit model for the third round of audits of HEIs (2018-2024). The FINEEC closely follows the Standards and Guidelines for Quality Assurance in the European Higher Education Area along with European Commission's guidelines. In Finland, Higher education institutions (HEIs) themselves have the primary responsibility for the quality of education they organise. This is stipulated in the Universities Act and the Universities of Applied Sciences Act. HEIs are responsible for evaluating their education, research and artistic activities. For example, Laurea has developed its own quality assurance processes that run regularly. Being active HEIs brings frequent Center of Excellence and other benefits.[3]
Greece	Quality assurance in higher education was established for the first time by virtue of Law 3374/2005. A single, nationwide ongoing evaluation process is established, analyzing and systematically assessing teaching and research work, study programmes and other services of HEIs. The same Law established the Agency for Quality Assurance, and Accreditation in HE (ADIP) which is the competent body for implementing Quality Assurance in HE. By Law 4009/2011 "Structure, function, quality assurance for studies and internationalization of HE Institutes", Greece acquires a national accreditation system supporting HEI, to develop stable programmes of growing academic and professional quality. Accreditation is an external evaluation process based on specific, predetermined, internationally accepted, and ex-ante published quantitative and qualitative criteria and indicators, all harmonized with the Principles and Guidelines for Quality Assurance of the European Area of Higher Education (ESG 2015). Recently, ADIP has been renamed Hellenic Authority for Higher Education (H.A.H.E.) under Law 4653/2020. H.A.H.E is an autonomous body supervised by the Ministry of Education and Religious Affairs. Its mission is to assure high quality in higher education. The Quality Assurance Unit (MODIP) is the responsible body in every HEI for the coordination and support of quality assurance processes. It cooperates with the H.A.H.E The certification of HEIs and their individual units/departments, curricula, and internal quality assurance systems is a quality assurance procedure based on specific, predefined, internationally accepted and pre-publicised quantitative and qualitative criteria and indicators. The External Evaluation and Certification Committee (EEAP) is a five-member panel consisting of 3 independent experts from the Registry of Experts, one student representative and one professional association/chamber representative. The external evaluation and certification carried out by the EEAP follows the completion of the internal evaluation procedure considering the relevant HEI's/Academic unit's internal evaluation report. To verify internal evaluation elements, EEAP takes into account the findings after carrying out a site visit to the HEI/academic unit. The external evaluation is completed after issuing the external evaluation and certification report. Digital Tools for Quality Assurance. The Internal Evaluation Team (OM.E.A.) is set up following the decision of the General Assembly of each Department of the University. OM.E.A. is responsible for coordinating and conducting the procedures of internal evaluation of the Department as well as the

[3] Finnish main finding confirms the key gaps of uneven education and process development quality within various HEIs. This is one of the key development challenges mentioned in the Council conclusions on digital education in Europe's knowledge societies 2020/C 415/10 (THE COUNCIL OF THE EUROPEAN UNION). Their study confirms the autonomous HEIs give a decentralised and freedom to individual institutes for the educational innovation. However, it also brings challenges of their own.

	collection of all the data which is needed for the process and submission of the Annual Internal Report. The Annual Internal Report, in particular, is the annual survey and recording of the educational and research work that is carried out by the Department. This is the primary and constantly repeated process, which provides the information and data needed for the Internal Evaluation Report that is drawn up every four years. The Internal Evaluation Report is based on the quality analysis and comparative assessment of the four-year indicators and provides the basis for the External Evaluation Report.
Ireland	Two Bologna Process objectives were fully implemented by 2010, and Ireland were among the early leaders in terms of the establishment of a National Framework of Qualifications (NFQ) in 2003 and widespread Quality Assurance systems. The National Framework of Qualifications (NFQ) is a 10-level, single national entity through which all learning achievements may be measured and related to each other. Underpinned by quality assurance principles, it describes qualifications in the Irish education and training system and sets out what each qualification says about what learners at each level should obtain in terms of knowledge, skills, and competences. The breadth of its scope results in a central point of reference, nationally and internationally, for the comparison, contrast, and recognition of qualifications. Its ultimate purpose is to place the learner at the centre of education and training in Ireland. QQI (Quality and Qualifications Ireland) is an independent State agency responsible for promoting quality and accountability in education and training services in Ireland. Established in 2012 by the Qualifications and Quality Assurance (Education and Training) Act 2012. In its role, it oversees key component areas of the development of the European Higher Education Area under the Bologna process in Ireland. QQI Role: ▪ Promote, maintain and develop the Irish National Framework of Qualifications (NFQ) ▪ Approve programmes offered at a variety of schools, colleges and further and higher education and training institutions. These programmes lead to qualifications (QQI awards) listed in the NFQ, which are recognised internationally. ▪ Regulate and promote the quality of programmes offered by schools and colleges, leading to qualifications in the NFQ for the benefit of learners, employers and other interested parties. ▪ Advise the Minister for Education and Skills about national policy on quality assurance and improvement in education and training.
Italy	ANVUR is an independent agency supervised by MIUR aiming for the evaluation of universities and research bodies' quality of processes, results and products of management, training and research activities, and technology transfer. In particular, it evaluates: ▪ the efficiency and effectiveness of teaching resulting in students' learning outcomes and work placement; ▪ the quality of research products, mainly assessed through peer-to-peer procedures (PEER-REVUE); ▪ the ability to attract external funding and to activate researchers' collaborations and exchange; ▪ the adequacy of public communication of the educational offer, student services and evaluation results.

	It has built a working team aiming to survey the university's teaching experiences during Covid-19 health emergency. The survey targets are university rectors and directors, professors and students.
Spain	At the State level, the National Agency for Quality Assessment and Accreditation of Spain, ANECA, is an Autonomous Body whose aim is to provide external quality assurance for the Spanish Higher Education System and to contribute to its constant improvement through evaluation, certification and accreditation. ANECA publishes annual reports including the objectives that have guided ANECA throughout the year, together with the institutional and evaluation activities that have been carried out within the scope of responsibilities of the Agency. The last published report can be found in ANECA (2017). ANECA has developed several evaluation Programmes in order to perform its activities: evaluation, certification and accreditation. ANECA, in its role of promoting the adoption of quality assurance (QA) criteria in accordance with international standards, is aware that to alleviate the effects of the current health situation, resulting from the evolution of Covid-19, with the suspension of face-to-face teaching activities and other serious consequences, different and meritorious solutions have been adopted in the field of university education. In Catalonia, the local agency AQU, founded in 1996, is regulated by Act 15/2015 of the Catalan University Quality Assurance Agency (Published in the Official Journal of the Government of Catalonia, DOGC, dated 23 July 2015). The Act strengthens and reinforces AQU Catalunya as the main instrument for the promotion and assurance of quality in the Catalan higher education system with functions that are upgraded and up-to-date, a more flexible structure and better compliance with European standards as regards its independent nature as an agency. It also places the international sphere of its activities on a firmer footing and establishes a system for the appointment of the Agency's director by way of an open and competitive process, amongst other things.

National financing programs

ICT financing programs are generally based on three strategies: the allocation of a percentage of the total public expenditure, the allocation of funds to a specific plans, and the allocation of funds to specific program (Table 4). While the allocation of a percentage of the total public expenditure grants constant financial support to digitalization allowing for a long-term development strategy, the allocation of funds to specific plans aims to foster the uptake and integration of digital technologies in national strategic areas, and the allocation of funds to specific program aims to foster innovation and competitiveness on specific targets. The financing methods, therefore, differ in their amount: programs' funding is lower than public expenditure and plan. Also, the level of competitiveness counts: it is greater in programs, that have a selection phase, than the public expenditure. Moreover, the pandemic has tested the robustness and adequacy of countries' ICT facilities and services. The shortcomings identified to lead to the implementation of action plans or other sources of funding to fill the gaps. Finally, the funding strategies, not surprisingly, differ according to the level of ICT development of the country: the more the ICT is developed, the more the projects are targeted, while the less ICT is developed, the more a multiplicity of funding strategies is adopted by the country.

Tab. 6 - National financing programs

Country	National financing programs
Finland	EuroStat data: European Government expenditure on education: In 2017, public spending on education relative to GDP was highest in Denmark (7.3 %), Sweden (7.1 %), while in Finland (6.3762 %). The expenditure on education totalled EUR 12.3 billion in 2019. Costs of comprehensive school education made up the biggest share of current expenditure on education. EUR 5.1 billion were used on comprehensive school education in 2019. The shares were next biggest in university education and research, on which EUR 2.3 billion were spent and in vocational education, on which EUR 1.8 were used. Digital Finland Framework supported by the Finnish government with EUR 400 million in funding to local authorities to support digitalisation efforts and projects during the year 2018 to 2022. Digivision 2030 project: The Ministry of Education and Culture has awarded a special grant of EUR 20 million to the Digivision 2030 project. In addition to the special grant, the Ministry of Education and Culture is allocating EUR 17.8 million from the strategic funding for higher education institutions to the project for the years 2021-2024. The Digivision 2030, a joint project between Finnish universities and universities of applied sciences, will bring greater opportunities for all learners to learn flexibly. The aim is to restructure Finland's higher education over the next decade by means of digitalisation and to make Finland a model country for flexible learning. Interestingly, the resources for vocational education and training will be boosted by allocating EUR 150 million for recruiting teachers and instructors by 2022. The government and institutions of higher education are to cooperate in promoting the digitalisation of teaching, particularly the development of digital pedagogy and the provision of sufficient resources for new learning environments.
Greece	HEIs are Legal Entities of Public Law, mainly financed by public resources. Hence, their administrative mechanism is based on the legislation governing the public sector. At the same time, in the framework of full self-administration established by article 16 of the Constitution, HEIs can use their discretion broadly in choosing and configuring the most appropriate means, at their judgment, in order to realize their mission and support their goals and are responsible for managing their own resources. Eurydice within the budgetary limits of the Ministry of Education and Religious Affairs HEIs funding includes, in particular, the operating costs and the expenditure of the Public Investments Program. whereas other resources of HEIs are: Income from the institution's entrepreneurial activity or private assets; Income from investment grants; Donations, endowments and bequests; Other resources. National strategic programme for HE-Draft planning agreements. Every four years, the Minister of Education approves the National Strategic Programme for HE which primarily, involves midterm objectives, guidelines, investment plans, programmes or individual actions of national policy for higher education and may be specified on an annual basis. The National Strategy Programme for Higher Education is implemented through HEIs. Under the existing legislative framework (laws 4009/2011, 4485/2017 and 4653/2020, public funding of HEIs is distributed on the basis of objective criteria and indicators: ▪ 80% of HEIs' regular funding is distributed on the basis of the total number of students enrolled per study programme; the estimated annual cost of studying per student for each

	study programme; the duration of the study programmes; the institution's size and geographical spread; ▪ 20% of HEIs' regular funding is distributed on the basis of the qualitative indicators and indicators of achievement each HEI chooses to be evaluated on. What is more, the management and employment of funds derived from scientific research, education, training, technological development and innovation is undertaken by the Special Account for Research Funds (ELKE) which is established and operates in each HEI. These funds may come from different sources such as the Programme of Public Investment as well as private resources like the exploitation of intellectual property rights or publications (L. 4485/2017).
Ireland	Core grant support for research is provided as part of the block grant. This is in recognition of the need to provide a 'foundation investment' in research excellence across the system. Institutions have the final say on the distribution of their budgets between teaching and research, in accordance with their mission and objectives. Student supports also makes up a significant portion of the allocation to Higher Education. Third-level students who fit the eligibility criteria are entitled to claim two grants from Student Universal Support Ireland (SUSI). In the academic year 2017/2018, 77,495 students were awarded SUSI grants at a cost of €363 million. This figure includes maintenance grants (intended to cover additional costs, such as books) and fee grants (intended to cover some, or all, of the Student Contribution Charge of €3,000 per annum). Approximately €168 million was awarded in maintenance grants and €195 million in fee grants during the 2017/2018 academic year. ▪ Additional government planned investment close to the €5.5 billion in capital investment recommended by 2030 in the Cassells Report. ▪ A further €60 million is to be provided for Higher Education from the €300 million Human Capital Initiative Fund in Budget 2020. This is being sourced from surpluses within the National Training Fund. Over 50% of university funding comes from "market transactions" and private sources. This allows universities to be classified as market producers, and therefore outside the General Government or 'off-balance sheet. This means that they have fully autonomous borrowing powers, and their debt does not impact the level of Government debt. In a recent report published by IUA- Irish Universities Association-, the effects of Covid-19 on higher education were touched upon, whilst also conveying the strengths of the rapid migration to online teaching and assessing. Different funds, including a Stability Fund, a Transformation Fund, and a Research and Innovation Fund have been proposed in order to secure the learning and development needs of current and future cohorts of students in higher education. The Research and Innovation Fund, in particular, will help with the future of digital technologies in higher education in Ireland, even though the State investment in R&D is at '0.95% of total government expenditure as against a EU27 average of 1.3%.
Italy	The decree-law 23 February 2020 "Urgent measures on the matters of containment and managing of the epidemiological emergency of COVID-19» does not include funding Budget law 2020: 40 million are foreseen for the digitalisation of schools (education, administration and students) but apparently not for universities National Recovery and Resilience Plan allocates € 31 billion to the education and research sector covering the whole education sector (Schools, Universities and research centres)

Spain	In 2019, the Member States of the European Union (EU) spent over €306 billion on R&D. The R&D intensity, i.e. R&D expenditure as a percentage of GDP, stood at 2.19% in 2019, compared with 2.18% in 2018. Ten years earlier (2009), R&D intensity was 1.97%. With respect to other major economies, R&D intensity in the EU was much lower than in South Korea (4.52% in 2018), Japan (3.28% in 2018) and the United States (2.82% in 2018), while it was at about the same level as in China (2.06% in 2018), higher than in the UK (1.76%) and much higher than in Russia (1.03%) and Turkey (1.03% in 2018). R&D expenditure in Spain at 1.14% of GDP in 2019, one of the lowest in EU,

Universities micro-policies

This paragraph focuses on universities' micro-policies. It is based on a literature review and takes into consideration principal public documents adopted by universities (statutes, qualitative politics for teaching, strategic plan, didactic plans, regulations, university policies, QA guidelines, etc.).

The objective of this analysis is to understand the way in which Academic Bodies have interpreted, adopted and translated in internal rules and practices above questions.

Tab. 7 - Universities micro-policies

Country	Universities micro-policies
FINLAND **Laurea University of Applied Sciences**	Strategic vision & policies towards implementation: ▪ Main findings about the Universities micro-policies programme: Field study and practices ▪ Organisation structural changes within Laurea UAS ▪ Laurea focuses on strategic development with concrete vision, strategies and policies ▪ Continue development of processes and practices ▪ Recognition of best practices and open cooperation within the organisation and beyond ▪ Internal quality assurance processes ▪ Digital pedagogy, skills and competence development. ▪ Main findings about the Best practices: Field study and practices.
GREECE **University of Patras**	In Greece, HEIs are self-governed Legal Entities of Public Law and are supervised by the Ministry of Education and Religious Affairs. For that reason, each HEI is responsible for the formulation of its own policies. The Institutional framework of the University of Patras is summarized in the national case study report.
IRELAND **Adult Continuing Education**	STATUTE was adopted by the Governing Body in 2009, with its latest amendment in 2020. The University has a system of shared governance made up of the Governing Body (GB), Academic Council (AC) and the University Management Team (UMTO/UMTS). The role and authority of the Governing Body and of the Academic Council are set out in the Universities Act of 1997 and in the University's Principal Statute. The Academic Council is the primary internal body responsible for academic affairs and derives its authority from the Universities Act, 1997 (SI24), Chapter V, §27 and Principal Statute. Quality Assurance

	UCC is recognised as an autonomous degree-awarding body under the terms of the Qualifications & Quality Assurance (Education & Training) (Amendment) Act 2018, with responsibility for assuring and enhancing the quality of its education, research, and allied services. UCC has comprehensive internal and external quality assurance procedures meeting both national and European standards, with a strong focus on enhancing the quality of all activities. *Policy Framework for UCC Digital Badges* "This Policy Framework is a document that sets direction, objectives, standards, policy and process for the development of digital badges in the University." This policy framework aims to keep the level of quality and standard of the digital badges that are issued by UCC. The digital badges are micro-credentials "awarded to earners in an online format." The main objectives of the policy framework are: OBJECTIVE – To provide a Strategic Approach to developing the organisation and navigation of UCC Digital Badges, enabling the strategic development of emerging longer-term opportunities for digital badges within UCC; OBJECTIVE – To put in place a clear Governance and Operational Policy for immediate use in the development and issue of externally facing, non-credit bearing digital badges; and, OBJECTIVE – To ensure UCC Digital Badge Quality and Standards by implementing an Approvals Process for immediate use to progress the development and issue of any new digital badges by UCC. Another principal Strategy PLAN: UCC Digital Strategy 2018-2022 The following are some of the key policies that University College Cork has outlined in their current four-year Digital Strategy plan. This course of action will all be governed by the Academic Council, IS&ER committee and an ICT steering group: Technology enabling academic strategy. The use of digitalization to support the growth of UCC. Strategic Plan 2017-2022; Teaching and Learning This five-year strategic plan outlined by University College Cork was designed to activate the enhancement of learning and teaching based on a continuous involvement plan. The ambition of the project is to 'deliver an outstanding, student-centred teaching and learning experience with a renewed, responsive and research-led curriculum at its core' and to 'ensure a diverse staff who are enabled to reach their full potential'. The following are some of the key actions and targets set out by the plan in terms of digitalization. UCC Centre for Digital Skills This department is currently involved with a range of committees and working groups across the university. The Digital Education Advisory Group. Responsible for reporting to the Academic Council Teaching and Learning Committee and the Academic Council Information Strategy and Education Resources Committee. The Digital Badge Subcommittee of Academic Development and Standards Committee The IT Steering Group Academic Programme and Regulations Programme Approval boards. This board carries the right to decide whether online components are included in new programmes submitted for approval UCC 2022: Delivering a Connected University According to the executive summary of the UCC 2022: Delivering a Connected University, the plan sets out a thematic prioritisation of UCCs strategy. This strategic pivot identifies the key strategic priorities for the period 2021-2022, clustered within five interconnected thematic pillars:

	▪ Learning and Teaching - has a particular focus on digitalisation ▪ Research and Innovation ▪ Student Success ▪ People and Organisational Culture ▪ Infrastructure and Resources.
ITALY **eCampus University**	STATUTES The Statute of the e-Campus University was approved by a resolution of the Board of Directors of the E-Campus Foundation on 21.09.2016. e-Campus University acknowledges the following Code of Ethics, which determines the fundamental values of the University and of the academic community, promoting the recognition and respect of individual rights and the acceptance of duties and responsibilities towards the Institution. These values are: ▪ equality, ▪ respect for the individual, ▪ transparency and impartiality, ▪ freedom of teaching and research, ▪ the good name and reputation of the University, ▪ enhancement of merit. REGULATIONs Among the essential documents, which derive from the Statute, are: ▪ The General Regulations of the University; ▪ Finance and Accountability Regulation setting out: general principles; forecasting, management and reporting systems; contractual activities; organisation and operation; monitoring and evaluation system; and final and transitional provisions; ▪ The Teaching Regulation which includes : University Teaching Regulations; University Regulations for the recognition of university credits; the Regulations for the final degree examination; the General Regulations for University Masters Courses and the Teaching Regulations for study courses. ▪ The Teachers Regulations defining: the public selection of researchers; the procedures for calling up professors of the first and second rank; the calling up and renewal of contractual professors; the supplementary regulations for the contractual relationship of researchers in force since 14.11.2016; the regulations governing compatibility/incompatibility and the regulations governing the working hours of professors and researchers; the activities of the professor in charge of supplementary teaching functions (disciplinary tutor); salary increases and subject matter experts. ▪ The Regulations BODIES and STRUCTURES that, with regard to the national QA system, they refer to the Regulations of the University Evaluation Board, of the Quality Presidium and of the Joint Teachers-Students Committee ▪ The Research regulations define: the Research; procedures for the awards of research grants and spin- Off Institution; the regulations of three research centres: the Centre for Studies and Research on Legal Policy and the Production and Services System; the Centre for Studies and Research on Energy and the Environment; the European Centre for Studies and Research on Enterprise) and the Centre for Research on Learning and the Right to Education (CRA). The CRA is divided into three sections, each with its own specific objective: ▪ "Section a: Learning at the heart of the person: human capital. Basic and applied research on the cognitive variables involved in human learning.

	▪ Section b: Learning at the heart of the enterprise: learning organisation. Basic and applied research on learning processes in organisations. ▪ Section c: Learning at the heart of society: cognitive society. Socio-economic observatory on education, training, work". In the student section have been arranged the student Regulations; the Regulations for the conduct of proficiency examinations; the Election Regulations for the election of student representatives to the Joint Teachers' and Students' Committees and to the Review Groups; the Regulations for master examinations, perf. courses, training courses and 24 CFU teach training courses and the regulation on the prohibition of smoking no the premises of the e-Campus Telematic University. The Service Charter regulates the relationship and reciprocal commitments between the University and its users, explaining, among other things: services and technological standards; methods of providing services and teaching methods; teaching materials and design of courses, evaluation of profit exams and teaching services; services for students with disabilities and/or DSA. The Quality Assessment System The University's Quality Assurance system is fully in line with the national framework determined by ANVUR. In the first ten years of life the university has been characterized as a teaching university, mainly oriented to the training of adults, then starting a new season aimed at redrawing the map of development and academic positioning in terms of research and target. With regard to the first point, three interdisciplinary research centers and two PhDs in: Medium and Mediality and Applied Sciences to well-being and sustainability have been established with the aim of outlining a distinctive field of research of a university that aims to be an actor of social transformation. With regard to the second point, the penetration of the training offer towards increasingly young targets and beyond national borders has been defined. *Strategic Plan 2019-2021* The plan highlights the objectives of Telematic University, in a particular way: ▪ the importance of the relationship with the territory through its numerous physical and scattered locations; ▪ the flexibility of integrated distance learning that is combined with the personalization and assistance of tutors online and on the territory; ▪ the idea of "Widespread University" usable in every place and at any time through ▪ the distance-presence mix on the territory; ▪ the University Information System that integrates cognitive, personal, logistical and administrative perspectives. Technology The University adopts an LMS platform for its teaching services, which is accessible through a unique and secure identification procedure (Single Sign On) represented by an integrated system including: the University Portal to use all services: ▪ user management (students, tutors, teachers, secretarial staff), the production of content, and the monitoring of teaching activities; ▪ the EPPI procedure (Editor for the Design and Production of Courses) for the management of teaching activities and evaluation processes;

	▪ the GPSP procedure (Personal Study Plan Manager), through which tutors can plan and monitor the study path of each member; ▪ the ESSE3 system of Kion/CINECA, for the IT management of educational secretarial activities, integrated with Moodle (version 1.9.x) to ensure the measurement of the "frequency" and the recording by SCORM track; ▪ the use of the e-Portfolio; ▪ the integrated service for E-learning L2L is a, provided by CINECA. All IT services are outsourced.
ITALY **Roma Tre University**	STATUTES The Statute of the University Roma Tre governs the general principles of organization and functioning of the University. According to Law No. 168/1989, the Statute represents the highest degree of legal autonomy of the university. The Statute of the University indicates participation in the cultural and technological innovation processes of society and the productive world among the primary functions of the university and, therefore, enhances the actions aimed at the pursuit of digital innovation. REGULATIONs University Regulations are secondary normative sources and regulate specific aspects of university activity. They are also adopted in the exercise of the university's legal autonomy; they are issued by decree of the Rector after approval by the competent bodies. These regulatory tools are a constant source of reference for the need to accompany processes of innovation and the implementation of *digital transformation at* the University of Roma Tre. **University General Regulation** - published with Rector's Decree no. 231/2021 - regulates the implementation of the general principles of the Statute and lays down the provisions regarding the general organization and the modalities of operation of the University. Regulations for the performance of teleworking activities (D.R. n. 542/2016) **Regulations for the recruitment, progression, training and mobility of the Technical Administrative and Librarian Staff of the University** (C.d.a. 25.09.2001) make explicit reference to the training of digital skills as a preparatory step to ensure the internal mobility of staff at the University. **University Dicactics Regulations** are revised during 2020 (approved at the sessions of S.A. 14.07.2020 and the c.d.a. 21.07.2020). The Three-year Planning Document (University's three-year planning document) identifies: The University development plans in the following areas: ▪ didactics, also providing for degree and master's degree courses to be set up and activated in compliance with the minimum essential requirements in terms of financial, structural and human resources, as well as those to be deactivated; ▪ scientific research, also with reference to the educational offer of PhD courses; ▪ "third mission"; ▪ actions for the support and strengthening of services and interventions in favour of students; ▪ internationalization of didactics, scientific research and the "third mission"; ▪ policies relating to the University staff and the recruitment of staff based on needs; ▪ self-assessment criteria regarding the implementation of the above-mentioned development plans and the achievement of the expected objectives.

	The financial statements The three-year integrated plan for performance, transparency and corruption prevention. For the academic year 2021-2022, the University of Roma Tre requires the accreditation of seven new study courses, including: Economics and Data Science (class L-33, Economics), at the Department of Economics; Digital Society (class LM-62, Political Science), proposed by the Department of Political Science; E-Learning and Media Education (class LM-93 Theories and methodologies of e-learning and media education), proposed by the Department of Education in collaboration with the Department of Philosophy, Communication and Entertainment and with the Department of Law. *The Quality Assessment System* The University of Roma Tre has adopted a Quality Assurance (QA) System consistent with the Self-assessment, Periodic Assessment and Accreditation guidelines (in Italian : AVA - Autovalutazione, Valutazione periodica, Accreditamento guidelines), adopted by the National University and Research Assessment Agency (ANVUR), and with the European Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG). The university has adopted educational, research and third-stream design, monitoring and assessment procedures for the continuous improvement of quality standards, as indicated in the Quality Manual approved by the university's Governing Bodies. The Governing Bodies, the Quality Office and the Assessment Unit guarantee the implementation of opportune processes to assure the quality of the university's activities. The University, as a Public Administration, annually evaluates the performance of the Administration. For this purpose, it adopts and annually updates, granting the binding opinion of the Evaluation Unit, the Performance Measurement and Evaluation System. ANVUR, also in response to a need represented at European level by the ENQA (European Association for Quality Assurance in Higher Education), has promoted and established a working group to develop a survey and analysis of the didactic experiences made in Italian universities during the COVID-19 health emergency, also in order to offer useful elements in view of the strategies that the universities themselves will have to prepare once the current pandemic phase is over. The ANVUR survey on Distance Learning services provided by universities started on 14 December 2020 and ended on 8 February 2021. ANVUR has defined three e-learning questionnaires aimed at different recipients: Emergency governance - Recipients: Rector / Director of each University (there is only one Emergency Governance Questionnaire for each University, which can be completed in agreement by the Rector and the Director); Distance Learning - Recipients: Teachers (the request for participation of teachers disseminated by the University); Distance Learning - Recipients: Students (at the beginning of 2021 ANVUR should have sent a note to all universities, providing more information on the survey of students' opinions). The Plan E-Gov 2012 The e-Gov Plan 2012 has guided the Regions in the implementation of the main lines of digital development, with a view to complying with the principles expressed at the national level. Within the Regional boundaries, each Athenaeum then had to drop into its cultural fabric the salient points defined by the Plan itself.

	The University Roma Tre has translated into internal practices the principles expressed in the e-Gov Plan 2012. It contributed to the elaboration of the "Digital University Guidelines 2012" realized by the participating Universities to the project "Digital University" previewed from the Plan eGov 2012. The objective of the Guidelines is to modernise and make public administration more efficient and transparent by improving the quality and efficiency of advanced services for students, teachers, and administrative staff, as well as digital infrastructures, offered by the University. This happens through some steps: ▪ the implementation of the digital exam verbalization process, from July 2018; ▪ the realization of the Student identification card (R3-Card) equipped with RFID (Radio Frequency Identification) technology based on the ability to store data by particular electronic devices (Tag or Transponder) which, when in the vicinity of specific readers, are solicited by means of radio-frequency signals allowing the exchange of the information contained in the chips and thus the identification of the object or person associated with it; ▪ the systematization of online payments, with the institutionalization of Pagopa and the interruption of the payment procedures with the bulletins Mav; ▪ the adoption of VoIP systems - Voice over Internet Protocol (VoIP) is a technology that allows you to make voice calls using a broadband Internet connection instead of a regular (or analog) phone line -: the most explicit example is the adoption of the GARR - network - is the name of the Italian ultra-broadband network dedicated to the education, research and culture community - in line with the Voip technologies used on the national network by the main telecommunications operators; ▪ federated authentication for internet access and networked resources; ▪ the digitization of degree theses. A new Guide Line By 9 March 2021: the suspension of the graduation sessions of the winter session was defined as the first essential and strategic action of the University in accordance with national policies in the field of HE. The formative and curricular activities continued at a distance, in compliance with the measures already adopted by the University to combat the spread of contagion, and in accordance with the Guidelines issued by the Ministry of the University: with the exception of courses in the first year of the degree and master's degree programmes. The maximum capacity of the classrooms is confirmed at 30% of the seats available, upon reservation. Reservations made for lessons in the years after the first may be cancelled. The laboratory activities, exercises and experiential activities of all years have the opportunity to take place in the presence, in compliance with the Guidelines. The first-year training activities of the Phd students can be carried out in the presence of research and laboratory activities also students of the years after the first allowed. All the teachings are made accessible at a distance through the platforms made available by the University. As for the conduct of the exams is given the opportunity to be held in the presence, in compliance with the Ministerial Guidelines, also ensuring that students can, on request, to support them in distance mode. Graduation sessions continue at a distance. With the Provisions following the passage of the Lazio Region in the "red zone" of 12 March 2021, the Guidelines regarding the modalities of teaching activities for the first semester, that have made necessary the implementation of communication tools, are provided.

	A new way of communicating in the University: The tools of Roma Tre The three main tools identified for teaching and meeting management are: Moodle, Teams and Stream. These tools were used also by the various University bodies and academic staff. Moodle is a blended learning platform: each department then choose whether to adopt the original page and name or to modify them according to their own choices. In Educational Sciences it has taken the name of "form-on-line" (https://formonline.uniroma3.it). Microsoft Teams (the Universities that benefit from the GARR connection are more than ninety, including the University of Roma TRE (University | GARR). Other remote supports ▪ These are virtual Tutoring DSA interviews. ▪ FACEBOOK and INSTAGRAM. ▪ Roma Tre Sport (Link r3sport@uniromatre.it).
SPAIN **Universitat Oberta de Catalunya**	Adult Continuing Education: The Principal Statute of University College Cork was adopted by the Governing Body in 2009, with its latest amendment in 2020. The University has a system of shared governance made up of the Governing Body (GB), Academic Council (AC) and the University Management Team (UMTO/UMTS). The role and authority of the Governing Body and of the Academic Council are set out in the Universities Act of 1997 and in the University's Principal Statute. The Academic Council is the primary internal body responsible for academic affairs and derives its authority from the Universities Act, 1997 (SI24), Chapter V, §27 and Principal Statute. UCC is recognised as an autonomous degree-awarding body under the terms of the Qualifications & Quality Assurance with responsibility for assuring and enhancing the quality of its education, research, and allied services. Policy Framework for UCC Digital Badges: "This Policy Framework is a document that sets direction, objectives, standards, policy and process for the development of digital badges in the University. " Teach Digi "aims to address the digital education needs of staff during the Covid19 pandemic in a meaningful and responsive way. IUA Enhancing Digital Teaching and Learning Project "is aimed at enhancing the digital attributes and educational experiences of UCC students through enabling the mainstream and integrated use of digital technologies across the teaching and learning process." In order to do this, the project will set out to develop, pilot, review and roll out staff development programmes and responsive training "to enhance the digital confidence, skills and competences of those who teach in UCC." Digital Innovation at UCC are some of the key policies that University College Cork has outlined in their current four-year Digital Strategy plan. Further investment in student ICT centres, student records, curriculum, VLE, classroom tech identity and wired networks to allow for digital growth. Technology enabling academic strategy: These digital platforms will play key roles in the enabling of a more connected University. Curriculum management connects teaching with research to allow the support of the academic strategy. The use of digitalization to support the growth of UCC: The provision of the digital transformation of the administrative system will be through capital development to support new tech-rich buildings and spaces. Mobile Staff enables a more mobile workforce both on and off campus. IT Security secures university networks, data, and services. infrastructure and data centre and DevOps allow agility, flexibility, and automation, leveraging the public cloud where it makes sense. Digital Estate develops the University's online digital estate, websites, intranets, staff apps etc. Also,

	Digital Learning will empower staff and enhance their learning experience by incorporating a more online approach. The five-year strategic plan outlined by University College Cork was designed to activate the enhancement of learning and teaching based on a continuous involvement plan. The ambition of the project is to 'deliver an outstanding, student-centred teaching and learning experience with a renewed, responsive and research-led curriculum at its core' and to 'ensure a diverse staff who are enabled to reach their full potential. The following are some of the key actions and targets set out by the plan in terms of digitalization. UCC Centre for Digital Skills: This department is currently involved with a range of committees and working groups across the university (Digital Education Advisory Group. Digital Badge Subcommittee of Academic Development and Standards Committee; IT Steering Group, Academic Programme and Regulations Programme Approval boards) UCC 2022: Delivering a Connected University: the plan sets out a thematic prioritisation of UCCs strategy, as well as the transformative changes to the core operations in response to geopolitical challenges, the escalating climate crisis and accelerating societal and economic pressures associated with the Covid-19 pandemic. Deeply rooted in extensive collaboration both within and outside UCC, this two-year plan builds on the university's strengths in student focus, sustainability, and community and global engagement, to identify actions to respond to the current crisis and position UCC for long-term success. Digital technology has revolutionised the way we teach, as experienced when the entire University went online in March 2020 with only a few hours notice. While UCC commits to being a largely campus-based undergraduate university, the plan is to increase blended delivery and postgraduate online offering. This will be done while supporting the necessary digital skills and expertise of the academic staff. UCC plans to support its academics to work with learning designers to bring a richness of re: sources to the delivery of all courses. Actions: Enhance the digital learning experience for on-campus and off-campus learners, by upskilling including via micro-credentials, through investment in simulation, virtual resources and flexible learning and assessment using technology. Further enable remote learning through unique online programmes. Prioritise investment in digital education by expanding our range of infrastructural resources to staff, and deploy Instructional Design expertise in Colleges and Schools.

Good practices

The initial objective of this part of the project was for each case study to present some good or best practices of its own university, referring to the main and most interesting experiences in the field of training professors' and researchers' digital skills, the main and most interesting pedagogical adopted models in teachers' digital skills.

However, the concept of good practice has been interpreted in a different way by universities. Some referred to national studies (Spain), others to digitization projects of both teaching and administrative procedures (Greece), some to degree courses and projects related to the Third Mission (Roma Tre), and others to centres of excellence (Ireland). Finally, others referred to important lessons learned (Finland).

The lowest common denominator, however, is for all of them the role of digital in learning and working processes.

Tab. 8 - National good practices

Country	Leadership, planning and management	Quality Assurance	Scientific research work	Technology transfer and service to society	Learning and teaching	ICT culture	ICT resources and infrastructure
Finland **Laurea University Of Applied Sciences**	Digital Unit - Responsible department with skilled personnel and experts Independent and self-management skills				High quality education of some courses	Challenge of upskilling the teaching and non-teaching staff Digital pedagogical development Students adopt the new tools and practices quickly	Digital tools are helpful
Greece **Patras University**		Quality Assurance System			Lifelong Learning Centers IO - Internship Office		Digital Services - Institutional Account / Remote Teaching / /Remote Administration
Ireland **University College Cork**			CIRTL - Centre for the Integration of Research, Teaching and Learning DEFT Digital Education for Teaching		Teach Digi		

Italy **Ecampus University**					Virtual Intensive Week	Tutoring model and tutors' training	Customised online platform for examinations
Italy **Roma Tre University**				The Blockchain applied to labor policies Roma Tre meets companies	Education Sciences – Online degree course		
Spain **Universitat Oberta De Catalunya**					Development of a collaborative inter-university MOOC		Virtual Learning Environment

Finland - Laurea University Of Applied Sciences

High-quality education of some courses. The student survey and many years of research reveals that students are acknowledging the very high quality of individual selected online courses. However, students say, these are only some courses with high quality, and not every course offers the same learning and study experiences.

Digital Unit - Responsible department with skilled personnel and experts. Laurea has strategic objectives for the digital transformation and the processes; managed by D-unit (Digital Unit) which is responsible for pedagogical and technical training for the teachers.

Independent and self-management skills. They are vital. Digital virtualized or online studies require strong self-management skills from students and teachers, and it sets a high bar for pedagogical implementation. Therefore, independence and discipline skills are key elements for succeeding in the digitalisation of HEIs.

Challenge of upskilling the teaching and non-teaching staff. The study observed one of the biggest challenges of upskilling the teaching and non-teaching staff. There is a visible gap in digital skills. Personnel have been comfortable with traditional teaching methods, offerings and support systems due to their prior expertise. It takes tremendous efforts, individual motivations and collective upskilling processes to bridge the gap in digital skills and competences.

Digital pedagogical development. It is essential. We are in the early stage of digital pedagogical practices and implementation. A need for the development of digital pedagogical processes and practices emerges. practices must be aligned and harmonised with available digital tools and techniques. some teachers and support staff are adopting more innovative solutions and optimising their work where students benefit the most while some are struggling with it.

Digital tools are helpful. Teachers and tutors especially see that the new digital tools (Canvas LMS, Zoom, Teams, Azure and many others) have already eased their work remarkably. On the other hand, they see that their work has become more hectic, and they are not able to apply new tools as well as they wish and want.

Students adopt new tools and practices quickly. Students are much quicker to adopt new digital tools, practices and processes. They wish to use more mobile versions of these tools. This is one of the key reasons, the digital age students are more comfortable and habitual to use smartphones and computers before entering higher education institutions.

Greece - Patras University

Digital Services - Institutional Account / Remote Teaching / /Remote Administration. The Networking section of each HEI provides user accounts to all members of the academic community. These accounts are required for the use of all telematics services provided by HEIs as well as for the use of the services of partner organizations.

During COVID-19 days remote teaching became essential for HEIs. Several meeting platforms are used such as Zoom, Microsoft Teams, WebEx. Furthermore, asynchronous learning platforms such as e-class and e-class Exams. In addition, Virtual Private Network service is used which offers the possibility to the users who are outside the physical network of the university to access it and the services that it offers through a secure virtual

connection. The methods of teaching that are used are determined by each teacher independently. The majority use blended methods of learning. to use different methods and tools is the key.

The Student Life Cycle Management Subsystem covers the entire study cycle, offering the students of the University electronic one-stop services at each stage of this cycle. It is focused primarily on serving undergraduate and graduate students and secondarily on the faculty members of the University. Staff information applications and Alumni Social Network can use digital tools to monitor their career.

LifeLong Learning Centers. Each HEI can operate with the supervision of KEDIVIM Lifelong Training Centers. The main purpose of these centres is to design, organize and operate lifelong training programs in a wide range of fields such as technology, administration, health, humanities, education, art etc. Distance and blended learning are the main methods. The available human resources, the infrastructure and the technological equipment render the Center one of the most powerful services of HEIs.

IO - Internship Office. The main objective of the IO is the continuous upgrade of the quality of education offered to the students through an Internship Programme (IP).

Portal of administration's announcements. The Information Portal of the central Administrative and Technical Services aims at the daily information of the academic community, as well as the external collaborators of the University

Quality Assurance System. It constitutes one of the strategic priorities for the University of Patras, and its main objective is to pursue continuous improvement of quality in Education and Research. The University of Patras is the first Higher Education Institution in Greece to recognize the importance of quality assurance and to conduct a pilot external evaluation in December 1999, in the context of the processes outlined in the Rectors Summit – CRE (The Club of Rectors of Europe).

Ireland - University College Cork

Teach Digi - Centre for Digital Education. UCC takes a “pedagogy first” approach to all professional development in digital competencies. Objectives of the Centre are: to empower staff to improve student learning through the best practice application of technology; how to engage learners; how to build interactivity, and why recording lectures is important.

CIRTL - Centre for the Integration of Research, Teaching and Learning. It sees the points of integration between research, teaching and learning and builds on this. Not ‘training’ in the rigid sense, not teaching how to teach but offering frameworks, tools etc. Augmentation of what people do and working in partnership with colleagues to champion the development and uplifting of all staff. Seminars and digital badges. CIRTL also offers accredited professional development in the form of the Postgraduate Certificate, Diploma & MA in Teaching & Learning in HE.

DEFT - Digital Education for Teaching Project. Run by the Centre for Digital Education, this project supports UCC 2022, Action 1.3.3 on prioritising investment in digital education and promotes field research to understand the potential of technologies for learning.

Italy - Ecampus University

Virtual Intensive Week. A number of Virtual Intensive Weeks are scheduled throughout the academic year to help students check their level of preparation and review the syllabus of one or more subjects with a view to the final examination.

The student can register via the university's learning platform and participate. During the week, the lecturer of the course the student has selected conducts a series of two-hour synchronous online lessons (one lesson per day from Monday to Thursday) going over all the essential aspects of the syllabus. If the student attends all the lessons, he or she has the opportunity to access the examination session on Friday.

Customised online platform for examinations.

In order to take written examinations online, the student accesses a platform that has been designed and implemented entirely by the university and which allows the entire process to be managed, from the phase of identifying the student and verifying the student's identity document, to the phase of checking the environment in which the student is located (which the student must frame with a webcam), up to the phase of administering the actual examination. During the exam, the student is continuously monitored and, once he or she hands in the exam, the video recording of the exam is made available to the teacher who can check it.

If there have been irregularities during the written examination, reported by the system and verified by the examination board by checking the recording, the student is summoned to take the examination orally.

Tutoring model and tutors' training

E-campus places crucial importance on the figure of the tutor and has therefore identified two distinct tutoring profiles:

(a) Disciplinary Tutors (TDs). TDs, experts in the content and trained in the technical-communication aspects of online teaching, have the task of supporting the teacher in teaching activities.

b) On-line Tutors (TOLs). The TOLs have the objective of supporting the student's motivation throughout the course of study, suitably modulating the course of study to the characteristics of each student and promoting their active role. The TOLs are also responsible for introducing and familiarising students with the University website and its functions at the beginning of their studies; they provide students with ongoing technical support in using the Virtual Learning Environment (VLE).

Environment (VLE).

Tutors receive initial training in the use of the procedures and tools they have at their disposal for interacting with students, but training courses are also provided on a regular basis on various digitals skills, such as digital communication, interpersonal skills needed to communicate effectively with students through digital tools, time management, etc.

Italy - Roma Tre University

Education Sciences - An online degree course. From the academic year 2015/2016, the Degree Course in Educational Sciences ONLINE of the Department of Education Science (DSF) of University Roma Tre activated a channel in a mainly remote mode. This solution, which was innovative in terms of the offer and didactic organization, has allowed and allows today those who, for various reasons, encounter objective difficulties in attending face-to-face activities, to take part in a Course Degree. According to the e-learning formula, widely tested in the Department, textual and multimedia didactic materials are provided, as well as spaces for exercises, interaction and assessment, all in the specific platform. The used platform is Moodle.

The Blockchain applied to labour policies. Blockchain technology in support of labour policies can represent the solution to the problem of the lack of interconnection of databases and the failure to implement a unitary information system. Connected to the EU Blockchain Observatory and Forum[4] and in order to monitor, study and support the possible applications of the Blockchain in the field of the economy and the labour market, in Italy the Italian Blockchain Observatory was established at the CNEL (National Council of Economy and Labor[5]), in cooperation with the Roma Tre University.

Roma Tre meets companies. This is a University project committed to strengthening the link between the university world and businesses, thanks to the promotion of events/seminars/webinars dedicated to the CEOs of the main leading companies in Italy and in the world. The aim is also to offer students the opportunity to orientate themselves more consciously in their professional choices, through a direct comparison with some of the most significant realities in the world of work. The Project was born from the will and precious collaboration of the three Vice-Rectors for the Third Mission: the Vice Rector with responsibility for relations with the world of work, the Vice Rector with responsibility for relations with schools, companies and institutions and the Vice-Rector with responsibility for innovation and technology transfer.

Spain - Universitat Oberta De Catalunya

The systematic review carried out by Alonso-Garcia et. al. (2019), focused on good teaching practices with ICT in Spanish HE, bases the identification of good practices on the seven key principles of good practice with ICT established by Chickering and Gamson in 1987 listed below:

- Stimulate contact between teachers and students.
- Develop cooperation between the students.
- Use active learning techniques.
- Provide immediate feedback.
- Allow tasks to be carried out on schedule.
- Communicate positive expectations.
- Respect the diversity of capacities and modes of learning.

[4] https://www.eublockchainforum.eu/

[5] https://www.cnel.it/

Their work identifies the good teaching practices with ICT that are being developed in Spanish HE and to establish the relationship between good teaching practices with ICT and the Sustainable Development Goals (SDG), highlighting common aspects that characterise good teaching practice: the focus of the activity was on the student, they encouraged collaborative work and they favoured autonomy.

The study states a synthesis of 26 good teaching practices with ICT, for example:

- Virtual Learning Environment (VLE) that presented the content in different formats offers a variation of activities and develops fluid and constant communicative processes between teachers and students, as well as between peers.
- VLE based on the methodological principles of autonomy, cooperation, and interaction.
- Implementation of blended learning, where the platform collected a variety of materials and formats (text, audio, video, etc.).
- Development of a collaborative inter-university MOOC.

II PART. Field research

Introduction

The second part of this report presents the main results of the field research.

The main phases of the field research were:

- in-depth interviews with decision makers;
- interviews with representatives of academic bodies
- three focus groups with
  - teachers,
  - researchers and tutors
  - and administrative staff.

Tab. 9 - National case studies number

CASE STUDIES	POLICY-MAKERS INTER-VIEWS	ACADEMIC BODIES INTER-VIEWS	FG with TEACHERS	FG with RE-SEARCHES AND TU-TORS	FG with ADMINIS-TRATIVE STAFF
Finland Laurea University Of Applied Sciences	0	1	7	2	2
Greece Patras University	3	4	8	8	8
Ireland University College Cork	3	3	8	8	9
Italy Ecampus University	3	3	5	5	5
Italy Roma Tre University	0	3	8	4	8
Spain Universitat Oberta De Catalunya	3	4	9	8	9
Tot. 151	12	18	45	35	41

Policy-makers' in-depth interviews. Main results

Introduction

By means of a qualitative approach, the analysis of the interviews aimed at transversally identifying relevant dimensions in the way they are experienced by interviewees, directly involved in the process at national level. The analysis is enriched by the interviewees' opinions to highlight the interpretative and implementation dimensions acting at a local level, which are organized around three essential axes based on the interactions between the macro, the meso and micro-organizational level, aiming to highlight the interactions among levels.

Roles of interviewees in each national context are the following (Tab. 10).

Tab. 10 - Policy-makers' interviewees

University	Role of interviewees
FINLAND - LAUREA UNIVERSITY OF APPLIED SCIENCES	In this category, LAUREA had no interviewees. *There was contacted few persons from the Finnish National Agency for Education, but did not get any committed answers.*
GREECE - PATRAS UNIVERSITY	Vice president of EETT (Hellenic Telecommunications and Post Commission) Scientific Counselor at IEP (Institute of Educational Policy) Professor, Responsible contact person of Erasmus Plus projects of ECE Department (Department of Electrical and Computer Engineering)
IRELAND - UNIVERSITY COLLEGE CORK	Member of Department of Higher & Further Education Member of Irish Universities Association Member of The National Forum for the Enhancement of Teaching and Learning in Higher Education
ITALY - ECAMPUS UNIVERSITY ITALY - ROMA TRE UNIVERSITY	President of the International Council of Leadership, Governance, Entrepreneurship and Management (ICLGEM) President of ANVUR (The Italian National Agency for the Evaluation of Universities and Research Institutes) President of CRUI (The Association of recognized state and non-state Italian Universities) ICT/CRUI working group coordinator. Director at National Institute for Documentation, Innovation, Educational Research
SPAIN - UNIVERSITAT OBERTA DE CATALUNYA	Director of AQU (University Quality Agency) Directora gral universitats Secretari Executiu ACUP (Public Catalan Universities Association)

Policy-makers points of view	
Patras University	Vision of Digital Transformation in HE Regarding the DT into practices the main objectives are: ▪ Developing a digital teaching and learning policy that clearly and relevantly reflects the support for ○ high quality education, ○ development of the digital skills of the academic community, ○ stimulation of innovation in the institution, ○ provision of a framework for the issuance of certified digital qualifications and for the validation of the acquired digital skills (e.g. MOOCs) that are reliable, multilingual and can be stored in professional profiles (e.g. CV EuroPass); ▪ Increasing a clear policy for social media use in the university, promoting new teaching methods which empower students' digital skills and abilities as well as their flexibility of thinking and creating a new team structure consisting of both teaching and administrative staff; ▪ Designing functional and viable digitalization solutions: ○ Supporting ongoing development of digital literacy skills for the entire academic community. ○ Adjusting, modernizing educational forms and practices to take advantage of new digital technologies. ○ Developing career guidance methodologies (focused on students' needs; supporting employability actions). ○ Improving existing digital platforms. ○ Developing top strategies and practices aimed at introducing and applying digital technologies in education; ○ Exploiting innovations in the field of new technology in order to improve the educational process and academic performance (by using analytics, reinforcing cyber security, launching artificial intelligence pilot projects). Policies Greek Universities have implemented ECTS in graduate and postgraduate level studies. Based on the legislative framework, the objectives of the National Coalition are: ▪ promoting the cooperation between all parties in order to introduce actions with the aim of enhancing digital skills; ▪ enhancing the dissemination of EU policies on digital skills in Greece. ▪ Challenges ▪ Main challenges of digital innovation in HES are: ▪ Leadership and Governance ▪ Organisational Capacity: Funding, People and Incentives ▪ Measuring Impact ▪ Teaching and Learning (digital platforms such as Moodle etc and methodologies) ▪ The Internationalized Institution ▪ Preparing and Supporting students ▪ Knowledge Exchange and Collaboration

	▪ Digital Transformation and Capability ▪ Development of career guidance methodologies focused on the needs of the students, correlated with the skills needed. ▪ Development of Continuing Education for University Staff initiatives Strategies Some of the main strategies for the adoption the guidelines are: ▪ Implementation of the European Education Area strategy. ▪ Funding opportunities. ▪ Higher education mobility ▪ Adoption of the European Credit Transfer and Accumulation System (ECTS). Actions The actions should be related with: ▪ Newly established regional and local bodies may help improve local capacity and responsiveness. ▪ Restricted autonomy may limit universities' capacity to address students' and communities' needs. The investments should be focus on: ▪ Digital infrastructure, digital tools and apps, support content and access to e-learning platforms, a hub of interactive open educational resources. ▪ Support ongoing development of digital literacy skills for the entire academic community. ▪ Development of career guidance methodologies. ▪ Optimization of study offers. ▪ Exploiting innovations in the field of new technology in order to improve the educational process. ▪ Reinforcing cyber security. ▪ Launch of artificial intelligence pilot projects. ▪ Leverage cloud technologies to drive innovation. Strengths: ▪ provision of digital infrastructure has reached a good level when looking at European averages. ▪ policy work increasingly focuses on the quality of learning, educators training and student competence building. Weaknesses: ▪ disparities between regions persist in terms of the provision of digital infrastructure.
University College Cork	▪ National Policy The Department of Further and Higher Education, Research, Innovation and Science considers its role to be funding and enabling rather than proscriptive directing in relation to the higher education institutions, due to the autonomous nature of higher education institutions in Ireland. Evidence-based frameworks emerge from the work of organisations such as the HEA and they work with the department in a collaborative manner to implement development which respects the autonomy of the HEIs while also maintaining consistency across the institutions. The National Forum takes an embedded approach and works through collaborative relationships between the organisations, the department, the institutions and with the perspective of staff and students. The interviewee encourages the stakeholders to be aware

	of existing policies but to have agency in how they are implemented in the various higher education contexts. Digital is interwoven in Teaching and Learning in HE and is not looked at as a separate topic. Projects have adapted over the past years to look at developing the digital capacity of staff as well as students. Mainstream the use of digital technologies in universities to ensure the appropriate technologies and tools would be used. Needs to be pedagogy-lead. Recognition of prior learning – sector wide approach project underway. National policy needs to recognise and give value to the use of digital technologies in teaching and learning. European standards for QA in higher education in digital innovation have not necessarily been integrated into our national system – there were enough frameworks in place that meet the needs without adding more. ▪ Professional Development Regarding national guidelines on continuing education for university staff in digital competencies, the National Forum published The National Professional Development Framework for All Staff Who Teach in Higher Education in 2016 and it has been very successful. It came from a need from the sector for nationally recognised PD that would be recognised across the sector e.g. digital badges. Courses are easily accessible to staff Build across teams or programmes rather than digital champions which would have happened in the past – for a consistent experience for students. ▪ Best Practice HEAnet - Ireland's National Education and Research Network - They utilise their national education network to deliver IT shared services to over one million users, helping drive the digital transformation taking place throughout the education sector. Working in collaboration with the higher education organisations and institutions. Recognise and value the best practices in teaching and learning that are there by the institutions. That the structural and the individual need to develop digitally in tandem. Issues of connectivity, access to devices etc. should be balanced with the professional development of staff. Resources available to staff across the sector. Digital badges – micro-credentials across the sector available online. Digital capabilities and digital competence – The interviewee discussed the language change that has happened over recent years from 'digital capacities' to 'digital capabilities' in the work of the National Forum. This points to a change in approach and is very significant for the wellbeing of staff and students, as a person's capabilities can't be considered in isolation Build on what exists already in the sector and across all institutions. Digital accessibility as a driver – for example links between universal design and digital innovation. ▪ Challenges Staff in the sector lack the time and resources to attend to the professional development in the area of digital skills in teaching and learning to the level they need to provide quality online learning experiences. Pressure on staff to focus on research in their careers – one of the biggest challenges. UCC is very well developed in this area but not all universities are in the same place e.g. even recording on campus.

	Digital strategies tend to be quite vague – they need to be due to the autonomy of each institution – but then it means that it is very difficult to quantify how well a particular organisation is doing in that area.
E-Campus University Roma Tre University	MACRO LEVEL Culture. What emerges is the sense of urgency to act, which is why digital innovation is one of the central axes around which the Italian National Plan for Resilience and Reconstruction (PNRR) revolves. The dominant elements and keywords that can be distinguished from the current perspective are vision, emergency, overcoming the presence-distance dichotomy, digitalisation, integration and European guidelines and dictates. National Policies. Even in the absence of specific funds, especially for universities and digitalisation, the interviews show that is possible to reconstruct some essential steps that have contributed to redesign the digital transformation of the country following the European indications over the last ten years by means of the action's reorganisation, the regulatory redefinition, the economic resources, and the related strategies. Possible actions are: reorganisation of the national governance processes and systems, design of integrated and coordinated actions, regulatory tools & plans, economic tools and accompaniment strategies. MESO-INSTITUTIONAL LEVEL Actors. Institutional actors which make up the digital governance framework are many, therefore the condition of fragmentation of the interventions and the difficulties of coordination and alignment with the times and objectives are understandable. Translations into practice. Elements that appear as the most relevant in the analysis of these few testimonies are: the design of system actions for the research and construction of the inter-institutional alliances necessary to overcome the fragmentation of the system; adaptation to supranational guidelines; acceleration and reaction. Government tools are: ▪ SYSTEM. The digital dimension within teaching is taken into consideration only in online universities and in degree programs delivered electronically or blended beyond a certain threshold, thus allowing us to glimpse at a sort of dystopia with respect to digital integration in educational processes. ▪ AQA. The European reference processes and standards have now laboriously entered full capacity since 2012 with the launch of the AVA (Self-Assessment, Evaluation and Accreditation). ▪ Digital platforms. The determination of standards also passes through the pervasiveness of platforms aimed at guaranteeing interoperability, authenticity and safety, actively contributing to the standardisation of processes. ▪ Adaptation of European standards. The two reference agencies, each for its competence area, are an active part of the international networks that contribute to supporting the adaptation to European standards. System re-design. Need of System actions and integration. Acceleration. The digital challenge for the so-called conventional universities has not been a priority over the last two decades, because it has been relegated to the space of autonomy that has developed in a context of decreasing resources. Gap. This great social laboratory has highlighted as never before the great digital divide that occurs at all levels, showing that it is no longer possible to postpone a critical reflection on the present and future of the digital university. Organisational redesign. Need of internal innovation, which implies the need to invest in training (skilling and reskilling) of all technical, administrative and teaching staff. Need of

	innovator networks. Need of pilot experiences: the attempt to “translate into practice” the European proposals and recommendations necessarily comes to terms with the experimentation of pilot projects spread patchy throughout the territory, between research groups and with respect to diversified objectives. Challenges. National gaps require attention: the national gap that the country system records in terms of the number of students in HE; the need to overcome the gaps that act at different levels (infrastructural, economic, cultural, professional, etc.), negatively affecting the quality of the offer itself and the possibility of development for universities, teachers and students. ICT resources and infrastructure: a challenge certainly concerns the investment plan which has experienced a dramatic decrease over the past ten years. Among the most important challenges that our HES is facing with respect to digital innovation, on the organizational front, universities are facing challenges similar to those of other institutions: the dematerialization of processes, an overall revision of the relationship between time and workspace, with the predictable transition from "time-based" to "objective" work. Professional development needs represent another essential theme. MICRO-ORGANISATIONAL The need for innovation in teaching, interpreted from a transversal perspective to also include digitisation is evident in order to take charge of: redefinition of educational and organisational processes from a digital perspective; creation of digital content and platforms for their use through personal devices; review of the job placement process in a post-COVID era with a changed labour market; definition of a sustainable integrated teaching model; review of the quality assessment process in the light of a digital university.
Universitat Oberta de Catalunya (UOC)	*Only one interview was done, to a high authority of the Catalan University Quality Assurance Agency (AQU).* Two examples of how innovations have been landed to practice: ▪ Recently, in Catalonia has been articulated the accreditation of SLP (Short Learning Programs), which in a very specific field (digital competence) has opened a door to the improvement of continuous training in this field. ▪ During the time of pandemic, the Government of Catalonia has supported financially the universities, which have implemented their own digital innovation policies, even though this is not the best way to implement innovation. Digital transformation boosts universities to evolve towards an HE assuming the principles of blended learning. About the integration of the European requests, the Catalan University System follows the Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG) and European Quality Assurance Register for Higher Education (EQAR) indications. Challenges How Catalan universities give more value by taking advantage of DT. Continuing training will also be very relevant, with programs such as the mentioned SLP (or micro credentials). A new landscape where higher education institutions have to adapt against other more flexible organizations. To be careful grading the efforts on DT training.

Academic bodies in-depth interviews. Main results

Introduction

The objective of the in-depth interviews with academic bodies has been to investigate the digital innovation of the university at:

- organizational level (Leadership, planning and management, Quality Assurance, ICT resources and infrastructure);
- teaching-learning level (Learning and teaching, Scientific-research work, Technology transfer and service to society);
- cultural level (ex. ICT culture, hidden curriculum of teachers and academic staff);
- strength and weakness, opportunity and threat in implementation of the digitization process in HE;
- good practices (academic specificity that is considered useful to enhance), which have been presented in the paragraph "Good practices".

For each participating university, people who are part of the academic body were interviewed.

The roles that the interviewees cover in their respective universities are as follows:

Tab. 11 - Academic Bodies interviewees

University	N. and role of interviewees
FINLAND - LAUREA UNIVERSITY OF APPLIED SCIENCES	1 Vice-Rector for pedagogical development.
GREECE - PATRAS UNIVERSITY	Three key senior figures: The Dean of Polytechnic School; The President of Electrical and Computer engineering Department; The Director of Telecommunications Information Technology Division.
IRELAND - UNIVERSITY COLLEGE CORK	Three key senior figures: Office of the Vice-President for Learning & Teaching at UCC; Centre for the Integration of Research, Teaching and Learning at UCC; Centre for Digital Education at UCC
ITALY - ECAMPUS UNIVERSITY	1 Rector, 1 General Director, 1 Information System Manager.
ITALY - ROMA TRE UNIVERSITY	1 Vice-Rector for Teaching, 1 Vice-Rector for the Relations with the Labour Market; 1 Vice-Rector for Innovation and Technology Transfer.
SPAIN - UNIVERSITAT OBERTA DE CATALUNYA	3 Vice-rector and 1 Deputy Dean

ICT Culture

In this section we compare the results obtained from interviews with the Academic bodies and presented through the dimension of the Digital Maturity Framework for Higher Education Institution.

Specifically, we begin with the comparison of the sixth point of Digital Maturity: culture.

In general, the six partner countries stressed the significant importance that academic bodies attach to the concept of culture. Specifically, the countries highlighted the following points:

ICT Culture	
Laurea University of Applied Sciences	Laurea has a strategic objective for increasing the amount and quality of virtual studies Laurea participates to Digivision 2030 project
Patras University	The vision for establishing an ICT culture is to make the best out of every available legal technology. The current conditions made all university personnel familiar with the latest solutions which may be further examined in the years to come, depending on the legislation. UP took every possible effort to carry out the tasks related to students' studies, at all levels. Lessons and exams were performed with all possible safety precautions. Teachers, researchers, administrative staff and students adjusted very quickly to the new conditions. The same applies to various organizational processes. Some deadlines had to be extended, however. The goals of the institution remain more or less the same among others to provide the best possible education and skills which will follow graduate students in their professional career and the best possible connection with market needs. At the organizational level, no major changes have been made during the pandemic years. Digital hop was implemented years before the pandemic, providing to staff and students with digital tools such as e-secretary (progress), e-class, digital signatures etc. In teaching, asynchronous platform e-class has been used for almost two decades before, but the pandemic forces the implementation of synchronous online teaching changing the way of teaching procedures. (extensive use of meeting platforms, use of game platforms etc.). A new platform for examination purposes was created (exams class).
University College Cork	Strength and weakness, opportunity and threat in implementation of the digitization process in HE. Need to know to design for pedagogically better and deeper learning in online learning and not just provide the content. Highlighted the need for instructional design for online learning knowledge and skills. Awareness that there is a big difference between moving a programme online versus one that has been designed to be taught online and that a model of practice that has evolved over the past year needs to be standardised and established fully.
E-Campus University	e-Campus aims to become a leading university in online academic excellence by guaranteeing quality training at all levels, support to the research activities of the teaching staff and attention to the needs of reference territories. The mission of the university is to: Promote cultural and scientific progress throughout the country, reducing costs for students. Promote a transformative study experience using new methodologies and with a very high level of personalization of training services; Promote social innovation and economic development thanks to culture and academic excellence. The e-Campus distinctive training offer aims to respond to some known weaknesses of the traditional university system which can be traced back to two main types of factors: Qualitative (low attractiveness of the professional profiles produced by the university in the labour market);

	Functional (a weak response to the emerging needs of new skills and new professional profiles) In this regard, e-Campus governance assumes among its primary objectives that of: interpreting and responding in a new way to the demand for training of young people and adults; offering a holistic cultural proposal capable of training people and not only professionals, through the training of "skills of technical-scientific content, but also of relational, value, managerial, cultural, ethical content" The Strategic Plan 2019-2021 illustrates the ambitions of e-Campus, highlighting in particular: • the importance of the relationship with the territory through its numerous physical locations and disseminated • the flexibility of integrated distance learning which is combined with personalization and the assistance of online and local tutors • the idea of a "diffused university" that can be used in every place and at every moment through the mix distance-presence on the territory • the University Information System which integrates cognitive, personal, logistic and administrative perspectives.
Roma Tre University	The health emergency has accelerated a process of digitalization that would otherwise have taken several years to complete. The substantial changes of the last academic year have considerably changed the cultural fabric of the Roma Tre University. The role played by IT has increasingly shifted from an instrumental dimension to a transversal one, which does not place digital as a technology aimed at the formation of standardized skills, but, rather, as a transversal component increasingly present in study paths and which tends to contaminate the fabric of the cultural heritage of higher education. Roma Tre University has undertaken initiatives in which information technology participates because being a transversal technology, with its foundations, it can be applied to many contexts, such as: - within (three-year) degree courses in Legal Services for the security of the territory - at the Department of Law - with the aim of integrating digital and technological skills with the legal skills covered by this three-year course - in the courses of economic disciplines - in the courses of the Department of Education to train those computer science bases useful for future primary school teachers. Digital transformation is one of the fundamental drivers that allows the University to create a new connection infrastructure, for networking with the outside world, which affects all aspects of social life. The Roma Tre University, to encourage the use of digital technologies, has established relationships with global IT players based in Italy and, in particular, with important Italian companies, such as Leonardo (formerly Finmeccanica) for the supply of modern software, while, as regards the hardware part of the technologies, relationships have been established with companies producing equipment in the energy and manufacturing sectors.
Universitat Oberta de Catalunya (UOC)	This university is characterized by a constant organization in order to improve, above all, the results of teaching, research, management or dissemination. Innovation involves the use of new knowledge or a new combination of existing knowledge. How is digital innovation applied in your university context? institutional goals;

	internal and external organizational processes; teaching/ learning and university practices/activities; competencies and need required to teachers, researchers and students; the skills required of governance bodies and intermediate and support staff The eLearn Center drives the evolution of our educational model through innovations in learning. We have also a HUB, Hubbik, to promote entrepreneurship, open innovation, support for knowledge transfer of results, and cooperation between the entire UOC community. And different innovative research groups: Edul@b is focused on education and ICT.

Leadership, planning and management

The actors interviewed belonging to the academic body, with reference to the: "Leadership, planning and management" area of the Digital Maturity Framework for Higher Education Institutions , highlighted how although digital technologies have had a positive impact in academic activities, there are still several aspects that need to be improved and optimized.

Leadership, planning and management	
Laurea University of Applied Sciences	- Digital degrees and degrees components are developed, shared and used openly throughout the whole university. - The university has centralised critical digital innovation in its organizational structure (D-unit). - Laurea has good technological resources for digital development/innovation. - Laurea works in close collaboration with a working life that offers the possibility to keep education up-to-date.
Patras University	- Good acceptance and integration of the use of digital technologies (e.g. adoption of digital signatures and electronic meetings), despite some initial difficulties and is expected to be extended in the future - The organizational structure has not been changed, except for the communication systems: mail and forum - Special texts and videos have been created by the academic staff containing specific indications - the policies and guidelines for Academic Bodies that the central government provides follow the directives and documentation of the European Union that have become a practice with national laws. - National guidelines that are explicit and easy to use by the university ". - There are problems related to the technical infrastructure and the various malfunctions are mostly attributed to technical problems. - The nature of remote interaction makes it difficult to identify those involved causing problems in the lessons and especially in the exams. - The didactic activities are carried out through the telematic technologies made available by the Ministry. - The administrative and research activities were carried out in a mixed way with a controlled presence and online technology. - The third mission was penalized due to difficulties in interacting with the university which had other priorities during the emergency of the pandemic.
University College Cork	- Strength of great working relationships between the various units of the university concerned with digital technologies and digital teaching and learning – speed of key decisions, collaborations – build on in future.

E-Campus University	The need to manage a large number of students located throughout the country has favoured the development of a functional organization in which the following prevail: - Greater complexity of the environment, but relative stability; - Presence of management bodies specialized by function (professors, study course tutors, didactic tutors, technical tutors; study course coordinators, information systems technicians ...); - Formalization of the structure to cope with the complexity of the articulation and to solve the problems of competence between the different organizational units; - Clear distinction between the academic senate and the general management; - Strategic leadership - performance oriented; Great attention is paid to the methods of monitoring and controlling the processes that affect all the players involved: organizational staff, professors, tutors and students. In this context, digital technologies are the driver of monitoring and evaluation actions, providing reliable data to the Quality Department. A constant commitment to the development of digital technologies and the online environment leads to facilitating contact between professors, students, tutors and staff through an integrated desk from which the professor and the student can access all the functions: - Booking an interview room, messaging; - Online contact with the didactic secretariat; - VOIP switchboard available to students for telephone contact with the professor while respecting the privacy of students and teachers; - App for access to lessons; - Access to the simulation of written tests, with relative feedback. E-Campus, as well as other online universities, is further behind in the field of Research and Third mission is further behind than didactics.
Roma Tre University	Roma Tre University is well organized and efficient from a decision-making point of view and this has made it possible to respond quickly and effectively to the difficulties created by the pandemic - The digitization process had already been activated before the emergency, however since the pandemic began, the reorganization of the various organizational processes has undergone a strong acceleration, as a function of dematerialization of administrative procedures, partly already implemented, and the definition of an IT workflow automation process - The pandemic has provided the opportunity to improve teaching, which has never stopped, through a double provision that provides for the possibility of carrying out lessons in the classroom and, at the same time, of transmitting them in synchrony with the possibility of participation both by students in the classroom, and by remote students. - Roma Tre University has activated agreements with companies active in the field of digital transformation, to offer students a catalogue of additional activities. Some examples are free courses for students on digital awareness on the use of new technologies; the provision of online courses on digital for students of the humanities. - Roma Tre has shown a great capacity to react to some bureaucratic-administrative processes, even if a temporal misalignment has emerged between the two areas. It is, therefore, necessary to simplify the bureaucratic procedures, in order to facilitate collaboration with companies, in particular with regard to internships. - At the administrative level, there are some offices that are not designed to dialogue with the outside world and, in some cases, make dialogue with the external economic, productive and social system difficult, which finds it very difficult to identify the people with whom to relate . - The need for a simplification of processes is highlighted in order to make the best use of digital technologies.

Universitat Oberta de Catalunya (UOC)	Being a fully online university, digital innovation is not a problem for UOC. The complete online UOC system was a great plus for dealing with the pandemic situation. - Digital innovation specific to teaching and learning is shared with professors through the eLearn Center. Even some innovative experiences emerging from the research can be adopted by a teacher or a group of professors in an institutional way through the e-Learn Center. There is a specific circuit through which a professor proposes the new product or process and the eLearn Center, through a commission, studies if it is feasible to integrate it. Also - for any digital product, service, process or organization that adds value to higher education or society, it is promoted through HUBBIK, and directed to any person in the UOC community. - It's possible requesting funding for potentially innovative projects from any of the three administrations (Catalonia, Spain, Europe) and obtain funding for innovation from all three. - Some examples of solutions adopted for: teaching/learning, research and the third mission are Massive application of online assessment from the European TeSLA project. Creation of the spin-off chat kit (massive generation of on-demand chatbots) by a researcher from the IN3 research centre. Research projects with potential for insertion into the production sector: MoCoTo (Mobile Corneal Topographer), PositiveThinkingApp and DistractApp (two apps for pain management), and WiLD (Wireless Leakage Detection System in vehicle production lines). - UOC is very active in promoting digital innovation, as evidenced by the students who in 87% would choose the UOC again and 79% would recommend the UOC. - The UOC is recognized by companies with an employment rate of 93%.

Quality Assurance

The interviewees, regarding the quality of digital innovation, focused on various aspects. Some have made connections with what has been established by the quality assessment associations, others have referred to known methodologies (PDCA Plan Do Check Act), others believe that it is still early for a specific qualitative assessment as the digital innovation phase in universities is still in the phase of development.

The following are the main aspects highlighted by the various actors interviewed:

Quality assurance	
Laurea University of Applied Sciences	Laurea has a strong quality assurance system that follows the Plan-Do-Check-Act (PDCA) model.
Patras University	As the introduction of digital innovation is not yet finished, it is rather early for the quality control system to give us a formal assessment. The quality control system performs evaluations during and after a certain time necessary for the stabilization of the operation. The evaluation of the promotion of educational innovation processes is expected in the coming months. The monitoring of the curricula takes place implicitly by the procedures of our Academic Bodies. The vast majority of students are observed to be digitally proficient.
University College Cork	UCC's preparedness for the move to 100% online due to the pandemic by adopting digital innovation practices in recent years – infrastructure already in place
E-Campus University	The University's Quality Assurance (AQA) system is fully in line with the national framework determined by ANVUR.

	The University has already undergone the periodic Accreditation visit in 2016, following which in 2017 it received conditional accreditation for 24 months, modified to satisfactory with the 2020 verification. Among the points of attention reported by the external evaluation commission is the difficulty of involving students in the construction of internal quality processes. In the first ten years of life the university was characterized as a teaching university, mainly oriented towards adult education, then starting a new season aimed at redesigning the map of development and academic positioning in terms of research and target. As regards the first point, three interdisciplinary research centres and two research doctorates have been established in: Medium and Mediality and Sciences applied to well-being and sustainability with the aim of delineating a distinctive research field of a university that proposes to be an actor of social transformation. As regards the second point, the penetration of the training offer towards increasingly younger targets and beyond national borders was defined.
Roma Tre University	The third mission of the University of Roma Tre obtained the highest score from the CER magazine (it was rated at the highest by the CER magazine), more than the other two, and also obtained an excellent score from ANVUR (obtained an excellent evaluation also by ANVUR), recognizing the commitment of the Rector and the entire academic body. Some aspects that emerged in the quality analysis are highlighted below: ▪ Quality assessment: The process and procedures of the quality assessment system were not immediately appreciated, as it could apparently seem an additional bureaucratic burden. Only later did we realize that in reality quality monitoring, despite having bureaucratic features, is aimed at continuous improvement. ▪ Digital technologies: The use of digital technologies has speeded up and simplified the teaching monitoring process. The booking and registration of the exams take place exclusively online and this allows, among the various advantages, to be able to monitor the exams in a very short time. ▪ Digital skills and training curricula: It is necessary to include the acquisition and development of digital skills, given their increasingly transversal nature, also within the didactic curricula of the humanistic professions Therefore, it is necessary to review the training curricula, even if the space for intervention is limited by ministerial constraints. ▪ Scientific qualification. Today, the national scientific qualification system for professorships, while providing for the possession of a variety of qualifications, relies heavily on scientific production. Probably little consideration is given to all the activities that are concretely promoted and managed, also to foster innovation and improvement in the universities themselves. It is important to rethink the selection criteria for university careers, but this requires legislative initiatives, which usually take a long time.
Universitat Oberta de Catalunya (UOC)	The internal quality assurance system (SGIQ) currently only provides guidance on teaching, its planning and execution. The Planning and Quality Area of the UOC follows the requests of the Quality Assurance Agency of the Catalan University (AQU). The SGIQ is expected to incorporate aspects of the university's other missions in the future. The quality control system is promoted through the eLearn Center. UOC offers a transversal subject in Digital Competence for all students.

Scientific research work

In this section we compare the results obtained from interviews with the Academic bodies and presented through the dimension of the Digital Maturity Framework for Higher Education Institutions.

Specifically, we begin with the comparison of the third point of Digital Maturity: Scientific Research Work.

In general, the six partner countries stressed the significant importance that academic bodies attach to the concept of scientific research as "the central point to implement and to understand the use of ICT".

Specifically, the countries highlighted the following points.

Scientific research work	
Laurea University of Applied Sciences	Laura has digital degrees and degrees components are developed, shared and used openly throughout the whole university Laurea has centralised critical digital innovation in its organisational structure (D-unit)
Patras University	Regarding the vision of digital transformation, all notice that a big part of UP is of technical nature. So digital procedures were already encompassed, and they were also part of scientific research. N.A says: “Digital Innovation will play an even bigger part in the future, but it has to be studied carefully how this will be done.” Regarding concrete applications, UP has contracts with major software providers and with scientific publishers for free access. For communications reasons, various available tools are supported, like traditional electronic communications, zoom, WebEx, and social media.
University College Cork	UCC is a campus-based university and digital education is seen as a support for this but there are no plans for it to change its fundamental identity as a campus-based university
E-Campus University	The use of ICT in the preparation and publication of scientific papers ICT support in the preparation and management of scientific research work and projects. This university is characterised by continuous training of researchers in ICT application in scientific research networking and collaboration of researchers with ICT support. So, ICT research (collaborative ICT research on HEIs) is a system of support for researchers at the beginning of their careers in applying ICT in scientific research.
Roma Tre University	The University is very attentive to the dimension of digital innovation. It’s currently involved in some initiatives, including at the regional level, in support of digital research and technological innovation activities. Furthermore, as part of the PNRR, the three Engineering Departments of the three main state public universities in the Lazio Region - Sapienza, Tor Vergata, and Roma Tre - have developed a project aimed at the realization of a Tecno Polo in Rome, with the support of the Lazio Region and more than one hundred national companies.
Universitat Oberta de Catalunya (UOC)	Innovation (digital or not) is with the research part of the same chain of knowledge. Research is at the beginning of the chain because it generates knowledge and innovation is at the end because it creates value (economic and/or social) from this knowledge. However, we should note that on the one hand, not all the knowledge generated will end up creating value and that, on the other hand, value can be created from any knowledge, generated or not by research (professional experience, for example, it is also knowledge). There is a Vice-rectorate for Research and Innovation to which the Research and Innovation Area reports, which provides applications to support teaching and research staff in carrying out research. All the detailed applications can be found on the UOC intranet through a catalogue of research resources, ranging from training, to support for applying for funding for projects, ethical requirements, support for scientific publication, and all support for innovation through HUBBIK.

Technology transfer and service to society

In this section the results obtained from the interviews made to the Academic bodies are compared.

Specifically, point four of Digital Maturity is compared, which is identified in the level of teaching and learning: explicitly, in the dimension of Technology transfer and service to society.

Attention is also paid to the role of the Third Mission in the dissemination of digital innovation inside and outside the University.

The role (Third Mission) is considered in general:

- total and definitive innovation (digital and not) is the creation of added value for society.
- it is an objective of promoting the growth of the country through the transmission of knowledge as that factor capable of activating processes of direct interaction with civil society and the entrepreneurial fabric.

Each partner works in this process of transmission and interaction.

In the field of digitalization at the level of teaching and learning, almost equally for all partners, the nodal points would seem to focus (also in reference to the Third Mission) in:

- a question that is identified in the recovery of social value. Placing the stakeholder: the student as the final user of knowledge production.
- An issue that offers great potential for development and innovation but could also drain staff if the work is not adequately resourced with a clear and targeted vision.
- Teachers need more time to adapt to new pedagogical methods and digital technologies.
- A question related to continuing training.
- A possibility for universities to compare and collaborate with a view to building the future.
- Development of scientific research work.
- Greater complexity of the environment, but relative stability

In a comparative perspective, the reasoning and concepts of all Partners are presented below.

Technology transfer and service to society	
Laurea University of Applied Sciences	Pedagogical development The interviewee (Vice Rector) stated that Laurea has a strong commitment to the digitization of education according to the national project Digivision 2030 and all development work follows the Plan-Do-Check-Act (PDCA) process. The degree has also invested heavily in the digitization of education by establishing the department whose responsibility is to develop pedagogical and technological solutions for education and continuously train and support teaching staff. The biggest threat to continuous development is lack of time and resources Threat Lack of time and resources: Management perceives that staff work hard and there are some restrictions regarding resources. Digital growth and development

	Overall, the initial analysis confirms the preliminary studies that unbalance the growth towards the digitization of university studies. The upside is growth rather than decay (decline). Active participation The degree works in close collaboration with the working life that offers the possibility of keeping the training up to date.
Patras University	Third Mission ▪ Strong commitment to the digitalisation of education ▪ Development and support of society and entrepreneurial activities. ▪ Service to society. Activity: UP supports society and entrepreneurial activities in the adoption of digital innovation through participation in innovation projects. Networking (collaboration) ▪ Development and research to find the best possible way to collaborate with the main companies in the Greek market. ▪ The aim is to give students the opportunity to practice their profession. and turn their knowledge into work. Work: Goal and opportunity to be able to transform students' knowledge into work. Resources: Establishment of trained and highly qualified personnel.
University College Cork	Third Mission The salient points that emerge are identified in these themes: Teaching, learning, scientific research work, technology transfer and service to society. Networking ▪ Development of strong working relationships between the various units of the university dealing with digital technologies, teaching and digital learning. ▪ Speed of key decisions, collaborations and build in the future. Design and development of digital education ▪ Digital education is designed and developed from a first pedagogical perspective. ▪ Acceleration of digital education practices due to the pandemic (preparing UCC for the transition to 100% online due to the pandemic by adopting digital innovation practices in recent years). ▪ At the current layer, the data show the possibility of adopting more blended learning programmes. ▪ infrastructure already in place Objective Support teaching and learning at a higher level through a perspective of collective development. Not being at the center in yourself for yourself
E-Campus University	Third Mission: On the front of the encounter with the world of work, the main challenge is to provide young students with a "digital method" Didactic Models: In e-Campus prevails a product-oriented approach based on the individualization and personalization of teaching activity. Strategic Plan 2019-2021:

	▪ the flexibility of integrated distance learning which is combined with personalization and the assistance of online and local tutors ▪ the University Information System which integrates cognitive, personal, logistic and administrative perspectives . Areas of improvement: ▪ development of a punctual and widespread inbound orientation/vocational activity to counter the widespread prejudice on online training ▪ attention to the specificity of the target, generally coming from other unsatisfactory university courses ▪ specificity of online training which requires continuous specific training of incoming and in-service teachers and tutors.
Roma Tre University	Third Mission: The University of Roma Tre shows a particular sensitivity towards the Third Mission, the set of scientific, technological and cultural transfer activities aimed at promoting the growth of the country, through the transmission of knowledge as an element capable of activating processes of direct interaction with civil society and the entrepreneurial fabric. Role of the Third Mission: From the interview with the Vice Rector of Education, it emerges that: the role of the third mission is to recover the social value of teaching, as a dimension to which to restore that representativeness that remains, currently, the exclusive prerogative of research by identifying students as the end customers of this production of knowledge. Continuity between knowledge and technology transfer: The University's VRITT highlights how technology transfer derives from and is an application of knowledge transfer. Mission of the university: The mission of the university, both public and private, is to respond to the needs of the territory, developing knowledge useful for the development of the economic, productive and social sectors of the country. Activity: The university has long activated numerous initiatives, both at the national and regional levels , aimed at making the world of entrepreneurship and students are known, not favoring or reducing this interaction to specific areas of knowledge, but considering digital innovation as a transversal dimension. Roma Tre stands out for its intense activity of interconnection with the productive fabric of the country, proposing concrete initiatives of encounter between the business world and universities aimed at highlighting how new digital technologies influence the transformation of companies and the world of work. Partnership: The activation of partnerships between companies and the University has allowed the latter to be a privileged interlocutor of the major national and international stakeholders, and to promote the development of students' useful skills, favouring their insertion into the labour market.
Universitat Oberta de Catalunya (UOC)	Role of the Third Mission in Universities: The role is total and definitive as innovation (digital and other) is the creation of added value for society and the Third Mission is the commitment to social needs and market demands according to the socio-economic context Stakeholder: The entire university is involved. ▪ Spain is committed to all three missions (Teaching and research staff have all three missions as part of their work). ▪ In the 7 Departments, in addition to management, there are three sub-directorates, each aimed at one of the missions. ▪ They also claim to have coordinating bodies throughout the university: one for each mission. ▪ Competitiveness Commission is responsible for the third mission (innovation) chaired by the Vice-Rector for Competitiveness and Employability.

	Educational model: The eLearn Center leads the evolution of an educational model characterized by innovation in learning: ▪ HUB, Hubbik: to promote entrepreneurship, open innovation, and support for the transfer of knowledge about results and cooperation between the entire UOC community. ▪ Several innovative research groups: Edul@b is focused on Education and ICT. ▪ Research and Innovation Committee (chaired by the Vice-Rector for Strategic Planning and Research) which focuses on the interaction of technology with human activity in reference to the three main focus: the network society, online learning and digital health. ▪ Vice-Rector for Globalization and Cooperation (as well as the Area of the same name) is involved in the process of the Third Mission in relation to digital innovation, with particular attention to the transmission and transfer to Latin American countries, as well as in the exchange of knowledge with NGOs. The UOC system on line: ▪ It is comprehensive and has been a great advantage to deal with the pandemic situation. ▪ Use technology to improve teaching, research and knowledge sharing. ▪ Criticality: online training is not transferring the system face to face in the virtual world. Development of new skills: A new way of working to be: more digital, open, collaborative, agile, data-based, + transdisciplinary. New Tools: LMS: Use of a platform for teachers to innovate in their teaching work. Objective Academic Bodies: A focal point that emerged during the interviews lies in being flexible in order to accompany the large number and diversity of students who face the needs of the environment ⇒ pedagogical, professionalizing and itinerary-based guide.

Learning and teaching

Learning and Teaching	
Laurea University of Applied Sciences	The degree has strategic objectives for digital transformation and processes. It is managed through D-unit (Digital Unit) which is responsible for pedagogical and technical training for teachers. Pedagogical training and development of teachers.
Patras University	There are programs accessed by all academic staff, to support teaching procedures, like e-class, and to handle administration procedures like Progress, for the students to interact with the various administrational or teaching units. New platforms and tools and methods are examined in order to enrich teaching and learning procedures. To accomplish all that directives and manuals are issued and online seminars are also held. For the administrative stuff there is an ongoing procedure with continuous seminars.
University College Cork	Digital education is designed and developed from a pedagogy first perspective. The aim is to support high quality teaching and learning at the university not to be the focus in and of itself. Model of online teaching needs to be in place: a framework for consistency and structure for lecturing staff to follow, not just putting up your lecture online. Important to not see digital in competition with face-to-face teaching, that you can have in person classes and a high-quality digital experience. Moving forward there needs to be a

	mindset shift and that online teaching is not the antithesis of working in person and with the connection.
E-Campus University	In e-Campus prevails a product-oriented approach based on the individualization and personalization of teaching activity. Among the didactic models of reference, we can recognize the following: the ID Model (Instructional Design Model), Mastery Learning model, Pedagogy by objectives, CAI (Computer-assisted Instruction). Attention is placed on the learning outcomes as the result of a specific teaching action, with a special focus on the issues described below: ▪ Learning is seen as a predicted and controllable phenomenon ▪ Objective of the model: to achieve the expected result ▪ Forecasting of results ▪ Planning by objectives ▪ Skills of the teacher and tutors: ability to forecast and control interventions - process monitoring ▪ Evaluation to verify the results achieved once the process is complete The figure of the tutor is central in the teaching - learning process. Tutors can be study course tutors, disciplinary tutors, or technical tutors (tutors online). Great attention is paid to the monitoring and control procedures of the processes which affect all the actors involved: organizational staff, teachers, tutors and students. In the future, the perspective is to move more and more towards adaptive learning, creating the best learning experience for the learner.
Roma Tre University	The integration of digital innovation has entered the organization of the university in a very speed manner during the Pandemic. The reflection proposed by academic bodies on the forms of e-learning as support of traditional teaching are linked to the fundamental reflection declined in the analysis of the cultural dimension. The key strategies indicated by the respondents are: - recover the experiences developed in the years before the Covid-19 pandemic, learn from the past, continue to analyse the forms of teaching and learning in the present. Digital skills were already needed before the Pandemic, but for many probably they have to be developed. The difficulty of using new teaching tools does not discourage university professors who use some teaching methods with a self-taught style. Nevertheless, the lack of specific technical courses for the use of digital tools for teaching and learning is an issue to which much attention has to be paid: it is an essential theme for the current European agendas. The interview shows that Roma Tre is striving to bring an understanding that allows students to follow completely online training and learning courses, developing transversal skills necessary for professional development and acquiring the new E-pass - the new European digital skills licence - at least in the basic set modules. Several important projects are starting. Roma Tre is demonstrating that it can be a forerunner university among Roman public universities in the development of the learning of new skills for professional development and teaching in HE.

Universitat Oberta de Catalunya (UOC)	The innovative tools, methods and approaches used Curriculum improvements are carried out by each of the 7 UOC Departments or Studies with the support of the eLearn Center. However, it is worth mentioning that being a regulated study plan, innovation becomes difficult to integrate because it is necessary to make official modifications that must be approved by AQU. The professional development of teaching staff is carried out by the eLearn Center. In the case of students, they can present their "final studies work" with innovative potential (and, therefore, also with digital innovative potential) at HUBBIK and evolve towards digital innovation (creation of added value for higher education or for society in general). The management staff, as part of the UOC community, can also present the projects at HUBBIK and, in fact, there is already the first spin-off of a digital service from a management person: Immersum Studio.

ICT resources and infrastructure

This paragraph compares the size of ICT Resources and Infrastructure.

This dimension is found in point 7 of the organizational level of the Digital Maturity Framework for Higher Education Institutions .

Experiences and opinions of undoubted relevance emerge from all partners.

In general, it emerges:

- How the availability of infrastructure and technological devices is relatively adequate at all universities. Of course, each shows similarities and differences according to its specific aspect (micro level).
- The question related to the use of the university's digital resources, born from the need to continue to perform its functions during an emergency (Covid-19), how this model has now become part of the daily routine and how difficult it will be possible to go back.
- For some, the change in practices related to digital tools at the university level would seem to have been an indirect consequence of pre-existing legislation, which determined their presence at the local level (university), the direct consequence of their usefulness, configured in the last instance only during the pandemic.

Among the many topics covered, some are particularly relevant:

1. Acquisition of digital technology that at the same time does not necessarily guarantee an acquisition with respect to digital innovation,

2. the detection of some technical problems inherent above all in the overload of work for the server during the so-called "peak hours"

3. a process, that of the ITC in continuous evolution characterized by a continuous alternation of impulses and slowdowns with the aim for all to obtain and dispose of good effective technological resources in order to guarantee to teach .

With the aim of maintaining a transversal and above all comparative look, we present with the use of tables all the items, concepts and reasoning that have characterized the statements of our partners.

ICT resources and infrastructure	
Laurea University of Applied Sciences	**Technology Resources:** The degree has good technological resources for digital development/innovation **D-Unit:** The Degree has centralized critical digital innovation in its organizational structure (D-unit) **Digital components (development):** The digital components of bachelor's and bachelor's degrees are developed, shared and used openly throughout the university **investment and training:** Laurea has also invested heavily in the digitization of education by establishing the department whose responsibility is to develop pedagogical and technological solutions for education and continuously train and support teaching staff **Threat** The biggest threat to continuous development is lack of time and resources **Macro- result:** The main overall result is that digitalization offers great potential for development and innovation, but it could also drain staff if the work is not adequately resourced with a clear vision and focus. **PDCA** Degree has a strong quality assurance system that follows the Plan-Do-Check-Act (PDCA) model.
Patras University	Tools used in teaching and administrative process ▪ Progress (e-secretary) ▪ E-class and examseclass (for teaching and examination) ▪ webres (monitoring projects and payments) ▪ Digital signature ▪ Online meeting platforms (Zoom and Microsoft Teams) ▪ TeamViewer (remote access) **Criticality:** The bandwidth of the hole's network infrastructure should be increased because the workload especially during peak hours forces the system to overload and fail. Access for all interested parties to these modern technologies. **Effective solutions** A possible solution presented could be supported by establishing common premises where stakeholders could gain this access. At first, the problem (Overload system) was intense, but over time it has improved. **Development plan** A development plan is underway to improve and expand infrastructures with the objective of greater distribution. **Guidelines**: Specifically, there are no methodological guidelines for the use of digital teaching tools but, in general, the transition from traditional to digital procedures has been easy. They predict that this will continue in the future.
University College Cork	**Key Figures** To gain a university-level perspective on the areas of national case study field research, three in-depth interviews were conducted with key figures from University College Cork: Office of the Vice-President for Learning and Teaching Centre for the Integration of Research, Teaching and Learning Center for Digital Education Strong networking: Strength of the great working relationships between the various units of the university dealing with digital technologies and digital teaching and learning.

	Cooperation **Skills** Speed of key decisions **Objective** To work with a view to and in the common goal of building in and a future Infrastructure development Strong and significant infrastructure development. Incentive with the Covid-19 Crisis Infrastructure in place It is stated that even before the pandemic effective infrastructures were in place within the universities. **Infrastructure in place** It is stated that even before the pandemic effective infrastructures were in place within the universities.
E-Campus University	**ICT Resources and Infrastructure:** Ecampus claims to be a constantly evolving process characterized by a continuous alternation of impulses and slowdowns **Available resources and difficulties:** In some cases, they highlight difficulties with respect to the possibility of quantifying the resources invested to support the transition to new university models Difficulties to give continuity to the significant experiences gained within specific realities **Investment Plan**: The investment plan that has experienced a drastic decline in the last ten years. For digital innovation, in particular, this has been relegated, on the one hand, to the autonomy of universities and, on the other, to the very different design forces in the various areas of the country. Extraordinary investments are needed to ensure widespread dissemination of connectivity in university facilities to be able to adequately support integrated teaching. **Integrated digital development:** There is a transversal belief that to support the development of digital maturity in universities it is necessary to focus on "integrated" digital development. "integrated at the level of the individual university (discouraging ideological forms of analogue fundamentalism). Integrated at the level of the university system (providing for more substantial interventions where the delayed areas are foreseeable or already evident). It is integrated at the level of the country system”**.**
Roma Tre University	**Change:** The change in practices related to digital tools at the university level is the indirect consequence of pre-existing legislation (see national legislative framework), which determined their presence at the local level (universities), and the direct consequence of their usefulness, which was configured only during the pandemic. Almost all respondents highlight how the use of the university's digital resources has now become part of the daily routine. **Moratti Stanca Reform and National Plan:** The analysis of the interviews shows that, currently, they are available: The tools provided by the Moratti Stanca Reform and the National Plan for the Digital University (e.g. administrative services, e-mail, communication tools **Conduct of academic activities** The months of tools available by the University have allowed an effective performance of academic activities. In addition, during the pandemic, it has been possible to continue to provide services due to their effectiveness and efficiency. **Health Emergency:** The health emergency has been configured as: ▪ an infrastructure test, ▪ push to change practices.

	(Interviews themselves were carried out online thanks to the availability of resources, VRT points out and this is because IT support is not only a tool to succeed but a tool with which to increase the possibilities and develop synchronous activities). **Available resources:** The resources available are considered more than adequate to the needs of the people involved. Guidelines and Training: the need arises to: ▪ provide a document that provides guidance on their use ▪ plan periodic refresher courses that favour the comparison and consolidation of procedures for the use of existing infrastructures. **Infrastructure development measure**s: The university (Vice Rector, specifically) has put in place some actions to implement, develop, improve and adapt the infrastructures: -extend the home page of the university career because it was not there -insert a service for the publication of vacancies for the companies to be published, reformulation of rules for posting vacancies creation of a service for searching for some profiles for students by competence (etc.) **Partnership Collaboration:** Making sites more accessible to everyone and implementing services was time-demanding work and collaboration from external agencies that supported the standardization of websites. (This operation, however, is not considered completed but is currently one of the objectives to be achieved, although useful progress has been made) **Simplification of procedures:** During the interviews, some difficulties emerged and above all the need to simplify access and use**.**
Universitat Oberta de Catalunya (UOC)	**Current availability of infrastructure and technological devices**: The availability of infrastructure and technological devices at the UOC is relatively adequate. It is never enough, and we currently have a specific method of prioritization for the acquisition of digital technologies more transparent and clear. Technology and digital innovation Focal points presented by UOC: ▪ Digital technology is acquired, but not necessarily that digital innovation is acquired. ▪ Technology is rarely an innovation in itself because creating value-added higher education requires new products, services, organizational models or processes. Existence of methodological skills for the use of these resources and ability to update/maintain : as fundamental knowledge of the community of an online university. **Criticality:** In some ways, the budget is not enough to invest in digital technology **Development plan**: No specific plan has been presented but the government has been asked for the possibility of increasing the budget for: - investments in digital technology at the UOC made year after year. (Remained unchanged for over 10 years).

Focus groups: main results

Introduction

This paragraph presents the main issues emerging from the focus groups. They involved professors, researchers, PhD, tutors, administrative staff.

Main issues discussed are:

- their digital innovation idea;
- organisational dimension of digital innovation;
- teaching practices and digital innovation;
- professional development with a focus on digital skills;
- best practices related to their own university;
- strength and weakness, opportunity and threat in implementation of digital innovation in Higher Education.

The voice of professors. Gaining in extension, losing in deepness

In this section, the comparative report relates the results obtained by focus groups, aimed at teachers of each country.

All the teachers involved have developed accurate reflections on the effects that digital technologies have on teaching and learning practices and the common vision that emerges, we can anticipate it, is what you earn in extension but losing in deepness.

Below are the results broken down by university.

The voice of professors	
E-Campus	The professors recognise that digital technologies are an invaluable resource for education, especially in times of crises, such as the one universities faced during the Covid-19 pandemic. During the discussion, the topics explained below were deepened: ▪ **Organization dimension:** the picture that emerged from their words is that of an ongoing transition for which a common vision and shared rules are still lacking, also at the social level. ▪ **Development professional:** the most important skills needed to effectively perform their job, apart from knowledge and competencies specifically related to disciplines are communication skills and relational skills. ▪ **Teaching practices and digital technologies:** the teachers pointed out that online teaching requires the adoption of different methodologies. Therefore, it is crucial for teachers to acquire specific skills, to be able to effectively teach online. Moreover, they feel that the amount of work required to prepare quality online lessons is often underestimated.

Università Roma Tre	During the discussion, the topics explained below were deepened: ▪ the new strategic teaching using group work to reduce the time of frontal teaching; ▪ the large mode teaching using schemes to facilitate the understanding of complex concepts also for humanities; ▪ the new mechanisms of relationship with students who ask questions and receive answers in asynchronous mode on the web forum. Many underline how the need to rethink teaching has led them to experiment and change, a change from which there is no turning back.
Universitat Oberta de Catalunya (UOC)	During the discussion, the topics explained below were deepened: The perception of digital innovation dimension: Digital innovation (DI) is considered a vehicle for improvement, not an objective in itself. The degree of demand for the use of digital technologies ranges from their application, to the disruptive change in the processes of teaching and research activity. The Organization dimension underlines two aspects: 1. application of tools and resources to teaching and monitoring the evolution of students such as virtual campus, collaborative work in the cloud, and use of video or microblog. 2. the need for constant training and depersonalization due to process automation. The questions the group has not answered or commented on are many, because the participants (professors) do not feel confident enough in their experience with digital in HE.
Patras University	They all focus that the best way for keeping up to date with their skills is through self-training and sometimes seminars held by the university. Also, they notice the use of digital platforms such e-class and digital tools such Zoom in more intense during the pandemic years. During the discussion, the topics explained below were deepened: ▪ Digital Innovation Teaching practices and digital technologies as fundamental sections to underline the transversality of internet intervention in the daily life of teachers (not only in teaching and learning practices but also in bureaucratic, administrative, meeting practices etc.) ▪ Organizational Dimension as a fundamental section that enhanced collaboration between teachers and researchers because programming/scheduling was required on a daily/weekly basis. ▪ Professional development a particular dimension that on the one hand grows increasingly having to prepare additional support materials to be used during distance lessons (e.g. ppt, short video), but on the other hand limits the time when the teacher can prepare to offer his knowledge
Laurea University of Applied Sciences	The focus group was attended by 22 professors. Respondents indicated that the digitisation of education has made their work more efficient and flexible. Graduation provides a good set of tools to use for distance learning and support is available when needed. A very interesting result is that the role of the teacher has changed from a traditional teacher or information/knowledge owner to a facilitator or tutor and establishes new competence requirements for teachers in the future. The respondents said that digitisation has great potential for innovation, but the lack of time and resources prevents the best possible result from digitisation.

	During the discussion, the topics explained below were deepened: Teaching practices and digital innovation ▪ Use of digital tools has made working processes more efficient ▪ The role of the teacher has changed from traditional teacher to facilitator/tutor. ▪ The use of digital tools enables more flexibility for the students but in contrast, increased flexibility requires stronger self-management and goal setting skills. Professional development with a focus on digital skills ▪ participating in organized training , self-training, peer discussions and trying new tools by themselves ▪ Skills development is a time-consuming process
University College Cork	Only one or two of the teaching participants had designed online courses previous to the pandemic and so the discussion largely focused on the changes in practice in the last 12+months. This was also highlighted in the need to explore the terms used in the discussions between participants. During the discussion, the topics explained below were deepened: ▪ Digital Innovation Teaching practices and digital technologies as fundamental sections to underline the bidimensional of internet intervention in the daily life of teachers (Some found it exciting as they found that it had reignited their interest in adult education, yet There was also recognition of the extra workload in designing and preparing resources for online teaching.) ▪ Organizational Dimension a fundamental section that contributes to professional development with a focus on digital skills.

The voice of researchers. Between opportunities and problems

The analysis, according to the general framework described and the tools provided in the report *IO1.A1 Digital Technologies in HE: from the European vision to the university governance. Theoretical framework, European framework, Template and tools for national Case Studies*, concerned in particular: Digital Innovation Idea, Organisational Dimension, Teaching practices and digital technologies, Professional development, and Best practices.

Below are the results are broken down by university:

The voice of Research	
E-Campus	The focus group involved six Disciplinary tutors (1 for each of the six Faculties of e-Campus). The Disciplinary Tutors, who are content experts and trained in the technical and communication aspects of online teaching, have the main task of supporting the professor in teaching activities (i.e., collaborating with the professors in the preparation of teaching materials). Main aspects that emerged from the discussion: ▪ The contradictory nature of digital innovation (simplifying activities but often adding a layer of complexity to processes; reducing interpersonal distances but reducing the quality of interactions). ▪ An invaluable resource during the recent time of crisis.

	▪ An ongoing transition for which a common vision and shared social rules are still lacking. Resulting in an additional level of stress and uncertainty for the people involved. ▪ Especially during Covid crisis, technologies have been an invaluable resource to all the participants. ▪ On the downside, it is more and more difficult to keep working time and personal time separated. ▪ Students expect immediate answers at any time. ▪ as problem-solving and teamwork , are also mentioned as critical by the group of tutors online coordinators. ▪ Training initiative organised by the University ▪ Learning by doing ▪ Collaboration among peers ▪ Digital education is a way to guarantee access to study, especially to people that otherwise will be unable to access higher education (for economic, social, logistical and geographical reasons…)
Roma Tre University	The focus group was attended by three subjects who, within the university, hold the role of researchers, PhDs and didactic tutors. During the discussion, the topics explained below were deepened: ▪ easy availability of library materials, articles etc. in digital format but students make little use of these resources because they are not informed/prepared to use them ▪ digital skills should be acquired and developed by students from secondary schools, both lower and higher, to be able ○ to get to university and be able to master digital technologies sufficiently, ○ to be able to compare with innovative teaching methodologies ▪ The long-lasting exclusive use of technologies to meet at a distance determines the need to have social relations in the presence of the various subjects: colleagues; students; student-professors. ▪ Remote interactions have in some cases fostered knowledge between people, as in the case in which an online meeting was organized between all the PhD cycles.
Universitat Oberta de Catalunya (UOC)	The focus group was attended by seven collaboration professors and Tutors (PDC). They don't usually participate in research. Principal results can be found in below: ▪ Use DT to improve higher education both at a technological and methodological level. ▪ DT should allow global, efficient and versatile access. ▪ HE institutions have to be continuously updated in a changing digital world. ▪ The UOC virtual campus is a reference for the rest of the universities to adapt to online teaching. ▪ Participants highly the degree of flexibility and adaptation of the UOC to ID ▪ All participants use self-training as a way to be updated. The resources for this self-training can be by own search, or following seminars or courses offered by the university. ▪ One participant suggested that these courses could be cheaper or free for college collaborating professors (PDC). ▪ Three participants mentioned that developing their own work and communicating with the rest of the faculty is a way to update competences.

	▪ All participants value positively the support and training received to improve their teaching performance. ▪ This support is done from the coordination of each area, both for the updating of content and methodologies and for the acquisition of digital competences and the use of tools.
Patras University	That section presents the perspective of PhD Students and researchers of the Department of Electrical and Computer Engineering of UP (number not specified). The following section presents their opinions and thoughts concerning digital transformation in HE. ▪ Make the educational process more accessible to students ▪ Use and development of digital tools, both in learning support and research work ▪ With digital technology one can share information and knowledge to more recipients and in a more constructive way. ▪ Several people working at the university are unfamiliar with the current technological developments in digital applications and there is a constant demand for training. ▪ Concern of whether communication and dissemination of knowledge using digital technology is as effective as it was, using traditional methods. ▪ Professors have become "virtual entities" in the last period, making exclusive use of digital e-learning tools. ▪ Using the current digital technology of each era for teaching. ▪ Digital technologies have not modified the way of working. ▪ Professors have become "virtual entities" in the last period, making exclusive use of digital e-learning tools. ▪ Use of e-learning digital platform (e-class) and several tools of communication. ▪ Students are mostly interested in the use of digital technology but sometimes express apathy. ▪ Professors should provide interrelated activities. ▪ Encourage students to make explanations, interpretations, predictions, and ratings, to reorganize and transcend the surface structures of their data. ▪ Use of innovative digital tools for the effectiveness of teaching ▪ Restrain: The bureaucracy required to decide to integrate a new digital technology. ▪ Self-training and learning seminars to be up to date. Participants highlight the following best practices: ▪ Use of an e-learning platform (www.eclass.upatras.gr). ▪ Use of virtual or augmented reality environments instead of a real laboratory in the future.
Laurea University of Applied Sciences	Two subjects who hold the role of Professor or researcher participated in the focus group. All respondents participate actively to European H2020 projects. The following are the salient aspects: ▪ Digitalization makes teaching and research activities time and place independently. ▪ Participation in scientific seminars during COVID-19 pandemic has been easier and more cost-efficient than ever because the scientific seminars have been organized virtually. ▪ The virtualized seminars have also increased the participation ratio of the students due to removed travelling costs, removed travel insurance issues and increased time efficiency. ▪ The respondents keep themselves up to date by self-studies and sharing best practices with their colleagues.

	▪ The biggest threat for further development is the lack of resources.
University College Cork	The lecturing staff at ACE (Adult and Continuing Education) who participated (number not specified) were from various disciplines, some technological and some the humanities which led to various attitudes and approaches to digital innovation in Higher Education. The discussion offered good insights to the different experiences of the organisational system of the university and the professional development of the lecturing staff themselves. ▪ The overall consensus was that ACE teaching staff have adapted quite well to the move online. ▪ The move to 100% online programmes due to the pandemic was somewhat suitable for departments like ACE as they are adult learners so the flexibility regarding work, family and travel had advantages for their cohort of students. Yet not suitable for undergraduate students as they miss the social and networking aspect of the campus learning environment e.g., people meet through clubs etc. that become future colleagues in your sector. ▪ Need to know to design for pedagogically better and deeper learning in online learning and not just provide the content. Highlighted the need for instructional design for online learning knowledge and skills. Awareness that there is a big difference between moving a programme online versus one that has been designed to be taught online and that a model of practice that has evolved over the past year needs to be standardised and established fully. ▪ Model of online teaching needs to be in place: A framework for consistency and structure for lecturing staff to follow, not just putting up your lecture online. ▪ Important to not see digital in competition with face-to-face teaching, that you can have in person classes and a high-quality digital experience. Moving forward there needs to be a mindset shift and that online teaching is not the antithesis of working in person and with a connection. ▪ Feedback from students has been that a mix of synchronous and asynchronous teaching works best for them. ▪ Attendance and retention rates were high. ▪ Blended learning model proposed for post-covid future of some programmes at ACE. ▪ Discussion of the need for the protection of lecturers now that they are being recorded and circulated. Raised questions about not knowing UCC policies on this. ▪ Needs to be different layers of digitalisation within the university: Many different disciplines within the university so different layers of digitisation in teaching and learning are necessary. Difficult to have a universal policy to digitalisation and also respect the autonomy of the different approaches of the different disciplines. ▪ Future of digital innovation in education was discussed in terms of how technologies have been provided but it is what you do with it e.g. funding to develop virtual reality systems for teaching challenging concepts. The difference in learning in a fully immersive virtual space, not just online on your desktop is transformative and this could just be 4/5 years down the line. The challenge for lecturers will be how best to use the innovative technologies so the students can learn better, not just so it is convenient or just looks trendy, it is to understand how the students

The voice of the administrative staff

The issues that emerged during the Focus Groups for the Ecolhe project were many and all undoubtedly current.

In the phase of work in which the comparative analyses took place, some similarities emerged that see the issues in some ways similar and in others slightly deviate.

All the focuses, as far as administrative staff are concerned, can be said to be very rich in themes and food for thought.

All the focus groups with the administrative staff were naturally full of food for thought on the issues concerning the transformations in the organization of administrative procedures and practices, more generally, with regard to aspects of the bureaucratic life of the Universities.

The themes and concepts that emerge are:

- training,
- a request for a change in professional skills,
- the positive and negative aspects of Smart Working,
- personal professional experience,
- clear and effective communication,
- new roles,
- an acceleration of innovative practices due to Covid-19,
- professional development,
- a greater use of remote tools made available by universities that have highlighted, in some cases, inhomogeneity in staff in practical use.

We then proceeded, always following the same reasoning, to the elaboration of a SWOT analysis on digital innovation.

Maintaining a comparative objective, below they are exposed by means of tables, concepts and reflections of all partners.

The Voice of Administrative staff	
E-Campus	Professional development: It is highlighted as a common goal. A series of initiatives and procedures are in place month with the aim of continuous improvement: ▪ Importance of teamwork: everyone offers their own contribution and their own vision of the problem. ▪ Problem-solving . ▪ Synergy. ▪ Solution for everyone Skills: The skills more frequently mentioned by all participants to the focus groups are: ▪ Organisational skills (to be able to proficiently organise working tasks, achieving a good work-life balance); ▪ Technological/digital skills (especially the ability to master technological tools that are part of everyday working life); ▪ Continuous professional development (to stay constantly updated, and to be an active part of on the job collaborative learning processes);

	▪ Communication and interpersonal skills (to make use of digital technologies in a responsible way, to communicate clearly and effectively in written form through the different digital channels, to reduce the distance between the different actors of communication, teachers, learners, co-workers, to show empathy and offer guidance in case of difficulties); ▪ Flexibility, resilience and adaptability to change (to be able to adapt to the continuous changes that technologies impose on work processes and, more generally, to changes that can also occur due to external circumstances, as was the case in the Covid-19 emergency). Training: Regarding the way participants keep up to date and acquire and improve the skills they need to effectively perform their job, the most mentioned solutions were: ▪ Training initiatives organised by the University, that all the three groups of participants highly appreciated; ▪ Learning by doing; ▪ Collaboration among peers. Digital innovation: Digital innovation has been acknowledged as a powerful resource to provide students' with a more flexible (in terms of time and space) and inclusive way to access higher education, and as a driving force to enable the shift toward more learner-centred learning processes, integrated with individualised support and guidance. Organisational Dimension: The picture that emerged from their words is that of an ongoing transition for which a common vision and shared rules are still lacking, even at the social level: ▪ The introduction of digital innovation has involved the reconstruction of a process: Generation of a stress load in some cases, for administrative staff
Università Roma Tre	Digital innovation The possibility, accelerated by the pandemic, to create a non-face communication channel (p.es. Meetings on Teams). The idea of sustainability that innovating means digitizing, means being able to get to the elimination of paper something that at least here at the university in the administrative field claim to be still far from doing so. Participants agree on the relationship between the pandemic and speed in digital innovation. Digitalization Positive and negative aspects of the experience of administrative staff have emerged, on the one hand, digitalization also streamlines work in terms of execution time, tranquility from public pressures and so on. On the other hand, it also leads to the possibility of retrieving paper, printing and remaking archive procedures. **Using tools** Tools made available by the University: On-line Forum, Teams, Respondus etc. But, also, tools like Cloud. Smart Working ▪ Always be available and ready for action. **Communication**: The participants it is considered non-homogeneous and, in some ways, also "redundant" and not very effective, as there are different offices that can disseminate the same thing in different ways because everyone has their own way of writing. Skills Other skills are required than those put in place so far (p.es. the figure of the secretary). Everyone says that these are additional skills (for some very difficult to acquire). There is a real risk of not being able to keep up: what could potentially be a strong point (the use of software tools, for example) risks becoming an obstacle to the performance of one's work. It is also

	difficult to obtain a more widespread specialization and also continues ... by someone it is considered better that it is changed as an improvement. In this perspective of continuous change, it is therefore a question of including, among the required skills, also "flexibility". **Training**: Lack of effective capillary training. It is revealed how very often, these, and other programs are used only in an intuitive, experiential, empirical way. A "lack of training" and a digital system that, however, "slimming" it may be, without capillary training can become "ballast". What the University would seem to offer are training courses partly already repeatedly delivered and partly placed at "inconvenient" times. As for the use of tools, it turns out that many have had to do it themselves, moving as "self-taught". A climate of dissatisfaction emerges **Resistance to change:** It is revealed among some participants the opinion that one comes to adopt technological means only for a need; it seems and would seem to have been decisive the pandemic to use the online mode. They also say that there is still resistance at the bottom: legislation on paper has existed for decades (not years, decades).
Universitat Oberta de Catalunya (UOC)	**Digital technologies.** The group of technical and administrative staff expresses a very practical vision of the use of digital technologies with a view to exploiting technological possibilities to facilitate the processes of teaching-learning, communication and management. Declares that digital innovation in the university context consists in the application of new processes or tools and the improvement of existing ones to facilitate management **Technological improvement.** The six participants are very satisfied with how the university incorporates the technological advances that facilitate management (there is talk of its improvement). **Smart Working and process management.** Spain generally efficiently manages a lot of information and processes. Smart working is easy and is implemented **Critically:** a critical issue they declare lies in the fragmentation of innovations. Specifically, there is a lack of greater integration of the different processes that are executed. **Technology network.** A key point lies in the statement that emphasizes that the technological network was present even before. Some examples are given: Library (new databases or new products/software); Trello (for project management); Miro (for ideation processes); Digg (for sharing information). Tools designed and implemented to accompany the design and training of programs and subjects based on skills are made available by the university (implementation of GRAF). **Training:** Self-training, peer tutoring, paid private training, and training offered by the university, Most participants (6) use self-training. A participant mentions a training plan followed with the hierarchical superior to analyse his needs and plan learning. **Communication:** All participants are very satisfied with the different improvements in the digital management of processes both at an organizational and communicative level: in general adapt the tools to improve management and communication. Communication channels have multiplied, and their use should be recorded. **Tools for Staff Work/ Collaboration:** Having a catalogue of resources and tools for our community, which help to work collaboratively on projects, and not on processes, will facilitate the definition of strategies for projects. The daily volume does not allow us to have other perspectives and think about the future. Changes in the way we work

	▪ Digital resources and technologies have changed/changed the way we work. ▪ Management has become more efficient and the big change is collaborative networking and virtual communication that allows you to reduce presence. ▪ One participant is critical of the increase in the number of processes. Skills: ▪ Increase in skills that in some cases would not seem to be homogeneous. ▪ Companies and consultants with knowledge and skills to accompany the staff. **Threat** The rapid acceleration of digital innovation in the environment can generate increased competition.
Patras University	Digital Innovation: ▪ Have global access to results ▪ Communicate with students and provide services ▪ Automated system for reporting votes. ▪ Automated system to determine if students meet the degree requirements. ▪ Be able to provide diplomas with a digital signature. ▪ The ability to perform many tasks from home Organizational dimension ▪ The new tools/applications are not very well designed. ▪ The documentation is not very well written. ▪ The role definition is not changed. Teaching practices and digital technologies Digital technologies provide the ability to extract statistical information about grades, graduation rates, etc. from student/grade databases. Professional development ▪ Skills in accounting and financial planning. ▪ Organizational and communication skills. ▪ Computer literacy (e.g., ECDL level or higher). ▪ Management skills. ▪ Guarantee of security and privacy issues (e.g., GDPR). ▪ Stay up to date with training seminars. ▪ Bureaucracy still remains a problem **Pandemic:** The pandemic has made it necessary to develop ways to work effectively from home. This is an opportunity to streamline administrative tasks and reduce bureaucracy.
Laurea University of Applied Sciences	Teaching practices and digital innovation ▪ They talk about innovation in general, not just digital innovation ▪ Technology is seen both as a resource and as a limitation ▪ Best practices are actively shared among the team ▪ Digital transformation proceeds step by step, some parts of the organization proceed faster than others ▪ The development of digital innovation should not be limited only to digitalisation or technology, and digital innovations should have a broader perspective that includes the pedagogical aspect. Resources and time Lack of time resources is seen as a restriction for development Professional development and skills

	Professional development with a focus on digital skills. A wide variety of skills are required including good digital skills, understanding of the pedagogical approach, good communication and interaction skills, an innovative mindset, the right attitude, system thinking and learning skills. Criticalities: obstacles to the development of skills; time limits, too much work, no possibility of specialization, sometimes no respect for work and complex field of work. Adoption of new roles New roles have been adopted due to the digitized work environment. Formation The support staff keeps up to date in several ways, including reading, networking with EDUCATION eLearning experts, attending conferences, visiting edutech shows, and focusing on the most important things to finish. Lack of time and resources is a constraint for personal development. The group of respondents presents a non-heterogeneous perspective: because the department offered pedagogical and technical training for teaching staff during the COVID-19 pandemic and noted that development is not possible if technological or pedagogical skills are lacking. Teamwork More efficient teamwork thanks to the implementation of digital tools. Staff Staff are unable to adapt to digital transformation. Criticality: lack of possibilities of specialisation.
University College Cork	Use of digital technologies It is evident to the respondents to be development: ▪ teaching practices and digital innovation. ▪ professional with a focus on digital skills. Digital innovation Digital innovation is the transfer to the use of digital technologies such as MS Teams and SharePoint to facilitate the sharing of information. Criticality: from the FG it emerges how complicated it was for some and easier for others. It concerns both the digital landscape and the sphere of teaching. **New tools:** The discovery of an app that can connect the phone system for reception when operating remotely has highlighted the digital technologies available to make working practices more efficient. Change: A substantial change in the last 12 months due to the pandemic is declared. The changes are seen as positive and permanent. A sense of feeling more connected in relation to work practices. The need emerged among the participants to explore/define some terms used by them. **Professional development:** Professional development with a focus on digital skills. Improvement and Sharing of skills

	Inefficient use of digital platforms at first due to a lack of knowledge and skills, such as creating a Teams group for everything instead of a group with multiple channels. The most experienced participants in terms of technology have made their experience available to the staff. **Inhomogeneity:** The "online shift" of activities highlighted a gap between participants. Smart Working: Idea of "always being on" and then organizing meetings for times that previously would have been considered break times The acceleration of digital education practices due to the pandemic – current state of flux and data gathering for the future – more blended learning programmes?

Students online survey: main results

Framework

This part of the research report represents the conclusion of IO1 - Comparative Research Report on *Digital Technologies in higher education: from the European vision to the University.* It focuses on the: online survey for students. The main aims and scope of the questionnaire were to investigate students' perception of the ability to integrate digital Technologies into organizational and training processes supporting teaching/learning activities.

The hypothesis is that is possible to identify the dimensions of students' digital maturity by their perception of the university's capability to activate internal processes and services which characterize the students' learning experience.

The goal was to submit the questionnaire by Survey Monkey to at least 50 students per country for a total of 250 students in total. To build the questionnaire, a procedure made of three phases has been adopted (Fig.2).

Fig. 2 - Phases for building the questionnaire

Methodology

One of the ECOLHE project goals is to analyze student's perception regarding the ability of the organization to integrate digital technologies into organizational and training processes, supporting teaching/learning activities.

To gather this, a web survey with a questionnaire has been realized. It's worth noting that the analysis aims at describing the involved sample and does not claim at generalizing results over the student population of partner countries.

The elaboration of this questionnaire was developed in three main phases, as follows.

Phase 1: Literature Review

The first step for setting up the questionnaire is a literature review. We have focused on areas that have resulted during brainstorming activities around the theme of digital innovation in Higher Education in its meaning of an open and complex system (Bateson, 1977; von Bertalanffy, 1968). It's worth noting that we approached highlighted sections from the side of organization theory (Miller, 1959; Butera 1999; Cocozza 2014; Sangrà, 2008).

Organization activity

Following the organizational study, we defined the organization activity (Miller, 1959; Butera 1999; Cocozza 2014) concerning: a) context; b) dimensions that characterize it; c) performance criteria, and d) objective toward which it is oriented, four regions helping us to understand how the organization acts.

a) **Context**: internal and external experience observable by Technology (tools, machines, software which have the function of organizing and transforming things, information, and knowledge); Time (associated with the idea of punctuality, synchronization, and coordination); and Territory (that refers to context-environment in which the organization acts).

b) **Dimensions that characterize the Organization**; according with Butera (1999), we can identify 4 main dimensions: Cooperation; People communication determined by organizational processes and interactions which develop in the community; Knowledge we can summarize in the technical procedure, database, protocols etc. that characterize the organization; and Community expressed by a common feeling of participation.

c) **Performance criteria** represents effectiveness related to the achievement of a goal, and efficiency refers to the relationship between obtained results and incurred costs to achieve those results, to which we can add quality in its different meanings to more recent contributions.

d) **Objectives towards which it is oriented**, summarized by Butera (1999) in technical objectives (linked to the effectiveness and efficiency of the process), economic objectives (concern financial results) and social objectives (concerns the quality of life of people, environmental sustainability, etc.)

On this basis, we believed the questionnaire should explore the following sections: **teaching innovation**, **students' achievement** and **students' experience** briefly explained in the following.

Teaching innovation

According to the main reasoning, teaching innovation concerns the introduction of new ideas, methods, and tools of teaching, whilst creative teaching is related to the development of teaching inventiveness. According to Lee (2011), teaching innovation may be investigated from a double perspective: innovation of teaching methods to implement teachers' creativity and innovation of course design, inspiring students to integrate knowledge with practical ability. Pedagogically, there are some categories to be fulfilled for teaching innovation. In the HE fields, Hannan and Silver (2000) and Walder (2014) identify seven categories that are listed here.

1) Supporting schemes such as: cooperation, discussion forum, individual or group meeting, debates, peer assessment and former student mentoring;

2) pedagogies for professionalising innovation that aim to improve student learning and broaden it for professional purposes;

3) innovative pedagogies for concept of teaching i.e. the way in which the teacher conceives of his own teaching;

4) interdisciplinarity meaning opening up a class to speakers from other disciplines with the aim of demonstrating the global nature of the links between the disciplines;

5) interculturality such as mixed programmes remotely and in situ in the country of origin;

6) tools, primarily related to technology, i.e. Web databases, Clickers, Online lessons, Video clips, Conceptual maps, Slides, the Creation of pedagogical manuals, 3D modelling, PowerPoint presentations, university learning portals (i.e. Moodle), Clinical case studies, Wikis, Note-taking exercise books and Software;

7) pedagogical approaches with a particular focus on active learning methods, as described by Misseyanni et al., 2018 and in gamification as discussed in Martì et al., 2016. We also find appreciable the recent Redman et al. contribution (2021) arguing the innovation in self-assessment.

Finally, we intend to define **teaching innovation** in HE as those pedagogical strategies and technological tools for improving students' learning, accounting for the innovation in assessment methods.

Students' achievement

We may define **students' achievement** as academic performance gained in a given time frame. According to some studies (Lynch et al. 1998) learning styles affect performance as task experience does (Jones, 1996). Renee et al. (2016) discuss emotional climate may be a determinant for online learning. Consequently, it's interesting to us to address whether interactive learning may improve student achievement (Castaño-Muñoz et al., 2013). For this reason, we believe it is interesting to explore this section in correlation with teaching innovation; factors that are proximate are the following.

Performance indicators consisting of those objective measurements of students' capability.

Emotional climate with respect to both the use of digital learning environment and interactions (with professors and colleagues), passing through students' perceptions.

Student engagement level that is critical to student learning (Dixson, 2015), above all in the case of online courses.

Students' experience

From students' perspective, the **experience** may be identified as a synthesis of perceptions about academic living. In the literature, some contributions discuss that students' experiences of their learning are one of the sources of information about the quality of teaching and may affect satisfaction (Calvo et al., 2010). We believe that experiences in HE digitally mature may be declined in terms of digital transformation and may involve both *organizational processes* and *learning teaching*.

From the side of organizational aspects, Sanjai et al. (2016) manages the topic by exploring perceptions about IT/Administrative staff interactions, faculty empathy, student interactions, faculty feedback, faculty reputation and physical facilities.

From the side of learning to teach based on self-motivation theory, Keller (2010) discusses the ARCS model whose meaning is the following. People motivated to learn have to be met (A)attention, which means their curiosities and interests should be stimulated and sustained, (R)relevance, meaning they should believe the learning

is deeply connected with critical personal goals and (C)confidence since, "even if people believe the content is relevant and they are curious to learn it, they still might not be appropriately motivated due to too little or too much confidence, or expectancy for success. They could have well-established fears of the topic, skill, or situation that prevent them from learning effectively. Or, at the other extreme, they might misbelieve that they already know it and overlook important details in the learning activities." In the end, to have a continuing desire to learn, people must be (S)satisfied with the process or results of the learning experience. According to this approach, a scale has been developed and validated (Loorbach et al. 2015).

A preliminary items identification has been carried out based on a literature review briefly summarised section by section in Appendix 1. The list has been shared with partners to identify both the final dimensions of the questionnaire and the right position of items in the sections.

Phase 2: Discussion about the theoretical review with partners

The partner participation and activism were relevant for eventually defining the final dimension of the questionnaire. After a discussion during a virtual meeting, the last three shared dimensions of the questionnaire were the following.

a) *Teaching /Learning process*: this part of the questionnaire measures perception about the innovation in teaching methodologies, learning approaches, tools and resources in learning activities, and assessment methods.

b) *Students' learning outcome*: this part of the questionnaire explores the academic performance, skills and competences developed in a specific time frame, and it detects the students' engagement.

c) *Students' experience*: synthesis of perceptions and satisfaction about academic living.

Phase 3: Matching game for assessing items to dimensions

Partners' activism was stimulated also by a *matching game*[6] consisting in counting how many times a given item taken from the redundant list was declared by experts useless or belonging to a given or another dimension. Starting from a redundant items' carnet, experts proposed affiliation of each question to the questionnaire section for which they better felt the correspondence; the output was a pruning version of mutually exclusive items since only those items that were affiliated at the same section by the most of experts, were included in the questionnaire. The resultant was a questionnaire skeleton based on still three dimensions and 36 items distributed as follows: (A) *Teaching/Learning process*, including ten items measuring perception about the innovation in teaching methodologies, learning approaches, tools and resources in learning activities, assessment methods; (B) *Students' learning outcome* made of 17 items exploring the academic performance, skills and competences acquired in a given time frame and it measures the students' engagement and (C) *Students' experience* with nine items synthesising perceptions and satisfaction about academic living. Items were measured using a 5-point Likert scale. The questionnaire was completed by a student profiling section and some open questions to accomplish students' listening. The final realization of the questionnaire is displayed in Appendix 2.

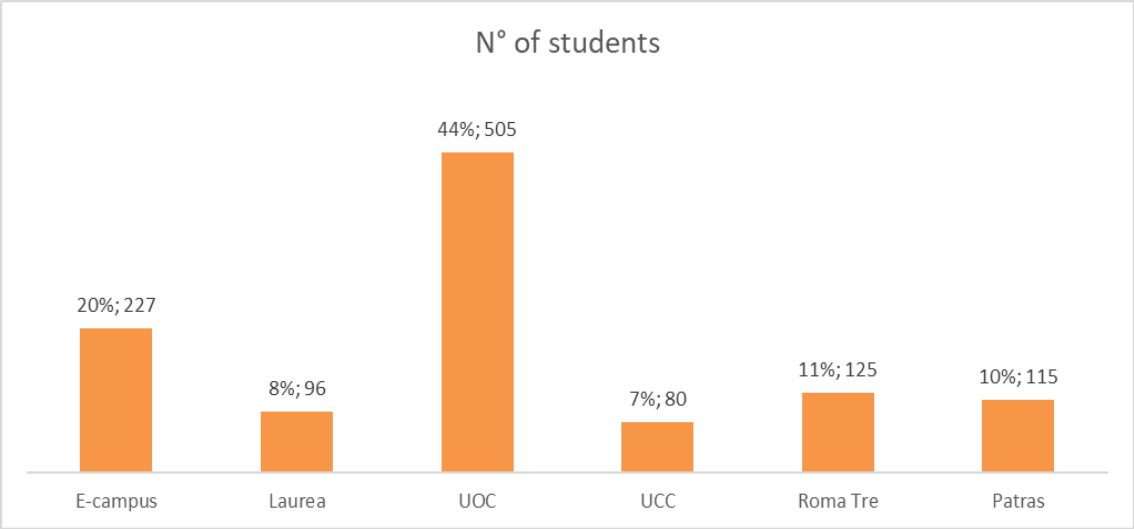
Moreover, the goal of the analysis is to describe the reached sample.

[6] The matching game has been inspired by the Q-sort method largely used in psychology and social science (Block, J. (2008)

After having built the questionnaire, the data gathering has been developed by Survey Monkey system. The total n° of complete responses is 1148, mainly coming from Spain and Italy. Only two universities were not able to completely reach the goal, but they arrived the closest they could.

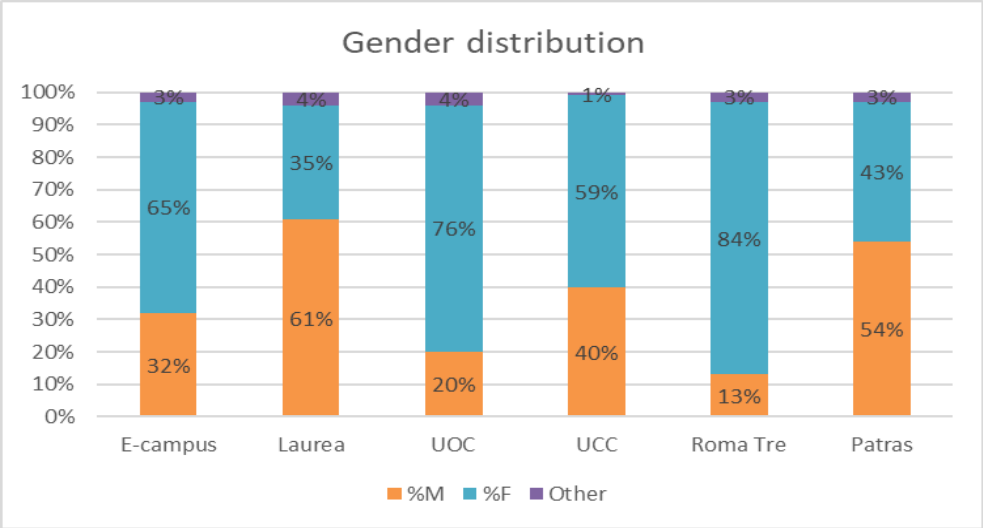
For UCC (Ireland), it was a bad time of the term for engaging students in a survey as many were finished or finishing their courses. Many of Ace's students were confused by the terminology of the questionnaire and thought that it was not for them as many are taking Cert & Diploma courses and the survey only referred to Degree students.

Also for LAUREA the administration period did not correspond fully to the teaching calendar, this made it difficult to reach the target. Fig. 3 - Distribution of collected data by country



Despite the distribution of gender is sometime unbalanced; the analysis is not affected since gender distribution is statistically independent by the country.

Fig. 4 - Distribution of collected data by gender



Data have been analysed country by country and in a comparative way that is the focus of this report. Even if it is possible to observe the traditional gender distribution found in many international literatures (Goulas, et. al. 2022) in relation to study choices: the students of UOC and Roma 3 who participated in the questionnaire mainly refer to the social and humanistic areas and it is possible to note the clear prevalence of women, contrary to Laurea which is a university of applied sciences where greater male participation is distinguished.

Research questions, goals, and methods

The comparative study was carried out with the aim of addressing three main research questions that are:

- **RQ1: Which is the University partner where digital practices seem to be more advanced?**

This RQ is addressed with the aim at comparing universities in terms of *digital maturity*. To analyze and compare the digital maturity of the Universities involved we were inspired by the taxonomy proposed by the *Digital Maturity Framework for Higher Education Institutions* which synthesizes the main existent frameworks/models related to the integration of digital technologies in HE (Đurek, Begičević Ređep, Kadoić, 2019). The digital maturity framework considers three areas of analysis- organizational, teaching-learning (educational) and cultural area – subdivided into the following seven dimensions: 1. Leadership, planning and management; 2. Quality assurance; 3. Scientific-research work; 4. Technology transfer and service to society; 5. Learning and teaching; 6. ICT culture; 7. ICT resources

and infrastructure[7]. To address this RQ the Principal component analysis has been chosen as the statistical method for the analysis. The principal component analysis is a technique useful for summarizing latent concepts underlying a group of variables. Throughout the technique, the dimensions of data can be reduced with an insignificant loss of information (Azzalini & Scarpa, 2009).

- **RQ2: Which are the latent factors characterizing students' digital maturity?**

[7] Đurek, V., Begičević Ređep, N. and Kadoić, N. (2019). Methodology for Developing Digital Maturity Model of Higher Education Institutions.Journal of Computers 14(4):247-256

This RQ is addressed with the aim of exploring latent dimensions in the questionnaire. To address this RQ the Explorative Factor analysis has been chosen as the statistical method for the analysis. Explorative factor analysis helps in exploring how many different latent dimensions underly variables through responses (Azzalini & Scarpa, 2009).

- **RQ3. How involved students can be classified?**

This RQ is addressed with the aim of profiling students according to latent aspects. To address this RQ the Cluster analysis has been chosen as the statistical method for the analysis. Cluster analysis helps in highlighting groups of units that are meant to be similar to each other with respect to some criteria.

- **RQ4. Are latent factors of digital maturity, on average, really different among Universities?**

This RQ is addressed with the aim of understanding if average values of latent components of digital maturity are different across Universities. To address this question, we proceeded in two steps. Firstly, we checked if latent dimensions' average values are statistically different and then, if this may be due to Universities. To address the first step the analysis of variance.

Results

RQ1 - Which is the University partner where digital practices/processes seem to be more advanced?

To address RQ1 the first selection of items has been done. The items in the questionnaire able to express the concept of digital maturity are displayed in table 1 with the related factor loadings.

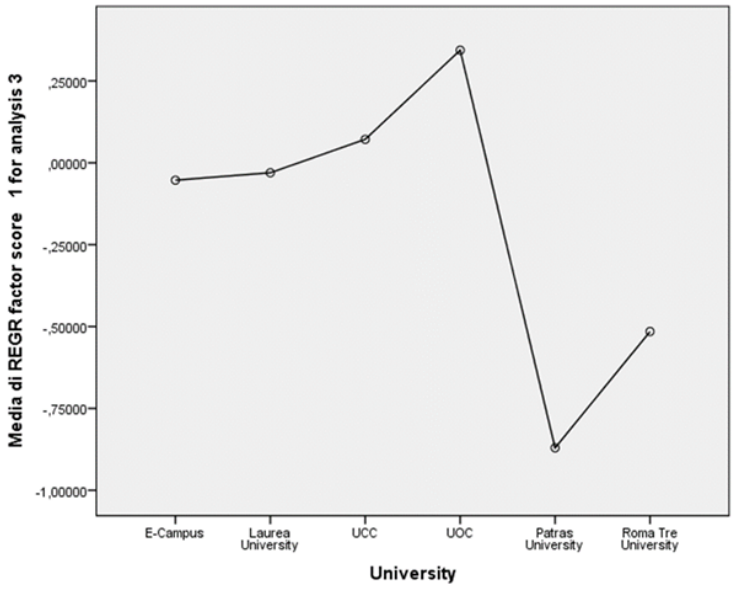
Tab. 12 - Items and PC1

Explained variance by PC1	63%
	Loadings
The faculty organization/structure is clear to me	0.788
Announcements from the administrative staff are clear	0.754
Teachers provide me the support that I need	0.842
Teachers are engaged in the teaching process	0.822
Teachers are digitally competent	0.782
Technology and learning portals (e.g. Moodle, Learning Management System) are effectively used	0.764
ICT Tools and platforms are intuitively used	0.766

The principal component (PC) underlying them can replicate the 63% of the variability. Factor leadings play the role of weights by means of items that take part in defining digital maturity and, thus, help us in defining the universities' *digital practices* more precisely.

Plotting the average value of PC1 by University we get the following graph (Fig. 5).

Fig. 5 - PC1 vs university



Statistically speaking, averages have been simultaneously compared by each other's by the HSC (*Honestly Significant Difference*) Tukey test (Tukey, 1949) that can be used to find means that are significantly different from each other. Results are displayed in table 2. Results can be briefly summarized as follows.

- E-campus, Laurea University and UCC have an average value of digital maturity similar to each other. Patras University and Roma Tre University have the lower level of digital maturity compared to other partners, although Roma Tre University has a higher level of digital maturity compared to Partras University.
- UOC has the highest level of digital maturity in the group. Probably, the digital maturity depends on both the country digital development level and online university. Traditional universities from low DESI countries show the lowest digital development among the group, while high DESI countries or online universities show an higher level of digital maturity. The UOC has the highest level of digital maturity in the group since it combines both characteristics.

Tab. 13 - Tukey's test results

(I) University	(J) University	Means diff. (I-J)	Std. error	Sig.	Confidence interval 95%	
					Inf	Sup
E-Campus	Laurea University	-0.02	0.11	1.00	-0.40	0.35
	UCC	-0.12	0.12	0.90	-0.53	0.28
	UOC	-0.40	0.07	0.00	-0.64	-0.15
	Patras University	0.82	0.11	0.00	0.46	1.17
	Roma Tre University	0.46	0.10	0.00	0.12	0.81
Laurea University	E-Campus	0.02	0.11	1.00	-0.35	0.40
	UCC	-0.10	0.14	0.98	-0.57	0.37
	UOC	-0.37	0.10	0.00	-0.72	-0.03
	Patras University	0.84	0.13	0.00	0.41	1.27

	Roma Tre University	0.48	0.12	0.00	0.06	0.91
UCC	E-Campus	0.12	0.12	0.90	-0.28	0.53
	Laurea University	0.10	0.14	0.98	-0.37	0.57
	UOC	-0.27	0.11	0.14	-0.65	0.10
	Patras University	0.94	0.13	0.00	0.49	1.39
	Roma Tre University	0.59	0.13	0.00	0.14	1.03
UOC	E-Campus	0.40	0.07	0.00	0.15	0.64
	Laurea University	0.37	0.10	0.00	0.03	0.72
	UCC	0.27	0.11	0.14	-0.10	0.65
	Patras University	1.21	0.10	0.00	0.89	1.54
	Roma Tre University	0.86	0.09	0.00	0.55	1.17
Patras University	E-Campus	-0.82	0.11	0.00	-1.17	-0.46
	Laurea University	-0.84	0.13	0.00	-1.27	-0.41
	UCC	-0.94	0.13	0.00	-1.39	-0.49
	UOC	-1.21	0.10	0.00	-1.54	-0.89
	Roma Tre University	-0.36	0.12	0.03	-0.76	0.05
Roma Tre University	E-Campus	-0.46	0.10	0.00	-0.81	-0.12
	Laurea University	-0.48	0.12	0.00	-0.91	-0.06
	UCC	-0.59	0.13	0.00	-1.03	-0.14
	UOC	-0.86	0.09	0.00	-1.17	-0.55
	Patras University	0.36	0.12	0.03	-0.05	0.76

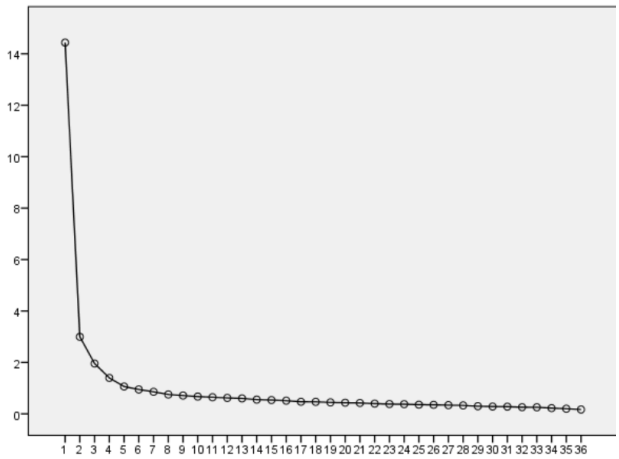
Reading these data in relation to the overall results of the national case studies reports, we can hypothesize that UOC shows the highest level in the adoption of *digital practices* consistent with its vocation as an online university since its foundation; while the others, as conventional universities, show significantly lower data in relation to the adoption of *digital practices* in their organizational processes. The UCC college University of Cork is going closer to the best performance in Spain. These data seem totally in line with the results of the *Digital Economy and Society Index – DESI* which summarises the state of progress of the European Union and the individual Member States with respect to the main thematic areas of digital policy.

However, the level of *digital maturity* assessed by selecting only some questionnaire items does not seem satisfactory to us, both due to the limitations connected with the items selection bias, that is, all the items of the survey investigated the digital maturity and the researcher's selection of some of them could be misleading. All the items of the survey reveal the level of *digital maturity*, which is composed of different dimensions. Then, we choose to adopt a principal component analysis procedure to identify the latent dimensions that constitute the students' *digital maturity*.

RQ2 - What are the latent factors characterizing students' digital maturity?

To explore the latent factors characterizing students' *digital maturity* and to address RQ2, all items have been used. Explorative factor analysis with the principal components' method was carried out. The right n° of factors to extract is usually chosen based on the % of cumulative variance replicated by factors or up to the first eigenvalue less than 1. Observing the *scree plot* (Fig. 6) is clear that the number of factors having an eigenvalue less than 1 is five. That is, there are five components constituting students' *digital maturity*.

Fig. 6 - Scree plot of factor analysis eigenvalues vs n° of component.



This is coherent with the analysis of cumulative variance (Tab. 13) highlighting that 5 factors explain more than 60% of the total variance.

Tab. 14 - Variance explained by factors

Latent factors	Initial eigen-values	% variance	% cumulative
1	14.436	40.1	40.1
2	2.996	8.322	48.423
3	1.956	5.434	53.856
4	1.398	3.884	57.741
5	1.063	2.953	60.694
6	0.948	2.633	63.327

Once factors have been extracted, varimax rotation with Kaiser normalization has been applied with the aim of catching the meaning of each factor based on factor loadings, displayed in table 14.

Tab. 15 - Factor loadings after rotation

	1	2	3	4	5
Teachers are engaged in the teaching process	0,731	0,182	0,123	0,193	0,293
Announcements from the administrative staff are clear	0,715	0,045	0,085	0,173	0,190
The faculty organization/structure is clear to me	0,695	0,118	0,171	0,127	0,213

The administrative staff is prompt to support students' needs	0,689	0,083	0,074	0,177	0,189
Teaching materials are not too difficult to understand	0,675	0,156	0,133	0,100	0,008
Teaching staff is empathic	0,673	0,129	0,122	0,186	0,328
Teachers are engaged in the teaching process	0,672	0,235	0,155	0,239	0,277
Technology and learning portals (e.g., Moodle, Learning Management System) are effectively used	0,644	0,216	0,384	0,010	0,075
Teaching materials are appealing	0,638	0,358	0,248	0,143	-0,122
Teachers are digitally competent	0,629	0,156	0,157	0,037	0,343
Lessons catch my attention and stimulate my curiosity	0,625	0,353	0,332	0,174	-0,094
ICT Tools and platforms are intuitively used	0,625	0,194	0,396	-0,005	0,068
I'm overall satisfied with my choice to study at this University	0,609	0,145	0,476	0,132	0,110
Lessons are available to students remotely on the internet	0,587	0,071	0,378	-0,105	0,122
Locations is functional to my needs of studying or staff contact	0,571	0,095	0,143	0,056	0,385
Matches my learning expectations	0,556	0,186	0,544	0,183	0,114
Use lab experiments and simulations	0,043	0,744	-0,065	0,224	-0,134
Use game elements or educational games	0,078	0,713	0,154	0,013	0,149
Assess students' prior knowledge to orient personalised learning	0,135	0,708	0,022	0,279	0,010
Use conceptual maps	0,191	0,693	0,074	0,102	0,142
Invite guest speakers	0,094	0,664	-0,082	0,365	-0,129
Students take innovative tests (quiz, game, playing role, speech, etc.) during the classes	0,193	0,593	0,308	-0,091	0,318
Use visual or digital resources and tools	0,247	0,574	0,270	-0,008	0,196
Use case studies	0,250	0,554	0,132	0,048	0,217
Will help me develop my critical thinking	0,314	0,131	0,690	0,274	0,154
Is really enjoyable	0,535	0,111	0,583	0,225	0,134
Will help me in team working	0,271	0,093	0,572	0,279	0,392
Will help me in acquiring a job or career-related knowledge and skills	0,301	0,070	0,568	0,458	0,176
Is developing my soft-skills	0,448	0,146	0,532	0,339	0,185
Is giving me the opportunity to find a job	0,185	0,254	0,102	0,749	-0,026
Is giving me the opportunity to meet significant people for my life and my profession	0,167	0,174	0,257	0,706	0,120
Will impact my good professional image/reputation	0,236	0,190	0,401	0,618	0,063
Students are respectful towards each other	0,388	-0,062	0,094	0,128	0,647
Students are at their ease to each other	0,391	0,150	0,084	0,213	0,608
Use class group activities	0,135	0,374	0,300	-0,198	0,572

Stimulate debating and peer assessment	0,199	0,457	0,290	-0,061	0,516

The first factor explains the 40% of the variance, then this is the most important component of student's *digital maturity*. As shown in Table 4, this digital maturity component is made of 10 variables, and it describes students' perception of their higher educational experience (teaching and more). For this reason, the factor has been called *Digital Tuning*. This component includes the following dimensions: Teaching materials are appealing; Technology and learning portals (e.g. Moodle, Learning Management System) are effectively used; *Lessons catch my attention and stimulate my curiosity; ICT Tools and platforms are intuitively used; Lessons are available to students remotely on the internet; I'm overall satisfied with my choice to study at this University; Teaching materials are not too difficult to understand; Matches my learning expectations; Is enjoyable; Teachers are engaged in the teaching process*, thus indicating, in the student's perception, that they can move within a user-friendly learning context, able to support their learning activities by making their experiences more efficient and effective.

Although the other four components explain overall half of the first component variance, then are less relevant than digital tuning for digital maturity, they account for relevant aspect in term of its quality. The second factor explains the 8% of the entire variability of data. The second factor explains the 8% of the entire variability of data, then it is less relevant than digital tuning in explaining digital maturity although it highlights a different element involved in it: *Teaching innovativeness*. In fact, it is made of 10 variables (Tab. 4), which account mostly for tools and methods of the training process. It describes methods and tools, mainly digital, adopted by teachers.

The third factor explains 5% of the variance and is made of 7 variables (Tab. 4), highlighting the relevance of *soft skills* in the students' perception, in order to the capability of the university case studies considered to promote their improvement. Or this reason, it is called *Soft skills*, then, it catches the capacity of the University to teach soft skills to students.

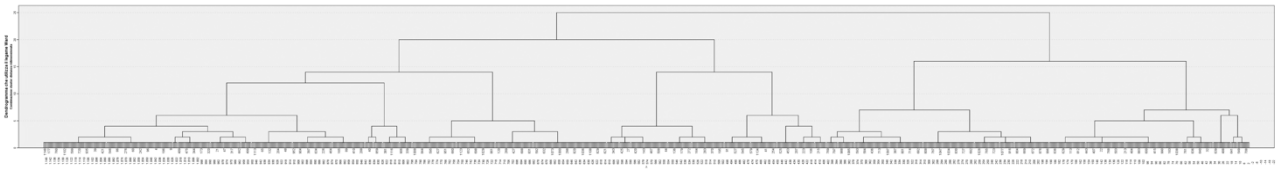
The fourth factor explains the 4% of total variability and it is made of 7 variables. It describes the perception of students to be enrolled in the job market after their studies, so it has been called *Employability.*

The last factor, namely *Positive relationships*, explains the 3% of total variability since it is made of 2 variables: students are respectful towards peers, and they are being at ease with peers. Then, it catches the students' trustful positive sentiment of being in relations with others.

RQ3 - How involved students can be classified?

To address RQ3 factors have been used to classify students by means of cluster analysis. Cluster analysis (Azzalini, Scarpa, 2009) helps in highlighting groups of units that are meant to be similar to each other with respect to some criteria. After having explored by a dendrogram the proper number of clusters, the k-means analysis has been carried out.

Fig. 7 - Dendrogram



Seven clusters have been selected to classify the students' digital maturity concerning their perception of the digitalization processes activated by universities they attended. Their interpretation can be done by observing means of cluster centroids (Tab. 15) that help in providing a name for each cluster.

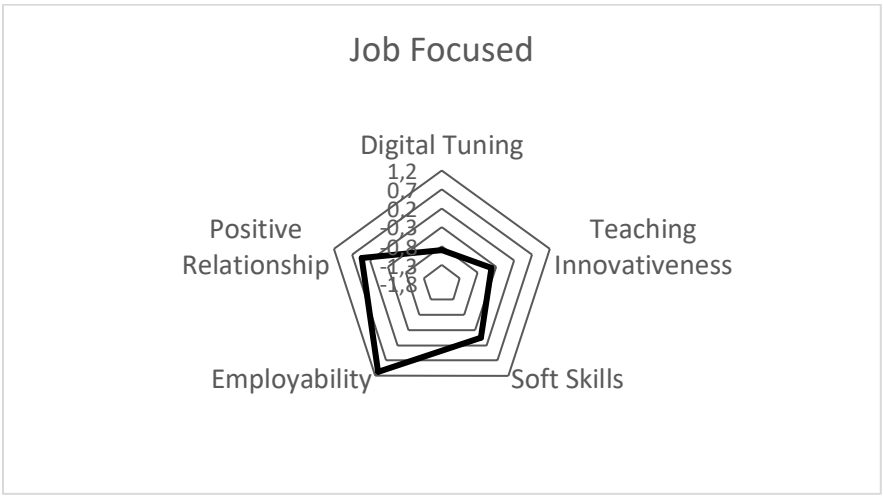
Tab. 16 - Cluster centroids

Component	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6	Cluster 7
	Job focused	Task Oriented	Analogically Tuned	Self-realization Focused	Teacher Centered	Lone Rider	Social
Digital Tuning	-0,90	-0,10	-1,05	0,70	-0,60	0,70	0,12
Teaching Innovativeness	-0,42	0,28	-1,39	0,52	0,94	-0,71	-0,56
Soft Skills	-0,05	-1,75	-1,05	0,04	0,32	0,17	0,70
Employability	1,07	-0,56	-0,39	0,40	-0,20	0,23	-0,92
Positive Relationship	0,43	0,23	-0,91	0,38	-0,75	-1,42	0,64

Looking at the following radar charts, we can appreciate the difference among clusters with respect to latent factors extracted.

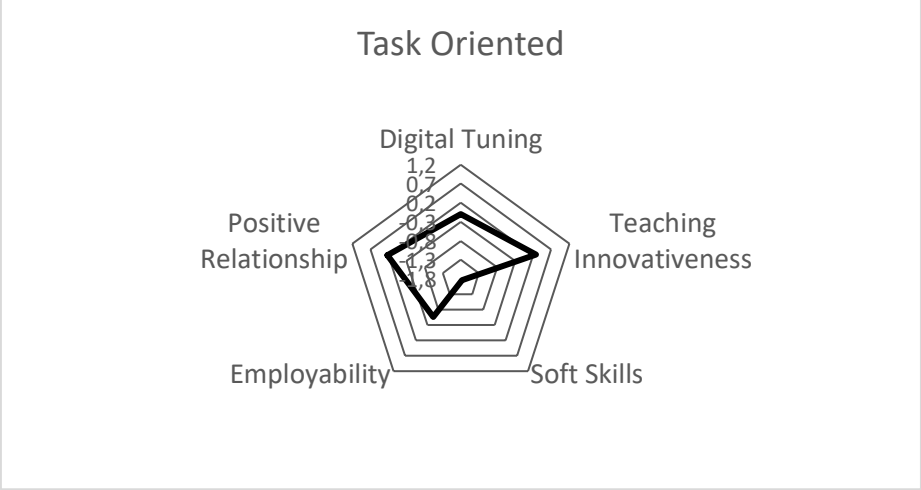
- *Job focused:* is a group of 162 students representing 14.1% of the total sample. They are focused mostly on *employability* and seem to be less interested in digital.

Fig. 8 - Radar chart of Job focused students



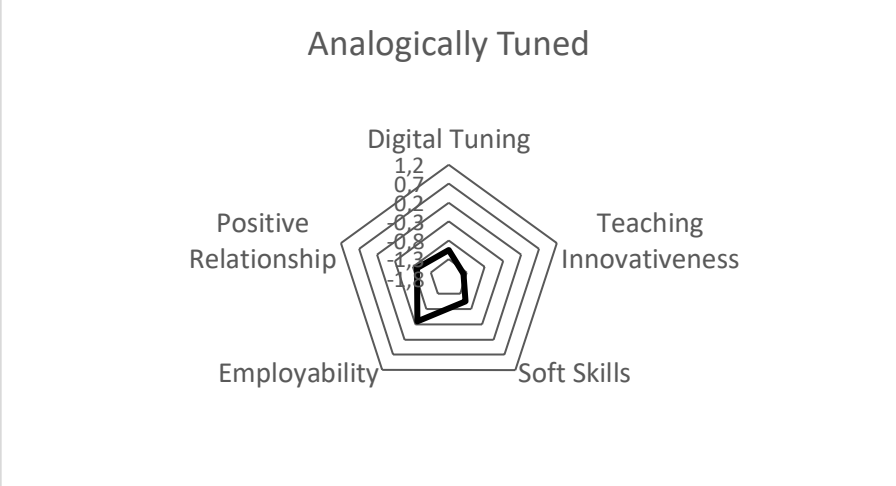
- *Task-oriented*: is a group of 102 students representing 8.9% of the entire sample. They are interested in average to all the digital factors but the *soft skills*. They seem to be practical and effective not really caring about the issue of professionalization and transversal skills.

Fig. 9 - Radar chart of Task-oriented students



- *Analogically Tuned*: is a small group of 56 students (4.9%) interested in none of the digital factors but the employability. They seem to be more tuned to face-to-face training than digital one.

Fig. 10 - Radar chart of Cosmic Pessimist students

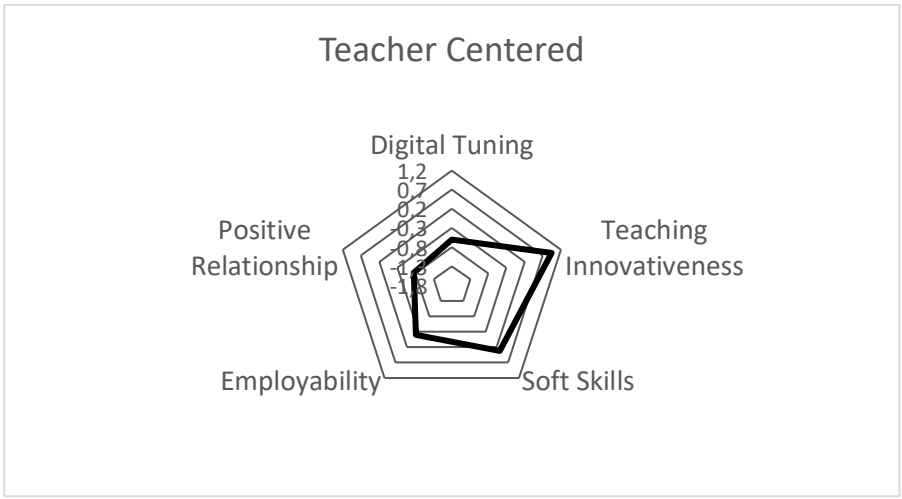


- *Self-realization Focused*: is the largest group of students (307 representing 26.7%) interested in all the aspects highlighted by latent factors, and they are definitely *digitally tuned*. Since the latent factors identified are unobserved variables that we believe to be the main constructs of digital maturity, respondents with high values of these elements are more interested in digital practices in teaching and, perhaps, more aware, therefore more digitally mature.

Fig. 11 - Radar chart of Self-realization Focused students

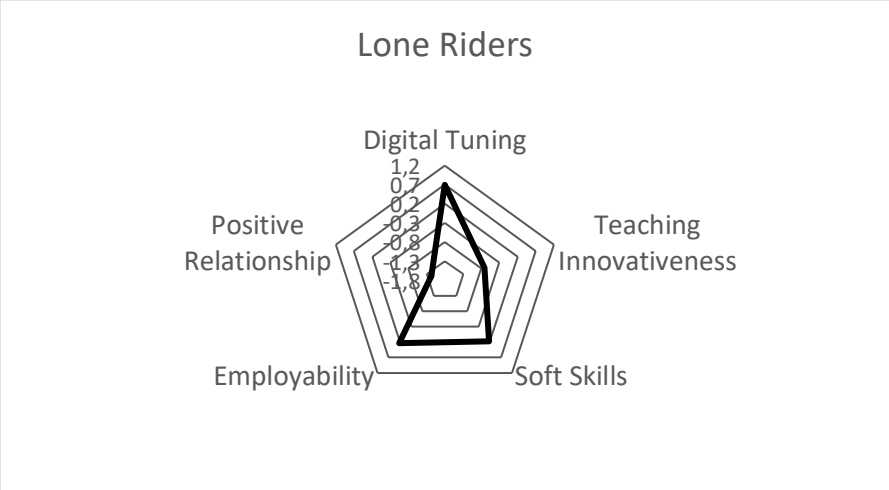
- *Teacher Cantered*: is made of 179 students (15.6%). It does not care about peer's relationship but focuses mostly on *teaching innovativeness* rather than being *digitally tuned.*

Fig. 12 - Radar chart of Teacher centred students



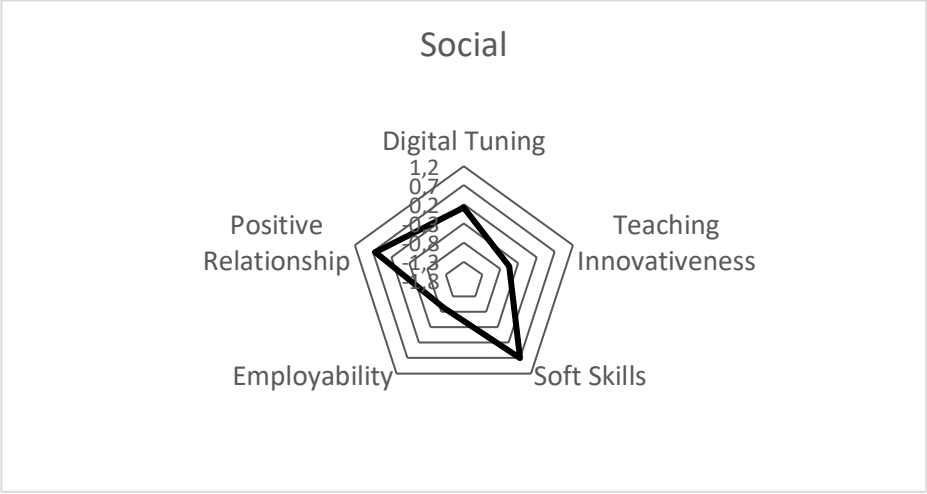
- *Lone Riders:* is a group of 117 students (10.2%), and It is the reverse of teacher oriented one. Both groups don't focus on peer's relationships, but these students are highly *digitally tuned* and don't care about *teacher innovativeness*. They seem like a group with great autonomy in moving within the learning context in which it is inserted.

Fig. 13 - Radar chart of Lone Riders



- *Social:* it is a large group of 225 students (19.6%) mostly interested in the relational activities surrounding education. They are cantered on *soft-skills* and *positive relationship,* and they do not really focus on employability and care less about *teacher innovativeness*.

Fig. 14 - Radar chart of Social



RQ4 - Are latent factors of digital maturity, on average, really different among Universities?

To address RQ4 the analysis of variance, henceforth ANOVA has been carried out. ANOVA is an inferential method for comparing the means of several groups. The test analyzes whether the difference observed among sample means is still reasonable true in the populations. ANOVA compares two types of the variability of the data: the variability between groups and the variability within groups.

The larger the variability between groups relative to the variability within groups the larger the value of the statistic test used to carry out the conclusion. Farther distance between variabilities means data support the hypothesis the means are statistically different.

Here, we use the multivariate technique to address the difference of the average of latent components is not due to the causality but to a given reason, such as the university affiliation.

Among several assumptions to properly carry out ANOVA is that the level of variance of a given variable is constant across groups. The following table shows the value of the statistic test for each latent component and the related p-value. Since p-values are not statistically significant (given a level of significance equals 0.01), then we can accept the homogeneity assumption.

Tab. 17 - Homoscedasticity test result

Variance homogeneity tests				
	Statistica di Levene	**df1**	**df2**	**Sig.**
Digital Tuning	1,568	5	1142	0,166
Teaching Innovativeness	1,792	5	1142	0,112
Soft Skills	2,81	5	1142	0,016
Employability	0,787	5	1142	0,559
Positive Relationship	2,408	5	1142	0,035

Due to the result gained in Table 6, we can proceed with the analysis. By comparing, component by component, the variability between groups and within groups, we can conclude that the average perception of students about the University is different in the latent components that activate it" is different in the latent components (test is statistically significant -Table 17).

Tab. 18 - AOVA result

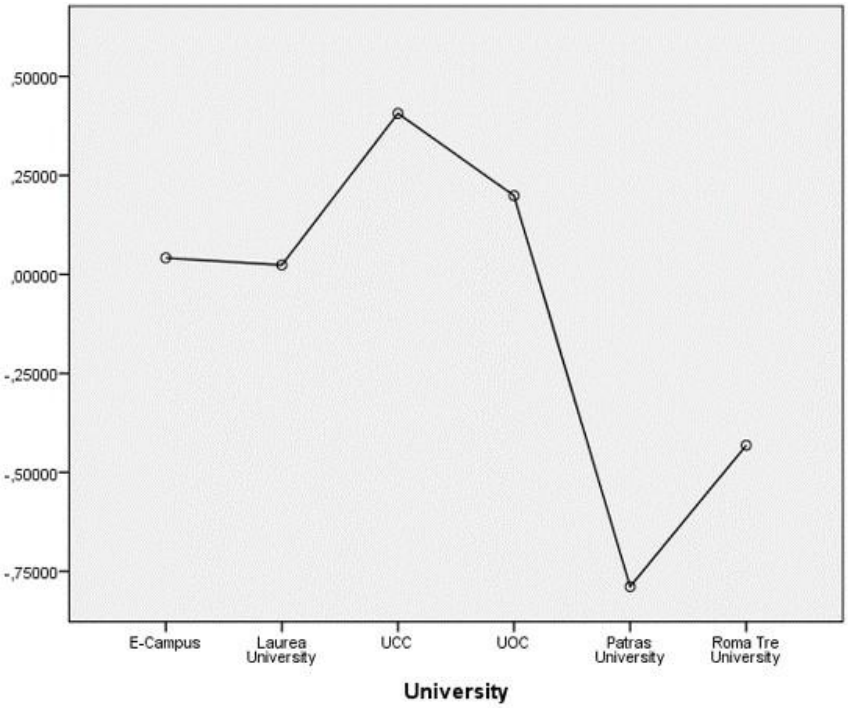
ANOVA univariate						
		sum of squares	df	squared average	F	Sig.
Digital Tuning	between groups	128,516	5	25,703	28,82	0,000
	within group	1018,484	1142	0,892		
	Total	1147	1147			
Teaching Innovativeness	between groups	99,251	5	19,85	21,636	0,000
	within group	1047,749	1142	0,917		
	Total	1147	1147			
Soft Skills	between groups	95,293	5	19,059	20,695	0,000
	within group	1051,707	1142	0,921		
	Total	1147	1147			
Employability	between groups	166,501	5	33,3	38,785	0,000
	within group	980,499	1142	0,859		
	Total	1147	1147			
Positive Relationship	between groups	276,672	5	55,334	72,607	0,000

	within group	870,328	1142	0,762		
	Total	1147	1147			

To better appreciate the difference among latent components average values across universities, the following graphs plotting means of latent components by universities. These, joint with results displayed in Appendix 3, help in highlighting the comparison among universities.

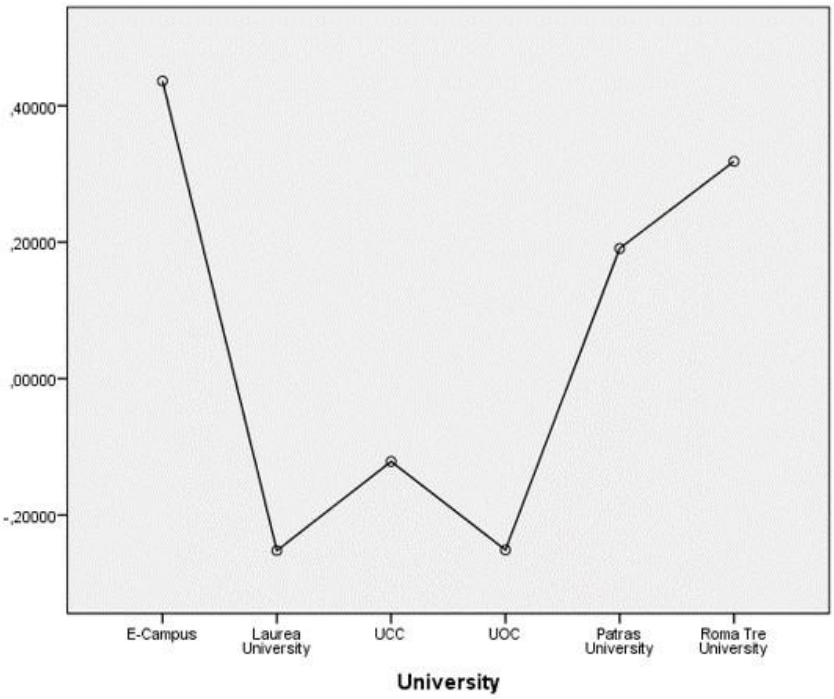
Digital Tuning seems to have a trend similar to digital maturity (Figure 15). The most tuned students are those from Spain and Ireland, two universities with a long experience in digital training, two countries with a good position in DESI, followed by an Italian digital university (E-campus) and the Finnish one. The traditional university's Italian students (Roma Tre University) among these respondents appear less *digitally tuned*, being however significantly more tuned than the Greeks. Based on these data we can say that *digital tuning* seems to be related to their familiarity with the digital higher education environment. In other words, contexts characterized by a more generalized and widespread digital culture, and organizational contexts later in the activation of digitization processes in the transformation of the HE allows us to glimpse a positive correlation with the ability to create user-friendly contexts, or at least perceived as such by students.

Fig. 15 - Digital tuning vs Universities



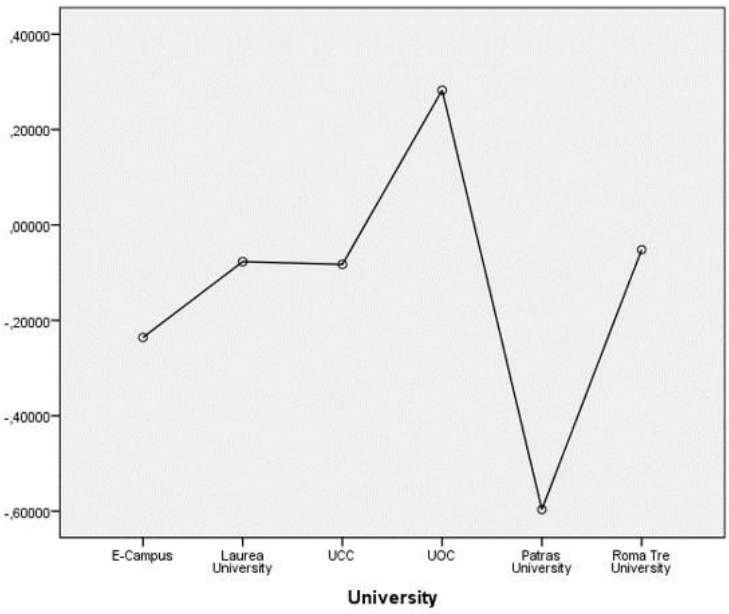
With regard to innovative teaching, as can be seen from the graph (Figure 16), two elements intervene: the level of digital maturity of the country and the disciplinary area of the students. Indeed, students of the Italian and Greek universities seem to be more positive about teaching innovation than Finnish, Irish and Spanish. Probably, in countries with a higher DESI, students are more critical in order to digital teaching and learning scaffolding and context offered by the university case studies. Conversely, students from countries still developing their digital structures and practices seem to take into account the universities' efforts in addressing the digitalization processes of their organization. However, Greek students are less positive than Italians even though they are less critical than the Spanish, Finnish and Irish. It can be assumed that this is due to the type of training of these students, often coming from faculties of natural sciences such as engineering, who have greater competences and familiarity with digital processes.

Fig. 16 - Innovative teaching vs Universities



Finnish and Irish students consider soft skills more important than Italians (Figure 17) of E-campus. These students consider soft skills less important; moreover, Greeks consider soft skills completely irrelevant. Attention to soft skills seems to be connected with the type of student interviewed. Students enrolled in faculties of natural sciences, like Greeks, seem to have less attention to this type of skill. Humanities students tend to pay more attention to this aspect.

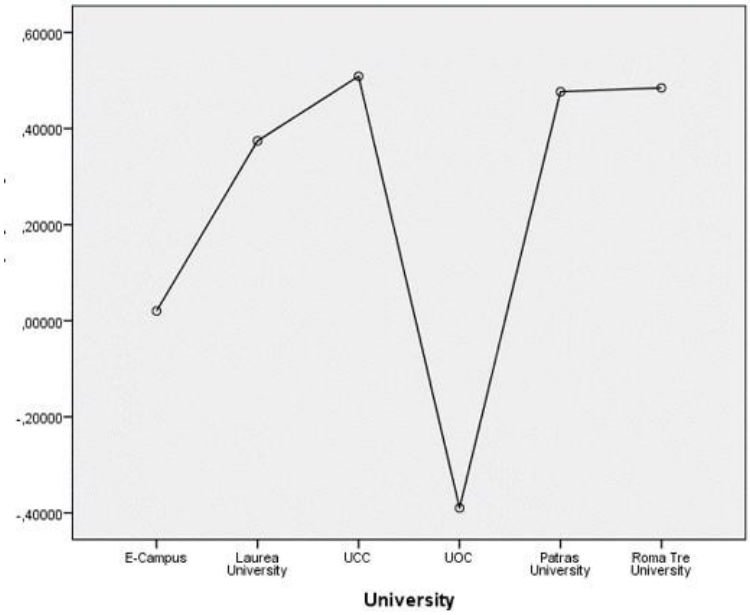
Fig. 17 - Soft skills vs Universities



This factor makes the difference between digital and traditional universities (Figure 17). The graph highlights how Irish Greek and Roma Tre students are most interested in using university education to enter the world of work, while E-Campus and Finnish students seem to be interested in career opportunities. Digital universities probably do it because they already have a job, while those who choose traditional universities follow a classic path that takes people from high school to university, and subsequently enter the job market.

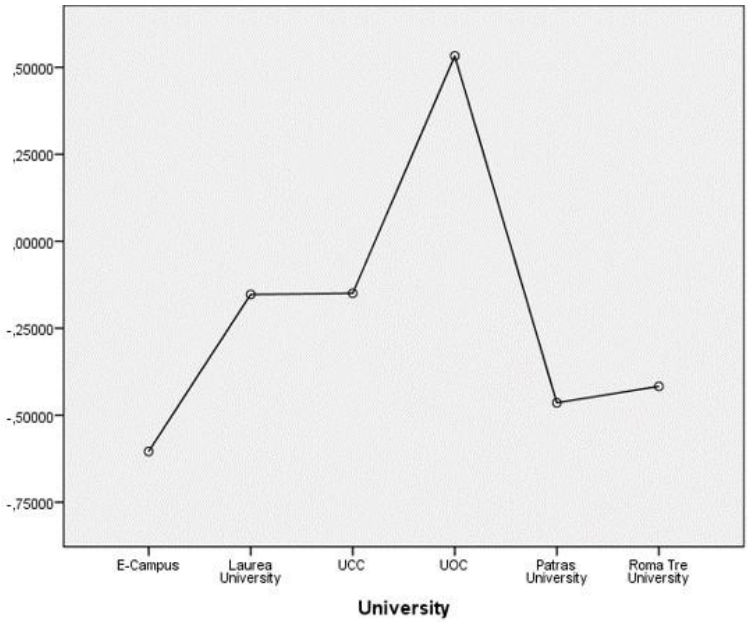
Between the two digital universities, the Spanish one seems to have students less interested in the possibility of entering in the job market. This is probably because Spanish students are already working and chose the digital university to fit their education and their working life. While E-Campus has a younger target that not necessarily is already working.

Fig. 18 - Employability vs Universities



Spanish, Irish, and Finnish students are the most caring in their relationship with peers, even if Spanish students stand out from all the others by showing greater sensitivity to this aspect (Figure 19). Italians and Greeks seem to show less interest in this aspect. One possible explanation could be that these students take this for granted, just as Spanish students showed less interest in job placement in their questionnaire responses because they are probably working students.

Fig. 19 - Positive relations vs Universities



To conclude the comparative report, we provide a synthesis of the main results.

- It seems that the best practice come from Spain; the other Universities, even though traditional or online, are not different to each other, but the Patras seems to be far from the topic considered in the analysis.
- There are at least 5 latent factors underlying the questionnaire. They concern with many aspects of students' experience.
- Students can be classified in 7 clusters.
- Components underlying the concept of digital maturity are, in average, different across Universities.

Conclusions

Conclusions present the main relevant results and the emerging key elements of the case studies in terms of a SWOT ANALYSIS.

The main highlighted strengths are the following.

For the Finnish research team (LAUREA):

- About professional development of the staff:
  - Co-creative processes integrating staff, students and workplaces,
  - Good availability of digital tools,
  - Good availability of internal training (D-unit),
  - Dedicated technical support for the teachers (D-unit),
  - Strong quality assurance system,
  - Strong sharing culture for the best practices,
  - Increased working flexibility,
  - Increased learning flexibility,
  - Integration of RDI-projects and teaching is easier due virtualized meeting possibilities,
  - Monetary and time resourcing,
  - Good LMS (Canvas),
  - Competency,
  - Vision.
- About learning processes for students:
  - Good and nice teachers,
  - Online studies,
  - Flexibility of studies,
  - Good reputation,
  - Caring staff.

For the Greek research team, the main strengths of UPAT according to its' students are the curriculums that students can follow, the quality of the professors, the cooperation between students among themselves and between teaching staff, the quality of laboratories and the access to the resources. Curriculum and professors are the main strengths of UP according to its students. Their experience of UP is positive and they believe that UP provides them all the necessary knowledge to find a job or continue their studies with Erasmus.

For the Irish research team (UCC), strength of great working relationships between the various units of the university concerned with digital technologies and digital teaching and learning – speed of key decisions, collaborations – build on in future.

For the Italian research team of ECAMPUS University, the main strengths are:

- the possibility to easily collect data to measure, i.e., students' learning progress, their degree of maturity, of involvement, etc.;

- the ability to offer students immediate feedback on their learning progress (i.e. thanks to automated feedback provided by the digital learning environment);
- lower barriers to communications between students, teachers and tutors (thanks to digital technologies, it is easier for students to reach out to teachers/tutors to clarify doubts and to receive guidance when needed);
- the possibility of tailoring the learning pathway to the characteristics of each student.

For the Italian research team of ROMA TRE University, the main strengths are:

- development of new competences;
- cohesion / support / help between colleagues' network / to succeed where the use of tools was not understandable or in any case university staff did not know each other;
- streamlining work;
- effectiveness / speed;
- inclusivity, especially workers and foreign students;
- easy availability of didactic supporting materials;
- finding new solutions to old problems.

For the Spanish research team, the full online UOC system has been a big advantage to face the Pandemic situation. UOC is also facing a new way of working to be: + digital, + open, + collaborative, + agile, + data-based, and + transdisciplinary.

- HE institutions have to be continuously updated in a changing digital world. To allow staff and students to be continuously updated, DT should allow global, efficient and versatile access. To ensure the updating of digital competence, UOC offers a cross subject in Digital Competence for all the students, but the UOC staff use self-training, use self-training as a way to be updated.
- Students evaluate positively the collaborative perspective of the teaching learning process, the innovative activities, the close and quick communication with the rest of university stakeholders and the opportunity to meet significant people for their life and profession.
- Flexibility is the most important factor motivating students to study online: geographic flexibility and also with their professional and family commitments.

The main highlighted weaknesses are the following.

For the Finnish research team (LAUREA), the main weaknesses are:

- about professional development of the staff:
  - lack of time resources,
  - lack of teaching competency in digital environment,
  - lack of the time for self-development,
  - creative work is not valued,
  - balance between virtual, blended and classroom teaching is unclear,
  - resistance for change,
  - some students lack self-management skills,
  - increased need for leadership, guidance and support,
  - increased cognitive load,

  - unclear difference between work time and free time,
  - no possibility to specialize,
  - incompetent teachers,
  - communication issues,
  - outdated course material,
  - variance in course quality,
  - internationalization.
- About learning processes for students, some weaknesses are:
  - incompetent teachers,
  - communication issues,
  - outdated course material,
  - variance in course quality,
  - internationalization.

For the Greek research team of UPAT, the main weaknesses are:

- there are acts that encourage digital transformation in HE, but there are not specific guidelines and a concise framework that HE should follow.
- A solid framework and guidelines should be formed, and both should be harmonized with E.U. general guidelines in order to have a smooth cooperation with other institutions not only in national but an international level, especially with HEI in the E.U.
- The vision for establishing ICT culture is to make the best out every available legal technology in both teaching and administrative levels.
- There is not a major change in organizational level, but interviewees believe that in the future will be for sure.
- Drawbacks of course exist and they are many, but as the technology and the new way of teaching become familiar, a lot of them are overcome.
- A need for fast internet services, the need for extra funding and equipment (these two are connected) from the state and the need for hiring more personnel for teaching and tutoring.
- Professional development to a lot of teaching and administrative staff does not come from self-training rather than seminars.
- Students find distance learning not such attractive as lessons in class. The majority of them prefer lessons in class and wants new teaching methods which use digital tools (for example gamification in teaching) and that is the major weakness of UP as a lot of students is not happy from teaching quality.
- The main weaknesses of Patras University, according to its' students, is the teaching quality and the lack of sufficient facilities and equipment, teachers, the funding. Also, the structure of the curriculum and operation of the institution should be reorganized.

For the Irish research team (UCC), the main weaknesses are:

- UCC is a campus-based university and digital education is seen as a support for this, but there are no plans for it to change its fundamental identity as a campus-based university.
- Staff Digital Divide. The phrase 'digital innovation' in the introduction questions needed teasing out for the conversation to begin, pointing to a gap between the language of the digital landscape and the

teaching arena. It had to be explained in terms of 'moving online' for there to be a sense of what the questions were asking. It is such a broad area, and it highlighted the divide when the staff who participated in the focus groups were largely not from an ICT background. The language and the jargon of the digital conversation needed discussion and clarification showing the lack of discussion in this area that teaching staff from other disciplines engage in.

For the Italian research team of ECAMPUS University, the main weaknesses are:

- lack of personal interactions, which translate into low quality of interaction;
- increase risk of cheating by students;
- "online education is often considered as a trivialised, simplified proposal, not at the same level as traditional didactics";
- need to find new and effective ways to engage and keep students motivated.

For the Italian research team of ROMA TRE University, the main weaknesses are:

- the risk of self-reference;
- lack of training (absent and sometimes not useful training);
- often redundant and not homogenous communication;
- redundancy of the means of communication / same communications given differently;
- on various platforms and not homogeneous;
- lack of guidance and reference points;
- lack of tutor as internal figures who helped and directed the students, lack of a face to face which generates alarms on someone;
- age gap;
- in using ICTS;
- new tools in old methods.

For the Spanish research team of UOC, on the other hand, some improvements can be faced by the university, such as inviting guest speakers, clarifying better the university organization/structure and the engaging of teachers in the teaching process.

The main highlighted opportunities are the following.

For the Finnish research team (LAUREA), the main opportunities are:

- About staff development:
  - Participation to Digivisio 2030 project,
  - Possibilities for automation,
  - Better courses and better student satisfaction,
  - Expanding study offering to international level,
  - Resilient learning,
  - Constant small improvements,
  - Curiosity,
  - Level up the quality of the education which could attract better students.
- About learning process of students:
  - Collaboration with companies,

- Digitalization of teaching,
- Online studies,
- Internships,
- Diversity of studies.

For the Greek research team (UPAT), the main opportunities are:

- The significant change took place during the pandemic years to fully online: interviewees mark current tools such as eclass, progress, meeting platforms and all agree that the pandemic was an opportunity for digital transformation of teaching.
- Technological tools are very helpful in both teaching and administrational procedures but can only play a complementary role in teaching activities. They should not replace human interaction which is the base of any educational system. Students should come into direct contact with their tutors and with one another. Socialization of students is as important as the accumulation of knowledge.
- The main opportunities of UPAT, according to students studying in UPAT, will lead them to find a job more easily, the Erasmus programs and the opportunity to work abroad and that they will make connections with the market and meet significant people.

For the Irish research team (UCC), the main opportunities are:

- Desire for developing online teaching knowledge and skills. Only one or two of the teaching participants had designed online courses previous to the pandemic and so the discussion largely focused on the changes in practice in the last 12+months. This was also highlighted in the need to explore the terms used in the discussions between participants. For example, synchronous and asynchronous teaching was new to some and the focus groups themselves became peer learning experiences for the participants as they provided discussion space for those who are more experienced in online instructional design to share their expertise with those new to the digital teaching landscape. Due to this mix of experience and choice to develop your teaching practice to include online teaching, the experiences of teaching online due to the pandemic were varied. Some found it exciting as they found that 'it had reignited their interest in adult education' and yet there was also recognition of the extra workload in designing and preparing resources for online teaching.

For the Italian research team of ECAMPUS University, the main opportunities are:

- "Dissemination of digital literacy, because all our students, since they enrolled in an online university, are forced into minimal digital literacy",
- *digital technologies make it possible to improve the level of inclusiveness of higher education*, making access to higher education easier for categories of students (people with disabilities, workers, elderly people, etc.) who would not otherwise have been able to complete their studies,
- "Possibility of reaching the territory in a widespread manner to provide training".

For the Italian research team of ROMA TRE University, the main opportunities are:

- smart working and smart teaching,
- push to work more in sharing,
- using shared workspaces makes, in some cases, the work faster,
- flexibility,

- it could increase number of enrolments and of final graduates,
- "social attitude" to digital opportunities,
- "social network attitude" to digital opportunities,

For the Spanish research team (UOC), the main opportunities are:

- Digital innovation is a vehicle for improvement, not an objective in itself. Therefore, universities should use technology to improve teaching, research and sharing knowledge.
- There are significant differences between the groups of staff when analyzing DI in the institution: teachers and researchers are the most critical with how DI impacts the institution and in their own responsibilities; tutor and collaborative teachers are satisfied with their possibilities of developing innovative proposals and the support of teachers and the rest of the team; administrative staff has a practical vision of DT use: take advantage of DT possibilities to facilitate/improve the teaching-learning, communication and management processes.

The main highlighted threats are the following.

For the Finnish research team (LAUREA), the main threats are:

- about staff:
  - New tools are not utilized best possible way due lack of competency,
  - Student dropouts,
  - Teachers lose their motivation due lack of time resources,
  - The ratio on innovation goes down due lack of time resources,
  - Teacher burnout,
  - The personnel are not able to adapt digital transformation;
- about students:
  - Low teaching quality,
  - Competition,
  - Not able to develop,
  - Lack of socialization,
  - COVID-19.

For the Greek research team (UPAT), the main threats are:

- according to its' students, the amount of work that they were called to carry on during semesters which leads them to health strain problems and fatigue.
- The difficulty of courses, a threat connected with the previous one. Some students believe that the existence of universities with similar fields of education are a threat for UPAT. The explanation for this maybe the fear of the competitive environment when they are going to look for a job.
- Major threat at their opinion is fatigue during the semester.

For the Italian research team of ECAMPUS University, the main threats are:

- "become attractive not only for the type of students who could not have finished their studies in any other way",
- some students still have a low or insufficient level of digital literacy,

- keeping alive the role of the university as a place for cultural debate and discussion and growth among all the players involved, even in the digital space,
- effectively training teachers to enable them to take full advantage of the potential of digital technologies.

For the Italian research team of ROMA TRE University, the main threats are:

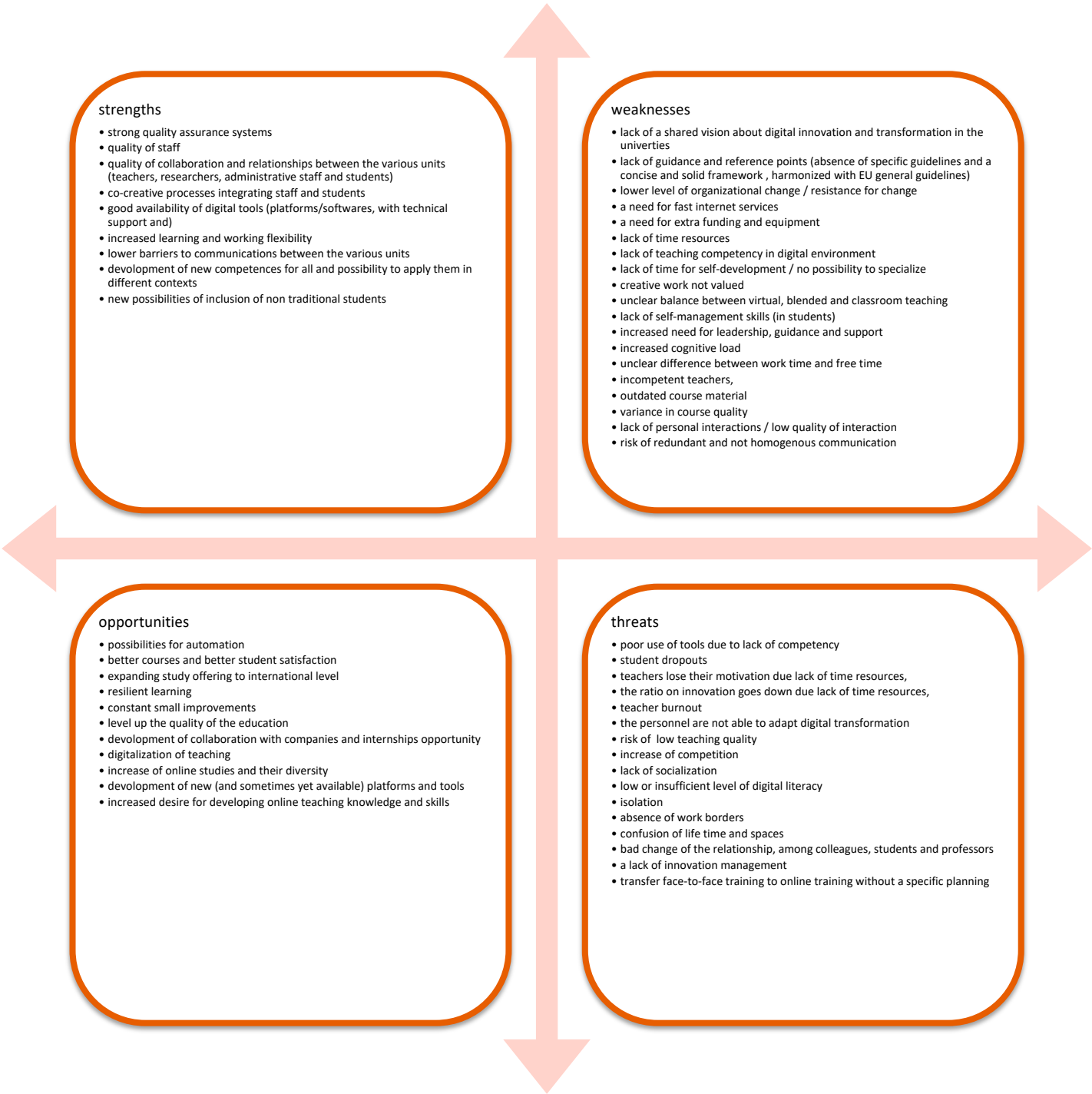
- isolation,
- absence of work borders,
- confusion of lifetime and spaces,
- bad change of the relationship, among colleagues, students and professors.

For the Spanish research team (UOC), the main threats are:

- training online is not transferring the face-to-face system to the virtual world.
- Traditional universities should face a deep evolution to achieve the integration of online learning in their structure.
- Digital transformation boosts universities to evolve towards an HE assuming the principles of blended learning. Therefore, all teachers should reflect on which part of their teaching should be face-to-face and which should not.
- The institutions should be prepared to receive innovative proposals. They need effective innovation management channels to be awake to their generation from anyone and quickly close the innovation circle. Therefore, the key is to transform the organizational dynamics to a learning organizations model.
- HE institutions have to be continuously updated in a changing digital world. To allow staff and students to be continuously updated, DT should allow global, efficient and versatile access. To ensure the updating of digital competence, UOC offers a cross subject in Digital Competence for all the students, but the UOC staff use self-training as a way to be updated.

In the last figure, a transversal conclusive SWOT analysis is presented.

Fig. 20 - A SWOT analysis

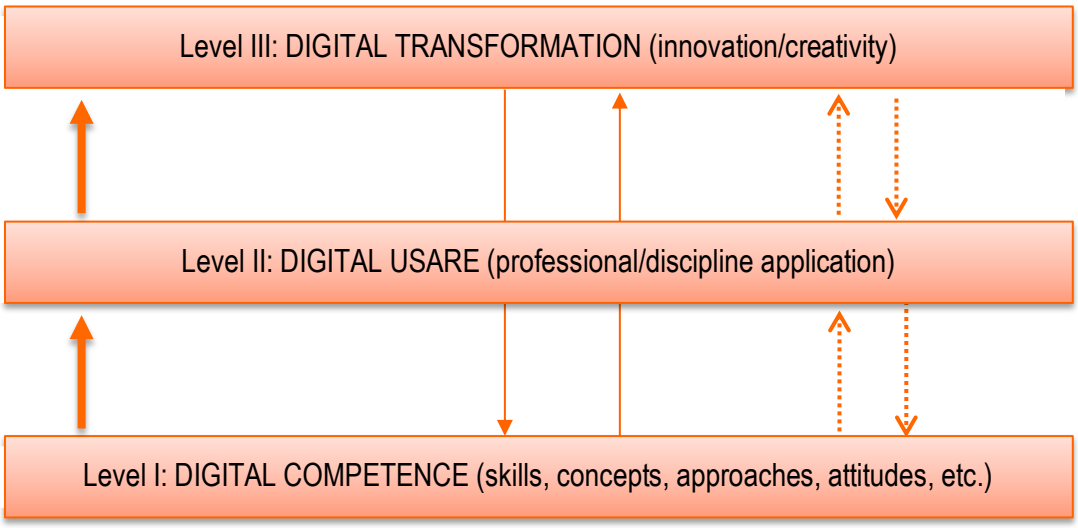


Although the existence of different definitions and concepts of digital literacy (Hall et al., 2013; Bawden, 2008; Lankshear & Knobel, 2008), it is possible to identify two main trends, according to Bawden (2008): on the one

hand, those who defend the mastery of ideas, which presupposes a careful and contextualised process of evaluation, analysis and synthesis of information; on the other hand, those who understand digital literacy as a list of specific skills and techniques that are necessary for the efficient use of digital technologies. From the point of view of this author, digital literacy involves mastering ideas, not keystrokes (Reis Monteiro, Leite, 2021).

The concept of digital literacies, which outcome from the main results of the case studies, includes the three levels mentioned by Martin and Grudziecki (2006): digital competence, professional/discipline application and innovation/creativity (Fig. 21).

Fig. 21 - Levels of digital literacy



According to these authors, Level 1, “digital competence” is a prerequisite for digital literacy and involves everything from simple skills, such as using a keyboard, to more critical, evaluative and conceptual approaches, including attitudes and awareness about their own learning, about themselves as learners, and about their relationship with peers, as well as about the role of the digital in order to live in society. Level 2, “digital use”, pertains to the application of digital skills in a professional context or in a specific knowledge domain. Level 3, “digital transformation”, is achieved when the use that is made of digital technologies provides innovation and creativity and stimulates significant changes in the professional field or in a conceptual domain (Reis Monteiro, Leite, 2021).

Annexs

Appendix 1 - Redundant items list

1. Professors foster students' cooperation through team, pair or class group activities
2. Professors ask the students to assess the work of their peers
3. Professors use lab experiments, simulations, field work, role-play and field trips to connect lectures' content to real-life situations
4. Professors ascertain the students' prior knowledge and beliefs to construct their teaching
5. Professors seek to surprise their students to get their interest and keep their attention
6. Professors invite professors from other disciplines or guest speakers to come and participate in their classes
7. Lessons are available to students remotely on the Internet
8. Professors use conceptual maps to help students to create a representation of concepts and the relationships that connect them
9. Professors use the university learning portal (e.g., Moodle Learning Management System)
10. Professors use visual resources, digital resources and tools to foster students learning
11. Professors use game elements (gamification) or educational games in their classes
12. Professors foster discussions in class-time after students have gained first exposure to learning contents at home
13. Students are asked to rate their own competency development based on a pre-determined scale (rubric)
14. Students respond in writing/drawing/verbally to prompts reflecting on their competency development
15. Students carry out simulations and / or practical tests (case studies, activities in or out of the classroom, etc.)
16. Students take traditional tests to verify knowledge (written tests, multiple choice tests, etc.)
17. My gender is: F, M, other
18. My age is: _____
19. My degree program is: bachelor's degree master's degree
20. My attending year is: 1, 2, (3)
21. I'm in progress with the exams YES NO
22. My school degree score was: _____(to be harmonized after)
23. My average score at exams is: _____(to be harmonized after)
24. Based on my experience, I perceive my professors:

- as understanding
- as respectful toward me
- as available (e.g., provide feedback on assignments and I can easily email or visit)

- as engaged in the teaching process
- as digitally competent

25. Based on my experience, I perceive as clear:
- the faculty organization
- faculty information
- the instructions for use of technology
- the instructions for assignments

26. Based on my experience, I perceive students:
- as respectful of one another
- as cooperative with one another
- as comfortable with one another
- as good in communication among them
- as at their ease with technology

27. Based on my experience, I perceive administrative staff:
- able to provide dependable information
- good in technical supporting

28. Based on my experience, I perceive teaching staff:
- as willing
- as empathic
- as prompt to provide detailed feedback
- as digital competent

29. Based on my learning experience at this University, I believe that:
- most of the lectures' contents are appealing and interesting to me
- most of the lectures' contents are presented in an interesting and appealing way to me
- most of the lectures stimulate my curiosity
- the connections among different lectures' materials and topics are clear to me
- the usefulness of most of the lectures' contents is clear to me
- usually, when I first look at lectures' programmes, I have the impression that they would be easy for me
- most of the times, teaching materials are less difficult to understand than I would expect for it to be
- most of the times, the wording of feedback after the exercises, or of other comments during lectures, help me feel rewarded for my effort
- I really enjoyed studying

30. I believe this University:
- has a good reputation

- is attractive
- is adequate for studying
- uses technology effectively

31. I believe that studying at this University:

- will help me in acquiring job or career-related knowledge and skills
- will help me in writing clearly, accurately, and effectively
- will help me in thinking critically and/or analytically
- will help me in learning effectively on my own, so I can identify, research, and complete a given task
- will help me in working effectively with other individuals

Appendix 2 - Final questionnaire for students

Dear student,

The ECOLHE project, funded by the European Commission under the Erasmus+ Programme, has among its goals to analyze student's perception regarding the ability of their University to **integrate digital technologies to support teaching/learning activities**. To gather this knowledge, we kindly ask you to fill in a brief questionnaire, which will take approximately 10 minutes to complete. All data will be collected anonymously, in accordance with the EU General Data Protection Regulation (GDPR) No. 679/2016 and will be processed in aggregate form.

Many thanks for your collaboration!

Teaching /Learning process					
In this part of the questionnaire, we measure your perception about the innovation in teaching methodologies, learning approaches, tools and resources in learning activities and assessment methods					
	Strongly disagree	Disa-gree	Neutral or uncertain	Agree	Strongly Agree
To foster students' learning, in the classes, the teachers					
Use game elements or educational games					
Use visual or digital resources and tools					
Use conceptual maps					
Use class group activities					
Use case studies					
Use lab experiments and simulations					
Stimulate debating and peer assessment					
Invite guest speakers					
Assess students' prior knowledge to orient personalised learning					
To assess the knowledge:					
Students take innovative tests (quiz, game, playing role, speech, etc.) during the classes					

Students' experience					
In this part of the questionnaire, we explore your perceptions and satisfaction about academic living					
	Strongly disagree	Disa-gree	Neutral or uncertain	Agree	Strongly Agree

Based on my experience, I believe that:					
Students are at their ease to each other					
Students are respectful towards each other					
Locations is functional to my needs of studying or staff contact					
The faculty organization/structure is clear to me					
Announcements from the administrative staff are clear					
The administrative staff is prompt to support students' needs					
Teaching staff is empathic					
Teaching staff provide the student support that I need					
Teachers are engaged in the teaching process					
Teachers are digitally competent					
Teaching materials are not too difficult to understand					
Teaching materials are appealing					
Lessons are available to students remotely on the internet					
Lessons catch my attention and stimulate my curiosity					
Technology and learning portals (e.g., Moodle, Learning Management System) are effectively used					
ICT Tools and platforms are intuitively used					
I'm overall satisfied with my choice to study at this University					

Students' learning outcome:					
In this part of the questionnaire, we explore your academic performance, skills and competences acquired in a given time frame and we measure your engagement					
	Strongly disagree	Disagree	Neutral or uncertain	Agree	Strongly Agree

I believe that studying at this University:					
matches my learning expectations					
is really enjoyable					
is developing my soft skills					
is giving me the opportunity to meet significant people for my life and my profession					
is giving me the oppotunity to find a job					
will impact on my good professional image/reputation					
will help me in acquiring job or career related knowledge and skills					
will help me develop my critical thinking					

Profiling					
Demographical and other information about the respondent					
I am	Male	Female	Other	I do not want to declare	
My age is	17-19	20-22	23-25	26 or more	
My school degree score is	(number)	over	(denote the max)		
My degree program is	Bachelor's degree	Master' degree			
My degree program is in the area of	All areas of mathematics, pure and applied, plus mathematical foundations of computer science, mathematical physics and statistics Particle, nuclear, plasma, atomic, molecular, gas, and optical physics Structure, electronic properties, fluids, nanosciences Analytical chemistry, chemical theory, physical chemistry/chemical physics Materials synthesis, structure-properties relations, functional and advanced materials, molecular architecture, organic chemistry Informatics and information systems, computer science, scientific computing, intelligent systems Electronic, communication, optical and systems engineering Product design, process design and control, construction methods, civil engineering, energy systems, material engineering Astro-physics/chemistry/biology; solar system; stellar, galactic and extragalactic astronomy, planetary systems, cosmology, space science, instrumentation				

	Physical geography, geology, geophysics, meteorology, oceanography, climatology, ecology, global environmental change, biogeochemical cycles, natural resources management Economics, finance and management Sociology, social anthropology, political science, law, communication, social studies of science and technology Environmental studies, demography, social geography, urban and regional studies Cognition, psychology, linguistics, philosophy and education Literature, visual and performing arts, music, cultural and comparative studies Archaeology, history and memory Molecular biology, biochemistry, biophysics, structural biology, biochemistry of signal transduction Genetics, population genetics, molecular genetics, genomics, transcriptomics, proteomics, metabolomics, bioinformatics, computational biology, biostatistics, biological modelling and simulation, systems biology, genetic epidemiology Cell biology, cell physiology, signal transduction, organogenesis, developmental genetics, pattern formation in plants and animals Organ physiology, pathophysiology, endocrinology, metabolism, ageing, regeneration, tumorigenesis, cardiovascular disease, metabolic syndrome Neurobiology, neuroanatomy, neurophysiology, neurochemistry, neuropharmacology, neuroimaging, systems neuroscience, neurological disorders, psychiatry Immunobiology, aetiology of immune disorders, microbiology, virology, parasitology, global and other infectious diseases, population dynamics of infectious diseases, veterinary medicine Aetiology, diagnosis and treatment of disease, public health, epidemiology, pharmacology, clinical medicine, regenerative medicine, medical ethics Evolution, ecology, animal behaviour, population biology, biodiversity, biogeography, marine biology, ecotoxicology, prokaryotic biology Agricultural, animal, fishery, forestry and food sciences; biotechnology, chemical biology, genetic engineering, synthetic biology, industrial biosciences; environmental biotechnology and remediation				
I am attending the	First year	Second Year	Third year *	Other	
My average score at the exams is	(number)	over	(denote the max)		
I'm in progress with the exams	Y	N			
I'm studying at	**name of University** (from a drop-down menu based on which result the customized section starts)				
SWOT ANALYSIS: Based on my experience, I believe that the	Weakness:	short open question			
	Strenghts:	short open question			
	Opportunities	short open question			

University where I study has the following	Threats	short open question	

Appendix 3 – ANOVA RESULTS

Multiple comparisons								
Dependent variable		**(I) University**	**(J) University**	**Difference between averages (I-J)**	**Standard error**	**Sig.**	**Confidence interval 95%**	
							Lower limit	Upper limit
Digital tuning	LSD	E-Campus	Laurea University	0,018104	0,114973	0,875	-0,20748	0,243686
			UCC	-,36491212*	0,122788	0,003	-0,60583	-0,124
			UOC	-,15718243*	0,075464	0,037	-0,30525	-0,00912
			Patras University	,83059230*	0,108092	0	0,61851	1,042674
			Roma Tre University	,47340685*	0,105183	0	0,267032	0,679781
		Laurea University	E-Campus	-0,0181	0,114973	0,875	-0,24369	0,207479
			UCC	-,38301585*	0,142962	0,007	-0,66351	-0,10252
			UOC	-0,17529	0,105148	0,096	-0,38159	0,031018
			Patras University	,81248857*	0,130557	0	0,55633	1,068647
			Roma Tre University	,45530312*	0,128159	0	0,203849	0,706757
		UCC	E-Campus	,36491212*	0,122788	0,003	0,123997	0,605827
			Laurea University	,38301585*	0,142962	0,007	0,102519	0,663513
			UOC	0,20773	0,11364	0,068	-0,01524	0,430696
			Patras University	1,19550443*	0,137489	0	0,925745	1,465263
			Roma Tre University	,83831897*	0,135214	0	0,573024	1,103614
		UOC	E-Campus	,15718243*	0,075464	0,037	0,009118	0,305246
			Laurea University	0,175286	0,105148	0,096	-0,03102	0,381591
			UCC	-0,20773	0,11364	0,068	-0,4307	0,015237
			Patras University	,98777474*	0,097576	0	0,796325	1,179224
			Roma Tre University	,63058929*	0,094344	0	0,445483	0,815696
		Patras University	E-Campus	-,83059230*	0,108092	0	-1,04267	-0,61851
			Laurea University	-,81248857*	0,130557	0	-1,06865	-0,55633
			UCC	-1,19550443*	0,137489	0	-1,46526	-0,92575
			UOC	-,98777474*	0,097576	0	-1,17922	-0,79633

			Roma Tre University	-,35718545*	0,122024	0,003	-0,5966	-0,11777
		Roma Tre University	E-Campus	-,47340685*	0,105183	0	-0,67978	-0,26703
			Laurea University	-,45530312*	0,128159	0	-0,70676	-0,20385
			UCC	-,83831897*	0,135214	0	-1,10361	-0,57302
			UOC	-,63058929*	0,094344	0	-0,8157	-0,44548
			Patras University	,35718545*	0,122024	0,003	0,117769	0,596602
Teaching Innovative-ness	LSD	E-Campus	Laurea University	,68856970*	0,116613	0	0,459769	0,91737
			UCC	,55793037*	0,124539	0	0,313579	0,802282
			UOC	,68758819*	0,076541	0	0,537412	0,837764
			Patras University	,24551518*	0,109634	0,025	0,030408	0,460623
			Roma Tre University	0,117899	0,106684	0,269	-0,09142	0,327218
		Laurea University	E-Campus	-,68856970*	0,116613	0	-0,91737	-0,45977
			UCC	-0,13064	0,145001	0,368	-0,41514	0,153859
			UOC	-0,00098	0,106648	0,993	-0,21023	0,208266
			Patras University	-,44305452*	0,13242	0,001	-0,70287	-0,18324
			Roma Tre University	-,57067048*	0,129987	0	-0,82571	-0,31563
		UCC	E-Campus	-,55793037*	0,124539	0	-0,80228	-0,31358
			Laurea University	0,130639	0,145001	0,368	-0,15386	0,415138
			UOC	0,129658	0,115261	0,261	-0,09649	0,355805
			Patras University	-,31241519*	0,13945	0,025	-0,58602	-0,03881
			Roma Tre University	-,44003115*	0,137143	0,001	-0,70911	-0,17095
		UOC	E-Campus	-,68758819*	0,076541	0	-0,83776	-0,53741
			Laurea University	0,000982	0,106648	0,993	-0,20827	0,210229
			UCC	-0,12966	0,115261	0,261	-0,35581	0,09649
			Patras University	-,44207301*	0,098968	0	-0,63625	-0,24789
			Roma Tre University	-,56968897*	0,09569	0	-0,75744	-0,38194
		Patras University	E-Campus	-,24551518*	0,109634	0,025	-0,46062	-0,03041
			Laurea University	,44305452*	0,13242	0,001	0,183242	0,702868

			UCC	,31241519*	0,13945	0,025	0,038808	0,586022
			UOC	,44207301*	0,098968	0	0,247893	0,636253
			Roma Tre University	-0,12762	0,123765	0,303	-0,37045	0,115216
		Roma Tre University	E-Campus	-0,1179	0,106684	0,269	-0,32722	0,091419
			Laurea University	,57067048*	0,129987	0	0,31563	0,825711
			UCC	,44003115*	0,137143	0,001	0,170951	0,709111
			UOC	,56968897*	0,09569	0	0,381942	0,757436
			Patras University	0,127616	0,123765	0,303	-0,11522	0,370448
Soft Skills	LSD	E-Campus	Laurea University	-0,15893	0,116833	0,174	-0,38816	0,070305
			UCC	-0,15333	0,124774	0,219	-0,39814	0,091483
			UOC	-,51834361*	0,076685	0	-0,6688	-0,36788
			Patras University	,36063921*	0,109841	0,001	0,145126	0,576153
			Roma Tre University	-0,18397	0,106885	0,085	-0,39369	0,025742
		Laurea University	E-Campus	0,158927	0,116833	0,174	-0,07031	0,388159
			UCC	0,005597	0,145275	0,969	-0,27944	0,290632
			UOC	-,35941676*	0,106849	0,001	-0,56906	-0,14977
			Patras University	,51956606*	0,132669	0	0,259263	0,779869
			Roma Tre University	-0,02504	0,130233	0,848	-0,28057	0,230477
		UCC	E-Campus	0,15333	0,124774	0,219	-0,09148	0,398143
			Laurea University	-0,0056	0,145275	0,969	-0,29063	0,279438
			UOC	-,36501391*	0,115479	0,002	-0,59159	-0,13844
			Patras University	,51396891*	0,139713	0	0,239845	0,788092
			Roma Tre University	-0,03064	0,137401	0,824	-0,30023	0,238945
		UOC	E-Campus	,51834361*	0,076685	0	0,367884	0,668803
			Laurea University	,35941676*	0,106849	0,001	0,149775	0,569059
			UCC	,36501391*	0,115479	0,002	0,13844	0,591588
			Patras University	,87898282*	0,099155	0	0,684436	1,07353
			Roma Tre University	,33437182*	0,09587	0,001	0,14627	0,522473
		Patras University	E-Campus	-,36063921*	0,109841	0,001	-0,57615	-0,14513

			Laurea University	-,51956606*	0,132669	0	-0,77987	-0,25926
			UCC	-,51396891*	0,139713	0	-0,78809	-0,23985
			UOC	-,87898282*	0,099155	0	-1,07353	-0,68444
			Roma Tre University	-,54461099*	0,123998	0	-0,7879	-0,30132
		Roma Tre University	E-Campus	0,183972	0,106885	0,085	-0,02574	0,393685
			Laurea University	0,025045	0,130233	0,848	-0,23048	0,280567
			UCC	0,030642	0,137401	0,824	-0,23895	0,30023
			UOC	-,33437182*	0,09587	0,001	-0,52247	-0,14627
			Patras University	,54461099*	0,123998	0	0,301321	0,787901
Employabil-ity	LSD	E-Campus	Laurea University	-,35409119*	0,112809	0,002	-0,57543	-0,13276
			UCC	-,48847674*	0,120476	0	-0,72486	-0,2521
			UOC	,41020504*	0,074044	0	0,264928	0,555482
			Patras University	-,45620908*	0,106058	0	-0,6643	-0,24812
			Roma Tre University	-,46432593*	0,103203	0	-0,66682	-0,26184
		Laurea University	E-Campus	,35409119*	0,112809	0,002	0,132755	0,575427
			UCC	-0,13439	0,14027	0,338	-0,4096	0,140831
			UOC	,76429623*	0,103168	0	0,561875	0,966717
			Patras University	-0,10212	0,128099	0,426	-0,35345	0,149219
			Roma Tre University	-0,11023	0,125747	0,381	-0,35695	0,136485
		UCC	E-Campus	,48847674*	0,120476	0	0,252097	0,724857
			Laurea University	0,134386	0,14027	0,338	-0,14083	0,409602
			UOC	,89868178*	0,111501	0	0,679913	1,117451
			Patras University	0,032268	0,134901	0,811	-0,23241	0,296949
			Roma Tre University	0,024151	0,132668	0,856	-0,23615	0,284452
		UOC	E-Campus	-,41020504*	0,074044	0	-0,55548	-0,26493
			Laurea University	-,76429623*	0,103168	0	-0,96672	-0,56188
			UCC	-,89868178*	0,111501	0	-1,11745	-0,67991
			Patras University	-,86641412*	0,09574	0	-1,05426	-0,67857
			Roma Tre University	-,87453098*	0,092568	0	-1,05615	-0,69291

		Patras University	E-Campus	,45620908*	0,106058	0	0,24812	0,664299
			Laurea University	0,102118	0,128099	0,426	-0,14922	0,353455
			UCC	-0,03227	0,134901	0,811	-0,29695	0,232413
			UOC	,86641412*	0,09574	0	0,678569	1,05426
			Roma Tre University	-0,00812	0,119727	0,946	-0,24303	0,226793
		Roma Tre University	E-Campus	,46432593*	0,103203	0	0,261836	0,666816
			Laurea University	0,110235	0,125747	0,381	-0,13649	0,356955
			UCC	-0,02415	0,132668	0,856	-0,28445	0,23615
			UOC	,87453098*	0,092568	0	0,692909	1,056153
			Patras University	0,008117	0,119727	0,946	-0,22679	0,243027
Positive Re-lationship	LSD	E-Campus	Laurea University	-,45135275*	0,106282	0	-0,65988	-0,24282
			UCC	-,45471565*	0,113506	0	-0,67742	-0,23201
			UOC	-1,13680117*	0,06976	0	-1,27367	-0,99993
			Patras University	-0,13994	0,099922	0,162	-0,33599	0,056113
			Roma Tre University	-0,1872	0,097233	0,054	-0,37797	0,003576
		Laurea University	E-Campus	,45135275*	0,106282	0	0,242822	0,659883
			UCC	-0,00336	0,132155	0,98	-0,26266	0,255931
			UOC	-,68544842*	0,0972	0	-0,87616	-0,49474
			Patras University	,31141529*	0,120688	0,01	0,07462	0,548211
			Roma Tre University	,26415436*	0,118472	0,026	0,031708	0,496601
		UCC	E-Campus	,45471565*	0,113506	0	0,232012	0,67742
			Laurea University	0,003363	0,132155	0,98	-0,25593	0,262657
			UOC	-,68208552*	0,10505	0	-0,8882	-0,47597
			Patras University	,31477818*	0,127096	0,013	0,06541	0,564146
			Roma Tre University	,26751726*	0,124993	0,033	0,022276	0,512759
		UOC	E-Campus	1,13680117*	0,06976	0	0,999929	1,273673
			Laurea University	,68544842*	0,0972	0	0,494739	0,876158
			UCC	,68208552*	0,10505	0	0,475973	0,888198
			Patras University	,99686370*	0,090201	0	0,819886	1,173841

			Roma Tre University	,94960278*	0,087212	0	0,778488	1,120717
		Patras University	E-Campus	0,139937	0,099922	0,162	-0,05611	0,335988
			Laurea University	-,31141529*	0,120688	0,01	-0,54821	-0,07462
			UCC	-,31477818*	0,127096	0,013	-0,56415	-0,06541
			UOC	-,99686370*	0,090201	0	-1,17384	-0,81989
			Roma Tre University	-0,04726	0,1128	0,675	-0,26858	0,174058
		Roma Tre University	E-Campus	0,187198	0,097233	0,054	-0,00358	0,377973
			Laurea University	-,26415436*	0,118472	0,026	-0,4966	-0,03171
			UCC	-,26751726*	0,124993	0,033	-0,51276	-0,02228
			UOC	-,94960278*	0,087212	0	-1,12072	-0,77849
			Patras University	0,047261	0,1128	0,675	-0,17406	0,26858
*The mean difference is significant at the 0.05 level								

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ECOLHE - Empower Competences for Onlife Learning in HE | 2020-1-IT02-KA203-079176
Co-funded by the Erasmus+ Programme of the European Union