Skills and competencies in the digital transformation era:
The case of Greece

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ABSTRACT

The era of digital transformation is currently more prevalent than ever in business. Enhancing specialized human resources is crucial for ensuring both economic and social plenty in the face of today's challenging job profiles. More specifically, this growing demand for skilled workers has widened the gap between what businesses need – and can’t find – and what specialists are available on the job market. Higher education is essential for developing the next generation of professionals and providing them with modernized skills and competencies, acting as a base upon which such talents and skills might develop. The goal of modern higher education institutions is to equip students with a comprehensive knowledge base that will help them develop their employability skills, become in-demand professionals, and stay competitive in the job market for the next 30 to 40 years.

This study focuses on the case of Greece, a developing economy, and its efforts to improve employability through a shaky higher education system. This study aims to investigate how Greece and its higher education institutions assist students in developing and enhancing the skills and competencies needed by the modern labor market while keeping up with the pace of digital transformation.

Keywords: digital transformation, digital skills, digital literacy, education, employability

Symelia Maria Vasileiadou
January 7th, 2023

I hereby declare that the work submitted is mine and that where I have made use of another’s work, I have attributed the source(s) according to the Regulations set in the Student’s Handbook.
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1. INTRODUCTION

The business world is now, more than ever, experiencing the digital transformation era. Enhancing specialized human resources to fit into today's demanding job profiles is of great importance for both economic and social abundance. Especially after the COVID-19 pandemic, the job market has undergone a severe evolution, mainly because of significant technological advances that grew the business world's need for competent specialists (Bejaković & Mrnjavac, 2020). More specifically, this emerging necessity for skilled professionals has created a barrier between the companies' requirements, which are unable to find experts and the availability of specialists in the labour market (King, 2003; Andrews & Higson, 2008). Undoubtedly, Higher Education (HE) plays a critical role in forming future professionals and equipping them with upgraded skills and competencies. These skills and competencies are widely known and often mentioned as 21st-century skills (Ananiadou et al., 2009) in order to point out that they are more closely tied to the requirements of the new models of economic and social development than to those of the previous century, which are linked to mass industrial production. Moreover, globalization, fast-moving technological advancement, and digital transformation have launched debates on how governments worldwide adapt to these rigorous changes and create the circumstances and environment in which 21st-century trending skills and competencies can be developed (Skare & Riberio Soriano, 2021). HE works as a foundation upon which those skills and competencies can flourish. The mission of contemporary higher education institutions is to give students a holistic form of knowledge that will enable the development of their employability aptitudes, to become on-demand professionals and endure in the labour market for the next 30 to 40 years (Alenezi, 2021).

Consequently, it is fundamental that institutions re-evaluate how they approach the job market demands while cultivating not only the technical skills and competencies of the students but also promoting a comprehensive educational model. One that includes the growth of their emotional and social skills and successfully acts a part in transitioning to a “knowledge-based economy” and a "learning society” (Keeling, 2006; Panagiotakopoulos, 2012; Nijhof, 2005).

This study focuses on the case of Greece, a country with an advanced economy, and its employability development efforts via a fragile HE system. According to OECD,
the Hellenic HE system is one of the most problematic compared to the rest of the OECD members (Ananiadou et al., 2009). Although education in Greece is of great importance and whoever attends HE institutions enjoys high prestige, the country's adaptability during the era of digital transformation and employability development efforts have been proven inadequate (Kalogeratos & Pierrakeas, 2022).

Through this research, an attempt is made to explore the efforts of Greece and its higher education institutions to prepare and help students cultivate and enhance those skills and competencies required by the contemporaneous labour market while keeping up with the rhythms of digital transformation. It is investigated how well and to which extent the Greek HE system focuses on the employability of future professionals by making good use of mediums, such as mechanisms (e.g., internships that enable graduates to gain knowledge and work experience) and supporting services, well-trained personnel, and technology. Furthermore, various strategies are examined that the Greek government and ministry of Education, in association with the Ministry of Labour and Social Affairs, can adopt to improve the country's employability issues.

2. DIGITAL TRANSFORMATION AND THEORETICAL FRAMEWORK

2.1. Defining Digital Transformation

The first-time digital transformation appears as a concept goes back to the 1950s. But before proceeding with the definition and the brief history of digital transformation, we must outline and differentiate two more distinct terminologies that quite often appear to be confusing: digitization and digitalization (i-SCOOP, 2018).

On the one hand, digitization is about converting from analog to digital format, known as digital enablement (Gartner Glossary, IT). Scanning, recording, OCR, and sampling are some processes to digitize text, images, audio, video, and generally data. The benefits of digitization are manifold. Digital data can be shared, retrieved, and saved with ease. In the modern business environment, where information needs to be rapidly and easily accessible by personnel, clients, partners, and other stakeholders, this is extremely crucial. Also, digital data has the added benefit of being easier to modify than analog data. This translates to more accessible data analysis and decision-making
for enterprises. Lastly, by eliminating the need for paper documents and other analog materials, digitization can help firms become more eco-friendly and minimize their expenses (Sabbagh et al., 2012). Converting and transferring information from paper and manual work to digital platforms to simplify the routine of teachers and students is an example of digitization. Digitization is an aspect of digital transformation since it is the very first step an organization should take before deep diving into the DX process. At this point, it is of great significance to mention that during digitization, it is only the information that is getting digitized and not the processes, which is the distinguishing difference between digitization and digitalization.

On the other hand, digitalization and although many people use both of these conceptual terms interchangeably (Brennen et al., 2016) is associated with the process of moving, via digital technology, to a digital business (Gartner Glossary, IT) that, its business model undergoes a transformation of processes and operations to add extra value and achieve greater revenues (Dörner et al., 2015). More specifically, a good example of digitalization in education was realized massively during COVID-19, where due to the pandemic, schools remained closed for long periods. The digitalization of education is stepping from the traditional ways of teaching in a typical brick-and-mortar classroom, where an educator communicates with a group of students with the use of physical books, into the digital classroom enabled by the Internet. E-classrooms are facilitated by the use of various mobile or desktop devices, innovative software applications replace books, and, in general, teaching is based on digital technology. All of the above are applied to transform education culture and make teaching and learning more effective. In simpler words, digitalization is about automating business processes and operations (Muro et al., 2017)

By encompassing the entire organization, digital transformation goes beyond digitization and digitalization, focusing on end-to-end processes to reform their product or service and customer experience and interaction, making good use of available digital means (Mergel et al., 2019). Ultimately, DX is about building a digital company (Salesforce definition) that modifies the business's bureaucratic and organizational backbone and traditional practices by embedding new technologies that increase effectiveness and customer/user satisfaction.

In the late 50s, the microchip and semiconductor transistor are invented, working as a medium to jump from analog computing to digital. Followed by the 60s, when the first message was sent over the Advanced Research Projects Agency Network,
ARPANET in short, via TCP/IP, setting the foundation of the Internet (Schallmo et al., 2017). That is the point when digitization begins. Until the 70s, records were kept on paper, either written by hand or typed. Physical documents, i.e. analog data, were the means to exchange or record information in a business or organization. Gradually, computers replaced handwritten records and businesses operated with digital computer files (Sukhova, 2016). This conversion of analog data enabled managing information in a less-complicated way, like finding and sharing information throughout the organisation. However, business systems and operations mimicked the outdated analogue structure of extracting, exchanging, and using information (Schallmo et al., 2017). By the '80s and '90s, the invention of personal computers, accompanied by the automation of the workplace and widespread usage of the Internet, triggered a digital revolution that affected the whole world (Salinas, 2017). This transformation of developments allowed, on the one hand, companies and organizations to operate in more simple and efficient ways. Digitalization was introduced so as to access and share digitized information swiftly and effectively; it does not include how organizations do business or establish new types of businesses. Nevertheless, organizations suffered from the so-called "islands" of automation ( Strikes, 2021) where only fractured and isolated data could be found uncoordinated, causing a lack of coherent business view.

Until the 2000s, through the W.W.W., new, digitized channels were created, firstly websites and later social media. All of the above wouldn't be able to be accessed without the appearance of smart devices. As a result, companies discovered innovative ways to reach and contact their customers (Lozic, 2019). Quickly, businesses realised that they needed digital processes that would, on the one hand, facilitate these interactions and, on the other, they would acquire the ability to extract data from clients. With careful analysis by digitally expert teams, that kind of data would become extremely beneficial not only to the business but also utilized to provide enhanced experiences to customers. Enterprises began integrating tools and systems in cross-departmental networks to better exploit all the available marketing and sales channels, consumer data and experiences, and even internal operations. Software developers started to create digital platforms in response to the demand, which made it available to strategically apply digitization throughout the organization, transforming islands of automation into networks for automation (Brandon, 1993). Businesses focused on integrating all procedures and equipment into networks to better utilize the enormous volumes of information. They directed their attention to digital platforms that offered
an interconnection between all kinds of stakeholders, eliminating intermediaries. For the first time, companies had the chance to be introduced to new digital ways of conducting business, extracting and exploiting data, retaining talent, and increasing agility.

Building digital networks acted as the dawning of an innovative era: Digital transformation, a cross-departmental procedure to reinvent how a corporation utilizes its people, processes, and digital means to generate new business culture and revenue while customer expectations and needs increase very fast. Constant technology developments and insatiable consumer demand will act as driving forces of the continuous transformation of businesses, industries, and organizations that want to be productive and endure in time.

![Figure 1: Digitization, digitalisation, and digital transformation reviewed through five facets: focus, goal, activity, tools, and challenges, with examples of each; adopted from (Savić, 2019, p. 37)](image)

As we mentioned before, digital transformation goes beyond digitalization. When we discuss DX, we refer to a broad term that focuses on cross-cutting organizational reform, where implementing state-of-the-art technologies operate in a supportive way (Castro Benavides et al., 2020). The process of digitally transforming an organization and strategy has a customer-driven, continuous strategy at its core. However, it is not simply about digitizing information or digitalizing processes. Behind DX, there are many complex stages an organization has to undergo in order to achieve an agile transformation (Fuchs & Hess, 2018). Transforming a business digitally entails a focused, flexible and fast (the three characteristics of agility) (Perkin & Abraham, 2021) effort to re-evaluate the strategy, operations, and processes and eventually reform several elements of human resources, such as behaviors, mindset and culture (Castro
By applying an agile approach, institutions can reinvent themselves, digest change overall and finally survive in a digitally empowered world. While ongoing digitization activities should not be confused with agility, the ability of a business as a whole to adapt quickly to both external and internal processes will facilitate its execution (Leonhardt et al., 2017).

DX is not just digital record-keeping systems and de-materialization of processes, as it encompasses the adoption of third Platform technologies to promote new services, redefine business models, and innovative interactions with users (Castro Benavides et al., 2020). The concept of Third Platform technologies is an information technology term invented by International Data Corporation and consists of 4 pillars: mobile computing, big data and analytics, social (media) technologies and cloud computing. A decade ago, in 2011, IDC announced that we were moving to the Third Platform. But this transition began in the 1950s with the First Platform and mainframe computers, which evolved in the 1980s into the Second Platform and the introduction of personal computers (PCs) and the client-server architecture. One of the main differences, except for the disruptive and innovative technologies, is that the Third Platform focuses firstly on the consumers' demands compared to the other two platforms that their initiatives and developments evolved mainly around the enterprises (i-SCOOP, 2021).

Industry 4.0 and the fusion of disruptive technologies accompanying the 4th Industrial Revolution, such as artificial intelligence (AI), and the Internet of Things (IoT), whose driving force is cloud computing, 3D printing, robotics, genetic engineering, and other technological advances, are already affecting our living, working life, and the way we interact. DX requires detachment from legacy systems and establishing innovative enablers like the cloud. For instance, the rapid growth of mobile devices and cloud applications has deeply changed how we can connect, communicate and collaborate with each other beyond geographical limits, time, or devices (Buchanan et al., 2016). When the pandemic burst, the business world came across a new reality, where unexpected patterns of consumer behavior and the necessity to work remotely emerged. Especially after COVID-19, organizations, through the integration of digital tools, managed to operate more efficiently, and employees collaborated even more productively (Boland et al., 2020).

Moreover, cloud-based collaboration apps accelerated the promptness of sharing information and interconnection throughout agile working environments. Also,
DX has profoundly transformed how enterprises engage with employees, customers, and partners. Companies have invented new models to engage with their clients that aim at building deeper and more solid relationships since. Due to this empowerment and interconnection customers enjoy, companies are expected to adjust to consumers' requirements. Organizations are in pursuit of creating personalized experiences using two-way communication and data-sharing models. However, according to a global survey from Salesforce Research, even though companies, thanks to technology, can provide personalization and greater customer experiences, due to the fact that clients are offered an enormous quantity of options, they are still at risk of losing them. It is easier for consumers to switch brands if offered a more tailored, trusted service and finer experience, as 56% of customers expect to find what they are looking for from a company in three clicks or less. (Donegan, 2019). Therefore, companies are pushed to reimagine.

Although we are experiencing so many rapid technological advancements, and as the need for IT talent continuously grows, a pronounced deficit of skills and competencies keeps widening (Wójcik, 2017). And although there is a huge call for IT professionals and IT-related job openings, according to ManpowerGroup Survey (ManpowerGroup, 2022), it was revealed that the talent shortage is quite alarming. The survey's results highlighted that in the next few years, and as the fourth Industrial Revolution penetrates all sectors, the demand for skilled and specialized workforce will increase at a point where the problem of the "skills gap" will not be tractable unless all parties will take measurements to annihilate this discontinuity between innovation and efficiency. In another ManpowerGroup study is reported that "3 of every 4 (75%) companies have reported talent shortages and difficulty hiring", indicating that the phenomenon of talent shortage is reaching historical levels (ManpowerGroup, 2022). The Fourth Industrial Revolution, along with the outbreak of the COVID-19 pandemic have been reshaping the future of work (McGinnis, 2021). Firstly, governments via the education system, and secondly, businesses must help students and professionals obtain a blend of technical and soft skills to find a place in the developing digital world. Both educational institutions have to reimagine the meaning of learning to bridge the skills gap, and enterprises have to establish a diverse culture of continual learning, upskilling, or reskilling to new types of jobs.
2.2 New competency demand and skills gap

The impact of the Fourth Industrial Revolution radiates in many directions; one of them is undoubtedly the skills and competencies of the active and future workforce. According to the 2020 Future of Jobs Report from the World Economic Forum, 44% of the employee competencies demanded to perform productively and effectively in the business world will be drastically changed by 2025 (World Economic Forum, 2020). All technological advancements and the enablement they have offered across industries contradict the number of professionals being efficient to keep up with them. Societies are in constant motion, and it is impressive how swiftly we managed to automate manual and repetitive tasks of various professions. That kind of societal automation gave rise to a "higher-level" and quality work (Anderson, 2008). During the last century and from the beginning of the First Industrial Revolution till the Fourth Industrial Revolution, most industries or part of their procedures have been automated, and mass production technologies have emerged. Subsequently, these changes have led to the decline of outdated professions and the acme of IT-related vocations that require different skills and competencies, and also caused the rise of a knowledge-based economy (Andrews & Higson, 2008) It is estimated that 40-60% of jobs in the European Union are in danger of vanishing because of the extreme extent of automation and digitization (Beken et al., 2015).

Unfortunately, we have not yet managed to adapt as fast as the technological developments are running. This is why we are coming across the so-called "skills gap". On the one hand, the older generation of workers struggles to follow the pace of change and evolve into digital immigrants. On the other hand, there is a new generation
consisting of internet natives and digital nomads, who have been multiplied after COVID-19 that break the barriers of physical workspace and are tech-savvy due to the fact that technology dominates their life by using computers and mobile technologies (Evans & Forbes, 2012). Digital natives are also multitaskers and can juggle in-between many different activities (Calderwood et al., 2016; Polak et al., 2020) and are intuitive learners (Prensky, 2001; Akçayır et al., 2016). Another characteristic is that because the Internet makes everyone appear equal, it is hard for them to follow hierarchical structures and outdated business-title status quo (Hasmawati et al., 2020). Lastly, they thrive in quick and dynamic environments, a fact that works as a barrier for organizations since they have to constantly try to retain their loyalty (Hoffmann et al., 2014; Prensky, 2001).

<table>
<thead>
<tr>
<th>Native</th>
<th>Immigrant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student</td>
<td>Teacher</td>
</tr>
<tr>
<td>Fast</td>
<td>Slow</td>
</tr>
<tr>
<td>Young</td>
<td>Old</td>
</tr>
<tr>
<td>Future</td>
<td>Past or legacy</td>
</tr>
<tr>
<td>Multitasking</td>
<td>Logical or serial thinking</td>
</tr>
<tr>
<td>Image/visual</td>
<td>Text</td>
</tr>
<tr>
<td>Playful</td>
<td>Serious</td>
</tr>
<tr>
<td>Looking forward</td>
<td>Looking backward</td>
</tr>
<tr>
<td>Digital</td>
<td>Analog</td>
</tr>
<tr>
<td>Action</td>
<td>Knowledge</td>
</tr>
<tr>
<td>Constant connection</td>
<td>Isolation</td>
</tr>
</tbody>
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*Table 1 Comparative Digital Native vs Immigrant (Source: Bayne & Ross, 2011)*

The pandemic revealed a domino of governmental insufficiencies globally. For instance, the education system suffered from continuous lockdowns, and combined with the huge burst of technological improvements, it appeared to function inadequately. Neither the facilities nor the infrastructure to educate and train students or professionals to become digitally literate rapidly has strong foundations (Morte-Nadal & Esteban-Navarro, 2022). Not enough people are being educated in parallel with trending scientific areas, such as cybersecurity, ICT systems, and data science, causing a talent drought. Primarily the digital natives have shown a different learning style compared to older generations, aka digital immigrants, where technology is the enabler. Education systems have not adopted innovative ways to build digital, engaging content for courses, and educators are not fully capable of interacting efficiently with
digital native students, who favor incorporating more technology into their classroom experience and learning by 61% (Sarkar & Manzo, 2017.)

In many respects, the fact that European education and training are overly supply-driven is the core source of the mismatch. The learners of this educational model and training are not sufficiently informed about the anticipated changes in the labour market. They are not offered adequate orientation about which programs and skills have a favorable return on the labour market (CEDEFOP, 2020). Also, it is quite alarming that 85% of job requirements demand basic knowledge of digital skills in the European Union (CEDEFOP, 2018), while 46% of European citizens are in danger of skills obsolescence due to an aging workforce and unemployment.

Undoubtedly, digital transitions affect both economic and social balances. As a consequence, not only modern skill demands are generated, but also mismatches and instabilities between competencies and the constantly evolving labour market (Hippe, and Jakubowski, 2022). Moreover, not only the skills and competencies are reshaping (Beken et al., 2015) but also the workplaces that, due to the changing economy and unpredicted disruptions, such as COVID-19, create new forms of digital

Figure 3: Long-term unemployment rate across countries in 2020; adopted from CEDEFOP, 2020
working environments like hybrid or remote working (Wontorczyk & Rożnowski, 2022). The in-demand skills are and will be a mixture of technical and soft skills. Regarding this broad set of skills, there is a strong correlation between cognitive (numeracy, literacy, and digital) and non-cognitive skills with labour productivity (Morandini et al., 2020).

Moreover, technical skills are bound to digital literacy, data analytics, and data visualization. Although cognitive skills play a crucial role, non-cognitive skills are progressively becoming more and more important. Soft skills revolve around social influence, communication and collaboration, time management, critical thinking, fast learning and adaptability, and creativity (Morandini et al., 2020). It is estimated that by 2030 soft skills will be the basis of nearly 66% of all professions since if not all, most of the business processes are being automated and digitalized. As a result, professionals are forced to develop and cultivate in-depth soft skills that machines do not acquire, such as being flexible to adapt and interact interpersonally (Bejaković & Mrnjavac, 2020). It is also possible to automate 30% of working time by 2030. For employees to survive in the competitive labour market and bring value and competitive advantage to their organization, it is essential to broaden interpersonal skills that machines cannot demonstrate (Manyika et al., 2017). Communication skills, mental flexibility and adaptability in changing environments, the ability to learn continuously, and build trusting relationships based on empathy, inclusiveness, and collaboration are indispensable pieces of the soft-skills puzzle. In fact, teamwork and social skills work as enablers of reducing coordination costs and allow employees to work in a more productive and orchestrated way (Morandini et al., 2020).

Moreover, demonstrating agile thinking and self-management, as well as crafting ethical leadership traits ("42% of jobs need leadership skill development for the digital era", Deloitte, 2017), will be fundamental for the workforce of the near future (Andrews & Higson, 2008; Pang et al., 2019). It should also be mentioned that the productivity and success of employees are highly attached to cognitive, emotional, and social intelligence, which are not sufficiently developed due to outdated educational models that promote barren knowledge (Deming, 2017). There is a growing argument for the necessity for educational reforms to address students’ and society’s social and economic requirements in the 21st century (Delors, 1998; Stofkova et al., 2022).
While soft skills play a crucial role in the modern digital-transformation era, some hard-technical skills are equally important. Firstly, digital literacy is a subject of conversation, especially after COVID-19 and its implications. The pandemic, the emergence of new technologies, and the digital transformation of working environments led to the obsolescence of some professions. But through this change, new positions and competency needs were created. A study regarding the digital skills of the Dutch population, who are 50% proficient in digital literacy, reveals that the E.U countries score an average of 33% in digital literacy skills (CBS, 2020).

STEM skills, which are comprised of Science, Technology, Engineering and Mathematics, are extremely important for businesses to make knowledge-driven decisions and grow in a productive way (Shapiro et al., 2015, Morandini, 2018). Moreover, ICT skills are numbered among the STEM skills that have become progressively in demand since the beginning of the 2000s thanks to the constant technological progress and the creation of new professions, and the "natural order" of replacing the aging STEM human resource with a young, competent workforce (Shapiro et al., 2015). Although Eurostat estimates that the growth of STEM and ICT professionals between 2005-2018 has increased by 1.3 %, there is still a notable lack of specialists who fall behind, as STEM skills are always evolving. New ones are being created. But there is an even greater need for digital competence, as digital transformation is playing a leading part in many enterprises and organizations. As a result, most companies these days demand some level of digital skills: a CEDEFOP survey revealed that 19% of employees need either basic digital skills such as using the Internet or sending emails, 52 % are in need of advanced like using word processing, and spreadsheet software, and 14% require advanced skills for programming and statistical analysis (CEDEFOP, 2018).
In general, digital literacy and skills are characterized by a mixture of interrelated concepts. The definition of digital literacy is of high importance. Nevertheless, it is not a simple task to define it in a precise and explicit way (Bejaković & Mrnjavac, 2020). There are quite a few attempts to categorize digital skills. Among those is the approach of Curtarelli et al. (2016), which identifies three main groups of digital skills, categorized based on the degree of complexity and demand of performing tasks. The first one is basic digital literacy, which is related both to citizens and the workforce and includes those skills and competencies that empower users to become digitally literate and contribute to the concept of the knowledge economy. The next category is highly attached to employment and the necessary digital skills to survive in the labour market. The last category encompasses all the previously mentioned skills plus the digital competencies required for ICT professions, including factors like creativity and innovative thinking, to offer contemporary digital solutions and services.

There is also a lot of interest and research on the essential digital skills required to distinguish in the labour market. Elements like employability, economic growth, and competitiveness on an international level are affected by the level of digital literacy and skills. On the one hand, some definitions specifically focus on and classify digital skills, bringing to the front the ICT specialists, e.g., the European e-skills Forum, whose definition tends to ICT professions, in order to provide a better definition of the skills gap and the European policy initiatives (Gareis et al., 2014; Husing et al., 2015). Another categorization approach is coming from CEDEFOP, which differentiates digital skills into three levels: basic, moderate, and advanced ICT skills, based on the level of literacy, competence, and difficulty of tasks executed by the employed workforce (CEDEFOP, 2015). In parallel, the OECD also adopted the task-based approach, which classifies employees into three types of users: the basic, the advanced, and the ICT specialists (OECD, 2004). But in 2016, the concept of “generic, specialist, and complementary” skills were developed as an extension to the previous framework to reveal the demand for new digital skills. More specifically, ICT specialist skills are linked to programming, developing applications, and managing networks; ICT generic skills are linked to the usage of such technologies in professional environments; ICT complementary skills have to do with the performing of new ICT tasks, like using social networks to communicate with colleagues (OECD, 2016). Lastly, in 2018 the European Commission introduced the Digital Competence Framework 2.0, outlining in five areas the key components of digital competence and literacy, quoting:
I. **Information and data literacy**: To articulate information needs, to locate and retrieve digital data, information and content. To judge the relevance of the source and its content. To store, manage, and organize digital data, information and content.

II. **Communication and collaboration**: To interact, communicate and collaborate through digital technologies while being aware of cultural and generational diversity. To participate in society through public and private digital services and participatory citizenship. To manage one’s digital presence, identity, and reputation.

III. **Digital content creation**: Create and edit new content (from word processing to images and video); integrate and re-elaborate previous knowledge and content; produce creative expressions, media outputs, and programming; deal with and apply intellectual property rights and licenses.

IV. **Safety**: To protect devices, content, personal data, and privacy in digital environments. To protect physical and psychological health, and to be aware of digital technologies for social well-being and social inclusion. To be aware of the environmental impact of digital technologies and their use.

V. **Problem-solving**: To identify needs and problems, and to resolve conceptual problems and problem situations in digital environments. To use digital tools to innovate processes and products. To keep up-to-date with the digital evolution.

Taking a step forward, data analytics and data visualization, and exploration are numbered among other trending technical skills. There is an enormous amount of structured and unstructured data flooding organizations, and there is also an imperative need to manage them to make data-driven decisions (Davenport, 2018; Holmström, 2022). For instance, AI and machine learning are those technologies that can manage this snowball of information, and there is an accretive percentage of organizations that adopt them. Consequently, it is highly important to include the knowledge of their usage between the data-literacy skills (Chrisinger, 2019). Nevertheless, excellence in data-analysis skills is not required only by pharmaceutical or ICT industries. There is an increasing tech talent gap, while organizations are embracing emerging technologies, small is the percentage of professionals who can fit their key-technical requirements. Using as an example the case of the UK, almost 69% of industries, generally speaking,
demand digital skills like data science and data analytics, yet only 17% are considered data literate (PWC, 2022).

Lastly, as soft and hard skills are becoming increasingly in demand, the need for physical skills is slowly becoming obsolete (McKinsey, 2019). The repetitive and heavy-lifting tasks are taken over by automation and robotic machinery. Although this can be translated as the extinction of job positions by some, it can be seen as an opportunity by others. Women and older workers, who are not characterized by "muscle power", are being given a chance to be absorbed by the labour market and sectors which are traditionally male-dominated (Morandini et al., 2020).

The European Commission, in order to monitor the overall digital performance and progress of its member states and track their digital competitiveness in the areas of Connectivity, Human Capital & Digital Skills, Use of Internet Services by Citizens, Digital Technology Integration of Businesses, Digital Public Services and Research & ICT Development, introduced the Digital Economy and Society Index (DESI).

As the Digital Decade policy programme is unwrapped, the DESI indicators are the chosen means to monitor the member states' progress. Until 2030, the four pillars to be analyzed are a digitally skilled population and highly skilled digital professionals, secure and sustainable digital infrastructures, the digital transformation of businesses, and the digitalization of public services. In this study, we will be focusing on digital skills, that in the European continent, citizens appear to be only 54% competent in basic digital skills, while at least 87% of Europeans surf the Internet at least once per week (Eurostat, 2022). The European Commission aims at increasing the percentage of
digitally skilled users to 80% by 2030. Although the pandemic somehow rushed society into using digital technology, it did not result in increasing the percentage of digitally competent citizens. Countries with good practices that benefited from digital tools and acquired advanced skills are Finland, Sweden, the Netherlands, and Ireland, while Greece is one of the countries confronting noticeable delays, along with Romania and Bulgaria (European Commission, 2022). At the same time, more and more jobs require all kinds of levels of digital skills, while this gap works as a damaging obstruction for the European economy to enter the digital age.

The skills gap and the employability issue are mostly related to the absence or the inadequacy of soft skills. Although most employers highly value soft skills, such as critical thinking, problem-solving and decision-making, less than 38% of hiring managers believe that higher education graduates are trained and prepared by the curriculum (E. Simpson et al., 2019). But there is also a share of employers considering digital fluency as a shield to protect the present and future workforce. The truth is that automation in the digital landscape is unstoppable, meaning that even highly-valued competencies such as coding can become obsolete in the near future (Radin et al., 2020). The skills-gap problem is caused by three different stakeholders/actors: the educational system and its institutions, students, and businesses. Firstly, HE institutions and skilling programs are not interconnected. Unfortunately, policymakers of the educational system do not meet the expectations and employability demands of the labour market. In addition, students are isolated by the corporate sector during their studies, leading to a misunderstanding of which are the requirements in the business sector (Sarin, 2019). Students acquire advanced academic knowledge that is not linked to the job market. Although they are over-qualified from a theoretical point of view, the fact that hiring companies and recruiters do not communicate to the institutions the actual needs of the market, HE institutes do not offer the students the necessary set of skills to adapt to the job market (Sarin, 2019).

A 2020 research of Deloitte and SEV showed that there is an insufficient interconnection between the Greek academic community and labour market, resulting in the inadequacy of applying and commercialising the research carried out and the critical delay in matters of substantial innovation in the ICT sector. At this point, it is quite important to mention a paradox; According to another study (SEV, 2006), among the skills that Greek employers demand so as to consider an employee competent are deep subject-specific knowledge, the ability to learn fast, communication skills, team
working, IT skills and foreign languages. Nevertheless, the same study underlines that the Greek HE system has not managed to cultivate and arm graduates with the abovementioned skills.

In recent years, and although there has been an improvement regarding the excellence of well-qualified higher education graduates in fields related to digital transformation (e.g., ICT, engineering, sciences), the performance of Greece, compared to other EU countries in terms of how well digital skills are applied in businesses and society in general, ranks low (CEDEFOP, 2021). On one side, there is a deficient connection between education, businesses, and the labour market, which enlarges issues like the over-qualification rate of tertiary graduates, the mismatch of job positions and long-term unemployment. More specifically, overqualified employees, due to the fact that they are mainly young and lack skills and experience, receive lower wages. In parallel, they are not offered adequate job-related training, which means that they have fewer opportunities to continue developing their skills (CEDEFOP, 2018). The above equal a waste of public resources and in the long run can negatively affect the value of lifelong education (CEDEFOP, 2018). It is reported that in the European Union, the value of over-qualification in 2020 was 24.2%. The minimum was 7.2% for Luxembourg, while the maximum was 43% for Greece (CEDEFOP, 2020). On the other side, the leakage of talent in foreign countries, known as "brain drain", the low level of lifelong learning, such as reskilling and upskilling, and the absence of a mechanism that monitors and evaluates the growth of digital skills in the public sector, can be considered as some of the main reasons fuelling this phenomenon.
2.3 DX in the education system, Lifelong Learning and the development of employability skills

DX has altered and keeps altering societies and economies but has significantly impacted everyday activities and work-life (Konle-Seidl & Danesi, 2022). We are coming across the elimination of traditional professions and the rise of new opportunities and business models that emerge from the penetration and need for digital capacity (CEDEFOP, 2020). One of the most important pillars affected and potentially benefited by Digital Transformation is education. Especially during and after the COVID-19 pandemic, most European countries had to implement strict lockdowns, where everyone had to adjust to this unprecedented reality, including training systems and institutions. The pandemic introduced innovative ways to interact, teach and learn online outside the traditional classroom. But, at the same time, due to the fact that not everyone has access to these technologies or even the Internet, challenges and questions arose regarding equal opportunities for the access and availability of ICT technologies and the European efforts to eliminate them (Blaskó et al., 2022; European Union, 2022; Eurostat, 2022). According to the analysis of the Broadband Commission for Sustainable Development Working Group on School Connectivity in 2020, which was made to identify the different dimensions that the COVID-19 affected education and obliged its digital transformation, there was a disclosure of manifold issues like the digital divide, inequity, and online safety issues, especially for juveniles. In order to resolve them, the cooperation of governments and development partners, the investments in digital infrastructures, and the literacy of alienated social groups are fundamental to eliminating technological and social barriers (Monteiro & Leite, 2021). The progress and success of students in an online educational environment depend tremendously on income level and capacity to interact online with their educational community, such as educators and classmates (Castaño-Muñoz et al., 2014; Socialinnov, 2020). Lastly, during this new-normal situation, the digital capacities of the education system have been put under the microscope, as both educators and students were not trained adequately to use these new technologies. Notably, according
to an OECD study in the EU, on average, less than 40% of teachers felt prepared to use digital tools in the e-classroom (OECD, 2019).

Nevertheless, the emergent need for remote teaching due to COVID-19 forced educators to increase and advance their skills towards the use of technological tools (Beardsley et al., 2021). Furthermore, another study from the International Computer and Information Literacy (Fraillon, 2020) revealed that more than one-third of teenage participants did not possess the most basic digital skills. Also, an ICDL Foundation survey of 2018 underlines the problem of the lacking digital skills and digital literacy that afflict the European population, especially the youngest generations (ICDL Foundation, 2018). Consequently, these kinds of results led to conclusions that there are inadequacies in digital skills and competencies in general, questioning, on the one hand, the digital readiness of educators and, on the other, the quality of preparation that education and training systems offer to graduates and active employees, resulting in the inability of graduates to meet employers’ needs (Bejaković & Mrnjavac, 2020).

In 2006, the European Parliament and Council of the EU introduced a definition of digital literacy and competence: “the confident and critical use of ICT for work, leisure, learning, and communication”. Based on this definition, digital literacy and competence entail, over and above the technical use of digital technologies, also cognitive abilities, capacities, and attitudes. It is also implied that digital literacy is a transversal acquisition that enables people to cultivate other skills too. But, in spite of the fact that non-cognitive skills are of great importance in the workplace, there is a tendency to overlook soft skills in formal education curricula in several countries (Gonzalez Vazquez et al., 2019; Morandini et al., 2020). Also, ICDL Europe made a report according to which computing skills and digital literacy, two interrelated competencies, are essential for young generations to develop intellectually and personally (Ostmeier & Strobel, 2022). As it contributes to the enhancement of critical and logical thinking, creativity, and problem-solving skills. By understanding the functionality of digital technologies, students are metamorphosed from numb consumers to innovative creators of the digital cosmos. In the same report, the necessity to include courses that enhance digital literacy and computing skills in compulsory education is underlined (ICDL, 2019). Undoubtedly, the growth of non-cognitive skills is tremendously dependent on non-educational factors, e.g., family and social circles, and there are signs that non-cognitive skills can be enhanced through education and training if targeted interventions are applied (Morandini et al., 2012; Kautz et al., 2017;
Chernyshenko et al., 2018). Although research in this area is premature, there is evidence that teaching and learning practices that include both soft and hard skills in preschool and school eras and also programs that enhance these skills later in life can be considered effective strategies. Likewise, mobility programs like Erasmus and Erasmus+ contribute to building social, communication, and leadership skills (European Commission, 2014).

However, digital and computing skills are equally important for the growth of the digital economy and the modernization of public services and industries (Bejaković & Mrnjavac, 2020). We are currently crossing Europe's Digital Decade, where digital technologies play a vital role in every aspect of our lives. Nevertheless, Europe is coming across various challenges associated with DX. For instance, the technological autonomy, the digital illiteracy, and skills gap, the protection of European digital citizens from misinformation and fraud, and the digital divide. The solution to confront these challenges was suggested via the 2030 Digital Compass, which sets four directions of interest: Skills, Infrastructures, DX of businesses, and digitalization of Public Services.

![Digital Compass 2030](image)

Figure 7: Digital Compass 2030; adopted from European Commission, 2022

Via the Digital Agenda for Europe, the introduction of EU-wide indicators of digital and media literacy and competence was envisioned. The offspring of this vision was the Digital Competence Framework for Citizen 1.0 to 2.2, which provides a common understanding of what digital competence is and the conceptual model of digital skills and competencies adopted by policymakers in order to efficiently prepare and implement both education and lifelong learning policies (Ferrari, 2013; Vuorikari et al., 2022).
According to the European Union, on average two in five European citizens, between the ages of 16-74 years old lack digital competencies and skills. And it is predicted that in the near future, both learning and professions will require these skills due to constant technological changes. Furthermore, it is estimated that 20% of working-age Europeans acquire low-level numeracy and literacy skills that are important for participating in the economy and society (OECD, 2019). A lifelong learning mentality and upgrading those skills will enable economic and social stability. In order to ensure a smooth digital transition in the field of education and the decrease of digital illiteracy, the European Commission in 2020 took a couple of initiatives that are encapsulated in the Digital Education Action Plan 2021-2027. This policy initiative envisions an inclusive, easily accessible, high-quality European digital education. It also communicates the need for a more orchestrated collaboration of European member-states on how efficiently enough digital education reflects on the challenges and opportunities the Covid-19 pandemic has brought and eventually produces solutions and opportunities for the whole Education Area community, such as teachers and students, researchers, and policymakers. The medium for this community to come even closer was the establishment of the European Digital Education Hub. An open, online, inclusive, collaborative platform focusing on the exchange of best practices, knowledge, and the development of solutions provided by its members from diverse education sectors.

What is more, in order to enhance the digital education area, the SELFIE (Self-reflection on Effective Learning by Fostering the use of Innovative Educational technologies) tools have been launched. These free, easy-to-use, and anonymous self-
reflection tools are addressed at teachers and students, including a SELFIE tool for schools and training companies. The main goal is to light the way for schools on how to embed digital technologies so as to create a digital action plan for improving learning, mentoring, and guidance and prepare practitioners and learners for the digital age (European Commission, 2022). Among the initiatives that the European Union launched was the DIGITAL, an EU funding program that will assist in providing digital technology and solutions in various sectors, such as businesses, the public sector and citizens produced in the geographical limits of Europe and not depending on other regions to supply them.

Furthermore, a five-year plan called (New) European Skills Agenda was launched in order to enhance and deploy the skills of individuals and organizations during the new digitalized era and the demands that have emerged, especially after the COVID-19 pandemic, followed by twelve actions "for sustainable competitiveness, social fairness and resilience" (CEDEFOP, 2022). Added to that, the Upskilling Pathways strategy was launched in order to help European adults improve their skills, as well as to promote the importance of lifelong learning. To address the ubiquitous problem of the skills gap, the EU established the Digital Skills and Jobs Platform under the umbrella of Connecting Europe Facility Programme. Last but not least, the European Commission enacted the Digital Skills and Jobs Coalition to tackle the digital gap in Europe. The coalition consists of various pan-European bodies and organizations associated with education and training institutions that are joining forces intending to arm the required digital skills in four broad groups: Digital skills for all, the labour force, ICE professionals, and education.
3. METHODOLOGY

3.1 Aim of the Research

The research aims to examine the status of Greece regarding the digital skills of its future and active professionals that enable them to become employable in a very competitive digital labour market, compared to other two European countries: Finland and Spain. The criteria that the two European countries were chosen are based on the DESI indicators, with a special focus on Human Capital, and rankings of its country. As Greece is ranked quite low among the other 27 European countries on the Digital Economy and Society Index, it was considered proper to compare country’s performance with a country that is performing exceptionally, such as Finland, and a country with mediocre, but above the European average, such as Spain. Governmental measurements and projects of each country are presented, in order to acquire a holistic view of the attempts to educate and enhance the digital skills and competencies of students and the working population. The comparison is realized in order to detect the pain points of Greece that lead to defective performance and suggest measurements that the Greek government could apply to better identify the need for digital skills and resolve its employability issues.

3.2 Search Strategy & Literature selection

To get a wide overview in identifying the barriers to the adequate cultivation of digital skills and competencies, a literature review following Webster and Watson’s (2002) proposed model was used to select the published relevant studies. There are five main steps upon which the mapping process was carried:

- Defining the research questions
- Defining the search keywords
- Screening and filtering the study results
- Applying criteria of exclusion
- Amalgamating the relevant literature

First of all, the research question(s) were formed. Then, the chosen databases for the research are referenced, along with the search terms and lastly the criteria used for study evaluation and selection are mentioned. As a final step, the filtered and chosen publications are presented.
Firstly, the research question was defined and then the search terms. The basic problem that this study aims to address is about revealing the barriers that hinder future professionals receive from the state the educational background, concerning digital skills and competencies, to become employable in the competitive labour market during the digital transformation era.

Research Questions:

- How are digital skills and competencies defined in the context of higher education?
- Which are the types of (digital) skills in need to become employable?
- What opportunities and obstacles does the young generation face in order to develop these skills within a university or training system context?

Regarding source selection and electronic databases, Scopus and Web of Science (WoS) were chosen to conduct the systematic literature review, as international multidisciplinary academic literature pre-sets them as the principal databases to consult (Aghaei Chadegani et al., 2013). In order to answer the research question, a query/search string was created using the Boolean operators AND and OR, to integrate in each database accordingly:

- WoS: TS=((“digital transformation*” AND “digital skill” OR “employability* OR competenc*”) AND (“education”))
- Scopus: TITLE-ABS-KEY ( (“digital transformation*” AND “digital skill” OR “employability* OR competenc*”) AND (“education”))

The process of literature selection was repetitive and multi-layered. For the purpose of finding relevant studies, the chosen terms, were primarily traced to titles, keywords and abstracts, concerning academic literature published between 2016-2022. Additionally, only published articles or review articles written in the English language were chosen. Initially, a total of 463 relevant pieces of literature, where both qualitative and quantitative research methods were used, as well as theoretical and conceptual approaches, and some of them followed mixed methods of various European countries and types of higher education and training programs were screened for the analysis process. After performing the data extraction, an Excel database was created to input the results.
From the initial 463 papers: 361 document results in WoS and 102 in Scopus, 55 articles were duplicates and they were transferred to a new Excel sheet. Ultimately, 408 articles were examined to discover if they met the inclusion criteria (Table 2).

Table 2. Inclusion and exclusion criteria

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<th>Inclusion &amp; exclusion criteria</th>
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<td>Inclusion Criteria:</td>
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<tr>
<td>➢ The research work is related to the digital competence of teachers or students in the context of higher education.</td>
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<tr>
<td>➢ The publication are included in high-impact journals</td>
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<tr>
<td>➢ Research papers are published between 2016 and 2021.</td>
</tr>
<tr>
<td>➢ The research papers are written in English.</td>
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<tr>
<td>➢ The research papers have been published after being submitted to a peer review process.</td>
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<tr>
<td>➢ The research follows the appropriate structure of research according to the research method.</td>
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<tr>
<td>Exclusion Criteria:</td>
</tr>
<tr>
<td>➢ The research work is not related to the digital competence of teachers or students in the context of higher education.</td>
</tr>
<tr>
<td>➢ The publication does not include the state of the art on digital competence. Research papers are not published between 2016 and 2021.</td>
</tr>
<tr>
<td>➢ Research papers are not written in English.</td>
</tr>
<tr>
<td>➢ Research papers have been published without a peer review process, such as early access or review.</td>
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<tr>
<td>➢ The publications do not follow the appropriate structure of a research according to the research method.</td>
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Next, 80 articles were read more sedulously and filtered based on quality criteria to secure that the inclusion and exclusion criteria were applied correctly and were adequate to answer the research question. The quality criteria revolved around whether the scientific studies described clearly the concepts of digital skills and competences, the research objectives and design were also precisely defined. Also, the mediums and samples were efficient to provide answers, while research conclusions limitations and lines for future research are thoroughly indicated.
Table 3. Quality criteria

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<th>Quality criteria</th>
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<tr>
<td>Quality Criteria:</td>
</tr>
<tr>
<td>➢ The concept of digital skills and competencies is clearly defined.</td>
</tr>
<tr>
<td>➢ The research objectives are specified in a clear and precise way.</td>
</tr>
<tr>
<td>➢ The design and mediums/instruments of the study can meet the objectives.</td>
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<tr>
<td>➢ The description of the samples and population of the study is clear and quantitatively sufficient to be analyzed.</td>
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<tr>
<td>➢ The research questions are answered sufficiently.</td>
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<tr>
<td>➢ The conclusions are result-based and clearly described.</td>
</tr>
<tr>
<td>➢ The authors analyze the problems and limitations of the research.</td>
</tr>
<tr>
<td>➢ The authors make suggestions for enhancement of the digital competence in higher education or training programs</td>
</tr>
<tr>
<td>➢ The authors provide lines of future research.</td>
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As a following of the literature filtering, using the criteria to exclude irrelevant material, 56 were excluded and the chosen literature of 17 articles was synthesized to answer the research question. In Fig.9 the PRISMA flow presents the procedure of data extraction and filtering.
4. CASE STUDIES OF 3 COUNTRIES: DENMARK, SPAIN, GREECE

4.1 The Cases of Finland & Spain: Overview of the Countries’ Digitalisation Efforts with regards to Human Capital

Apart from the theoretical infrastructure, some European countries have taken some serious steps during the digital transformation journey of education. The pandemic worked as the enabler of initiatives that lead European countries to establish practices in favour of DX, on a national level. One of the countries in the European continent that applied good practices related to digital education and advancement was the case of Finland. Actually, Finland ranks first in the European Commission’s 2022 edition of the Digital Economy and Society Index (DESI), among other 27 member states. The country is a leader in Human Capital and in Integration of Digital Technology, ranks second in Digital Public Services and is placed in the 8th position in Connectivity.
It is notable that more than 79% of the population acquire basic digital skills, almost reaching the 80% of EU Digital Decade target. What is more, 48% of users acquire advanced digital skills, while the share of ICT specialists is 7.4% and ICT graduates is 7.5%, almost doubled compared to the percentage of EU average of 3.9%. The government of Finland puts a lot of emphasis on the development of citizens’ digital skills and competencies. Being a pioneer on education, the Ministry of Education and Culture introduced the new literacy programme 2020-2022 to enhance the acquisition of skills and competences related to ICT, media literacy and programming. The programme was launched after the special grant that the Finish government awarded to 46 projects the drafting of the competency descriptions 2021-2022. Furthermore, they also emphasized on early childhood education and pre-primary, primary and lower education by awarding to 22 and 24 providers grants. Regarding higher education, in 2021 all of the HE institutions signed a compact of joining the long-term project of Digivision, with a provided grant of 20 million euros from the Ministry of Education & Culture [Digivision, 2021]. All 38 institutions have committed to building a digital future that enhances learning, teaching, and upgrading the higher education system and continuous learning, as well as the employment of Finish citizens both on a national & international level. By 2025, it is estimated that the educational ecosystem being built, will be ready to offer all of its services to students and learning institutions. As mentioned in 2.2 chapter, in order to close the gap between future professionals and the labour market, it is quite essential that schools, universities and business are connected. LUMA center, a science education network of higher
institutions in Finland, aims to inspire students to study STEM sciences by interconnecting students, educational institutions, from the early childhood to universities, and businesses. The use of contemporary pedagogical methods, along with educators’ life-long learning and research-based learning, intends to maintain a respectable share of science and technology experts.

Although the COVID-19 pandemic compelled the education system into online learning and teaching, Finland was already prepared. The world-class Finnish education system offers to students, in all grades of basic education, the tools and knowledge to develop their digital and ICT skills. Based on the new core national curriculum, the aim is to empower pupils with seven transversal competences that promote a set of soft, hard and digital skills needed in future. Finland aspires to create an inclusive and diverse education culture that encourages learning, participation, well-being and sustainability in the way of interacting and living, having safety as a priority (Finnish National Agency for Education).

Through the Youth Skills (ySKILLS), an international research project an attempt to reveal the essential skills for children and youth to thrive in the digital environment is made. At the same time as we dive deeper into the digital environments, socio-emotional are sparked. Curiosity, determination and co-operation skills are of great importance for children to develop digital skills and feel comfortable using them.

Figure 10. Transversal competences as part of every subject; adopted from Finnish National Agency for Education, 2022
Strategies that can be helpful and protective to children, schools, parents, as well as policymakers and regulators are suggested, in order to enhance the digital competences development. The child-centric and inclusive approach of the project is an effort to better comprehend and measure the digital skills and predict how the ICT use and environments can impact children’s cognitive, mental and social prosperity (Yskills, 2022)

The governmental plan for digital development has included initiatives like “Elements of AI”. A series of free online courses, both theoretical and practical, aiming at the education of Finish citizens of what is artificial intelligence, the potentialities and opportunities available thanks to the application of AI technologies, such as machine learning and neural networks. Designed by the university of Helsinki and MinnaLearn, a professional training and coaching, online learning platform in order to demystify AI, the programme is addressed to users without a mathematical or programming background, being available in 22 EU countries and translated into its country’s official language. It is impressive that in 4 months, 90,000 registrations have been recorded from 80 countries and at this point the enrolled users have exceeded 850.000 from 170 countries and 40% of participants are women. [University of Helsinki, 2022]. More than 1% of Finnish population (55.000 users) has been trained on the basic concepts of AI and over 25% are over the age of 45. Furthermore, there are more than 250 high profile companies engaging in the programme in order to strengthen and empower the skills of their labour force, Lastly, as a recognition of the new skills acquired, the “Elements of AI” offers 2 ECTS credits via the University of Helsinki Open University for people who live in Finland. As a result, since 2018 the share of people applying for the Master’s Program in Data Science offered by the University of Helsinki has increased by 79% [Reaktor, 2022].

In 2020 the Finnish Parliament presented the continuous learning reform. Due to the penetration of digital technologies, along with the constantly changing needs of the labour market, approaches that encourage continuous learning were adopted, so as to multiply the opportunities of working-age people to upgrade their skills and competencies and develop new ones. Via this reform, the active labour force can survive in this ever-changing digital world and also the availability of skilled professionals is protected. The Ministry of Education and Culture co-operated with the Ministry of Economic Affairs and Employment and launched a digital service where education and training, guidance upon the labour market and a variety of online services
are all interconnected on a platform that promotes continuous learning (Ministry of Education and Culture, 2020).

Another fruitful collaboration between the Ministry of Education and Culture and the Ministry of Economic Affairs and Employment is the Do Digi Forum. Among other goals, the promotion of digital transformation and the development of digital skills and competencies are distinguishing. This initiative is linked to the National Coalition on digital skills and jobs by the European Commission (TIEKE, 2022).

Digital transformation has become a national-level endeavour. Finland has entered the orbit of the digital future and since 2021 has been consistently implementing strategies with the vision of creating skills and competencies for a bright technological and digital future for Finnish people. As a result, both economy and subsequently the high standard of living in Finland have been improved. Work culture and well-being at work also play a great role are also of high importance. With the vision of making Finland a leader in well-being at work and the development of working life innovations, the Work 2030 programme was brought together under the responsibility of the Ministry of Social Affairs and Health. The goal of the development programme is to reform working cultures and operating practices accelerated by the wise use of emerging technologies (Ministry of Social Affairs and Health, 2022).

While Finland is conquering the DX, there is also another country that presents interesting results. Spain, a Mediterranean country has managed to climb to the 7th place in the DESI rankings, a score above the European average. Although the country’s Connectivity is ranked in the third position, there is still a need to bridge the gap of connectivity between urban and rural regions. The central public administration of Spain, on the strength of following a digital-by-default plan, has managed to offer substantial Digital public services and climb to the 5th position. On the other hand, Spain has managed to over-perform, especially compared to last year (16th place), on integrating digital technology, as the country acquires 11th place out of 27, maintaining the same levels as the European average. Even though the online sales of small and medium enterprises have grown, especially during the COVID-19 quarantine (...) , they are still not making good use of emerging technologies, such as AI, cloud services, and big data. Lastly, concerning our area of interest, Human Capital there has been a steady improvement during the last few years, placing Spain in the 10th position.
Digitally skilled citizens on a basic level cover 64% of the total population, slightly above the average of Europe. Undoubtedly there is still room to improve in order to reach the European target of 80% by 2030. The biggest problem in Spain is related to the lack of ICT specialists, where the employed ICT specialists’ share is 4.1%, below the European average of 4.5%. Also, ICT graduates reach only 4%, while only 1% of women acquire ICT positions, a low percentage that has not changed for the last 4 years. Consequently, even though Spain’s performance is getting better, the fact that there is a lack of basic and advanced digital skills in the overall population works as a burden for a seamless digital transformation (2025 Digital Spain).

Spain’s Recovery and Resilience Plan (RRP) brings into focus the need of strengthening the digital skills of the Spanish population, which along with improving the digital connectivity & deployment of digital technologies can benefit the growth of the digital economy and competitiveness both on a national level, especially for small and medium businesses, and international level.

The solution to aid the vulnerabilities of Spain was given through the introduction of Digital Spain 2025, the agenda for Spain’s journey of digital transformation, aligned with the European Commission’s policies. There are ten pillars of interest: Digital Connectivity, 5G Technology Boost Strategy, Digital Skills, Cybersecurity, Public sector transformation, Digital transformation and entrepreneurship, Sectoral digitization tractor projects, Focus on investment attraction and audio-visual talent, Data economics and artificial intelligence and Digital rights. The Ministry of Economic Affairs and Digital Transformation, under whose supervision the programme is running, has concentrated on strengthening the digital skills of citizens and the workforce. It has been mentioned before that, in order to close
the digital gaps, it is quite essential to provide digital skills and competencies from a very young age, as the young generation is more likely to understand and learn everything that has to do with digital technologies and skills, since they were born and exposed in a digitalized environment (Livingstone et al., 2021).

Similarly, Spain is investing in the digital skills of students and is fostering digital professions by introducing the Digital Education and Uni-Digital Plan. Firstly, the initiative of Digital education was introduced during the academic year of 2020-2021 and it is planned to allocate 260 million euros to provide publicly owned centres with technological devices and enhanced connectivity, with the vision of closing digital educational gaps, such as technological accessibility, productive usage of digital tools by groups who tend to become marginalized due to age or socio-economic criteria and training to develop and use of technological tools related to the ICT field. The Uni-Digital Plan has received an investment of 76.85 million euros, with the aim to prioritize digitalization processes in HE, modernizing the educational system, methods and digital equipment, so as to increase the rate of digitization of the university system by 10% until 2025, in comparison with the rates of 2019. Via increasing the courses related to digital skills and upgrading existing courses,

Another initiative that aims to aid the increase of digitally skilled citizens and professionals, is the National Plan for Digital Skills. One of the lines of action focuses on the digitalization of education and the development of digital skills. The government is accommodating schools and students with digital media, with access to educative material and open resources that enable the development of advanced digital skills. A great example of projects that promotes the use of emerging technologies in schools is the “Aggregate”, a federation of nodes that encourages the educational community to create and share digital educational content. Also, schools and colleges will be given the infrastructure and guidance to create and implement their own digital plan. Moreover, the incorporation of digital skills and programming into the compulsory education curriculum, as well as into the vocational training programmes, will increase the supply of ICT professionals and meet the demand for ICT specialists.

Also, the government is trying to enhance the active professionals and ICT specialists, especially the SME workforce, with in-demand digital skills through the National Digital Competences Plan following seven action lines: 1) digital skills training, with special emphasis on population groups at risk of digital exclusion; 2) bridging the digital gender divide; 3) digitalising the education system and developing
digital skills for learning; 4) digital skills training throughout working life [focusing on the working population in the private sector and the unemployed]; 5) digital skills training for public sector workers; 6) digital skills training for SMEs; and 7) increasing the supply of ICT specialists [via vocational training and university education] (DESI SPAIN, 2022). The program is funded by the European Social Fund (EFS) and also the Digital Europe Programmes (DIGITAL) with 3.59 billion euros.

In Spanish primary education, digital competences are included as a cross-curricular theme and is integrated into other compulsory subjects (EIT Digital, 2022). Neither coding or digital skills are obligatory educational subjects, there are several attempts that the Ministry of education is promoting digital skills training and programming from the early childhood. The School of Education and Artificial Intelligence is an example of such attempts. This project is designed to provide open educational training and sources that Spanish teachers so that they integrate robotics and programming into their teaching methods.

Last but not least, AMETIC, the business association for the digital industry, oversees the Spanish Coalition of Digital Skills and Jobs. The coalition brings together 200 stakeholders (businesses, public authorities, training facilities, and universities) who are actively working to promote digital skills and close the demand-supply gap for ICT specialists in Spain. Members of the Coalition are also involved in project of the Digital Skills Hub, which was introduced as part of the National Digital Competences Plan to endorse the government’s effort to develop and monitor the policies related to digital skills.

4.2 The case of Greece: Overview of the country’s digitalisation efforts

According to the Digital Economy and Society Index (DESI), Greece ranks 25th of 27 EU Member States in the 2022 edition (European Commission, 2022). Despite the low ranking, Greece has shown better progress in recent years in relation to other member states, which can be interpreted as a signal that the country might be catching up.
According to the DESI Greece Report of 2022, the domain in which Greece has scored the biggest progress is connectivity, and more specifically, in Very High-Capacity Networks (VHCN) and 5G coverage. Despite this progress, in the same domain, the take-up of at least 100 Mbps fixed broadband still remains quite low, at 9%, when the EU average is 41%, and the coverage of the 5G needs to be improved if the country is to ensure high-speed connectivity for all its territory. The second-best domain of Greece is Digital Public Services, where the percentage of active users of e-government services has increased since last year by 2% to 69% when the EU average is at 65%. Regarding the Human Capital Domain, the number of people with at least basic digital skills has improved to 52% approaching the 54% of the EU average. The integration of digital technologies into the business activities index seems to be problematic, with only 39% of SMEs having at least a basic level of digital intensity, scoring far below the 55% of the rest of the EU, even though scoring high in the online sell of services with 20% compared to the 18% of the EU average.

Regarding changes to internal legislation and guidelines, on 5 July 2021, the 'Digital Transformation Bible' became state law, an initiative of the Ministry of Digital Governance setting out the strategic roadmap for Greece's digital transformation for the next five years (gov.gr). The strategy consists of six pillars: connectivity, digital skills, digital state, digital business, digital innovation, and integration of digital technology.
in every economy sector. The country also published its Operational Programme for the Digital Transformation (2021-2027) under the EU cohesion policy in October 2021, intending to help the implementation of the strategy's pillars (Greek Ministry of Digital Governance, 2021). In broader terms, the country also participates in a wide spectrum of European initiatives and programs, such as the Technical Support Instrument (TSI) and the Research and Innovation funding program Horizon 2020, that contribute to the country's digital transformation.

Furthermore, as was the case for many EU member states, the COVID-19 pandemic helped boost the digital transformation of public services. More specifically, the country's main service is the single 'Gov.gr' portal, with more than 1.370 digital public services. Also, an interesting figure is the number of digital transactions, which grew exponentially, with 566 million compared to 94 million in 2020. Within the context of the Technical Support Instrument (TSI) 2022, 'Gov.gr' stands at the centre of a new integrated, shared digital public service ecosystem with the next generation of the single digital gateway.

Additionally, many initiatives are underway regarding the reskilling and up-skilling of civil servants to ensure and promote the utilization of advanced technologies in the public sector. The expected EU cohesion funds and the recovery and resilience plan (RRP) will progress the enterprises' digitalization, which remains slow. Moreover, in 2021, Greece participated in the Digital Europe Programme call for European Digital Innovation Hubs with the objective to improve digital skills, support and enhance digital innovation, in particular by supporting SMEs and High-Tech Start-ups with the establishment of Artificial Intelligence (AI) centres.

In December 2020, the National Cybersecurity Strategy (2020-2025) was published, constituting an umbrella strategy that covers all important and critical sectors and includes a series of actions under the flagship activity program. The catalyst for the quick strategic actions and restrictive measures seems to be the Russian invasion of Ukraine that furthered the (i) the development of a framework to promote excellence in cybersecurity, (ii) the increase of the readiness and alerting level of critical infrastructure and take all related measures, such as daily security alerts, (iii) the design of a Monitoring Centre for the Critical Infrastructures - Security Operations Center – SOC, and (iv) the full operation of the protection system regarding governmental web sites. The Hellenic Telecommunications and Post Commission (EETT) also took
appropriate measures, in cooperation with the providers, to ensure the suspension of the retransmission of two Russian channels abiding by the EU guidelines.

For all DESI indicators, the measures outlined in the strategy for the digital transformation of Greece are starting to show tangible improvements for people across the country, particularly the digitalisation of public services. However, vigilance is required to ensure the swift implementation of the major plans currently in force as it will increase digital opportunities at the national level and contribute to the achievement of the Digital Decade targets.

![Figure 12 DESI 2022 – Relative Performance by Dimension](image)

*Adopted from European Commission (2022)*

### 4.3 Greece’s Rankings regarding Human capital

Looking at Greece’s rankings regarding Human Capital, the country is the 22nd of the 27 member states with scores far below the EU average. Looking at the indexes more closely, 52% of Greeks (aged 16-74) have at least basic digital skills compared to the 54% EU average. Despite this percentage, if the category is more closely analysed, the age group of 16-24 with at least basic digital skills ranks very high, with 88% compared to 71% of the rest of the EU. The percentage of ICT specialists slightly progressed but still remains low at 2.8 % compared to the EU average of 4.5%. However, it is hopeful that the proportion of women ICT specialists (21%) is above the EU average (19%). Lastly, only 12% of enterprises provided ICT training to their employees in 2020, compared to the EU average of 20%.
One of the main goals of the country’s Digital Transformation Strategy is to equip people with digital skills (Gov.gr). In order to advance this goal, the Ministries of Digital Governance, Education and Religious Affairs, and Labour and Social Affairs produced a strategy for digital skills with three targets: to enhance digital knowledge, to consolidate the National Academy of Digital Competences (National Academy of Digital Skills), and to strengthen the Greek National Coalition for digital skills (national coalition). The strategy aims to create links between stakeholders in the fields of education and employment and public sector officials to facilitate their working together and improve digital skills. More specifically, the focus of the strategy is on vulnerable groups (people with disabilities, older people, etc.) and groups that face particular difficulties in entering the labour market (women, the unemployed, conscripts, etc.). By the end of 2022, Greece plans on announcing its Digital Skills Strategic Plan aimed at enhancing the digital skills of the population to make people more active members of the digital economy and society with a special focus on Digital Citizenship.

Table 3 Comparison of Greece’s Rankings to the EU Average regarding DESI’s Index of Human Capital; Adopted from European Commission (2022, p.6)
Moreover, the National Academy of Digital Competences, founded in 2021, has the aim of constituting the national portal for all digital training providers, both public and private, hosting, at the moment, approximately 300 courses and aiming to augment its collection of online courses as a way to enable everyone in the country to acquire basic, intermediate, and advanced digital skills. Under this framework, a self-assessment tool is also provided in order for people to be able to determine their individual learning paths. Adding to that, the Ministry of Digital Governance is processing a national digital competence framework and a certification system for digital skills in line with the European digital competence framework.

As it was mentioned above, several measures for the upskilling and reskilling of the labour force were introduced since 2021. More specifically, two of them were an initiative of the Hellenic Manpower Employment Organisation (OAED): (1) a training course on cloud technologies for the unemployed with two phases, one for unemployed people with IT knowledge to be trained as certified trainers in digital cloud technologies, and then, during the second phase, the online training will be made available to a wider group, and (2) a programme to help provide 5,000 unemployed young people with work experience.

The improvement of digital skills (both basic and specialised) of civil servants is also a priority for the Ministry of Digital Governance, which, together with the Ministry of Interior and the National Centre for Public Administration and Local Governments, as part of the National Coalition for digital skills organise training programmes to upgrade the digital skills of civil servants. One of the targets of this attempt was for a total of 3,000 civil servants to receive training between December 2021 and June 2022. The RRP outlines several other measures to improve digital skills as is, for example, the 'Digital skills upgrade programmes for conscripts' project to be launched in 2022, training 150,000 conscripts by 2025.

Many of the programmes planned, including projects presented in the RRP, will contribute to the digital transformation of the education system in Greece, once fully implemented, by improving (i) the digital equipment and content in schools, (ii) the professional development of teachers, and (iii) the development of digital services in schools and universities. For example, during its first phase, the "Digital Access" (Psifiaki Merimna) project issued more than 500,000 vouchers for students from low-income families in 2021, including 53,445 for higher education students to buy 
electronic devices. The second phase of the programmes also includes the purchase of digital devices by all public-school teachers.

Regarding the efforts being made to enshrine digital skills in students, the Ministry of Education and Religious Affairs is also continuing the revision of the curricula, which started last year. The curricula for primary and secondary schools, developed by the Institute for Education Policy (IEP), will now promote computational thinking and programming. During 2021, 166 school curricula for primary and secondary education were upgraded, adopting a learning-outcomes-based approach. The new school textbooks are expected to be available to students in 2023, accompanied by digital resources and tools. From 2021 to 2022, a new educational tool was developed and implemented at the national level, the 'Skills Labs', in primary and secondary schools aiming at further developing pupils' advanced skills. Teachers introduce pupils to coding and programming and advanced technologies such as AI, blockchain, the Internet of things and robotics. In 2021, participation in EU Code Week continued to grow. Greek schools were more active than ever, with 95,700 people participating in 2,283 activities organized at 97% in the country's schools, percentages that place Greece among the most active countries (CodeWeek).

Moreover, through the T4E (Training for Educators), a large-scale intensive program, more than 82,000 teachers were trained for the necessary digital competencies, as is the use of digital platforms and tools (T4E). The IEP has also embarked on numerous professional activities for teachers, providing more than 125,000 training sessions in 2021, and launching a one-stop-shop digital platform for this purpose. All these efforts seem to help propel the country in the right direction, a fact that was certified by a survey by the Bertelsmann Institute published in December 2021, testing the preparedness of the educational system to switch to remote learning for OECD and EU countries, in which Greece was 6th, 16 places above its previous ranking (Schiller et al., 2021).

Regarding higher education, the Ministry of Education and Religious Affairs has launched specific measures as a means of achieving the target of 20 million ICT specialists. More specifically, conversion courses on reskilling and upskilling in digital studies and advanced technologies are being developed targeted at university graduates. Furthermore, several initiatives have been launched through the National Strategic Reference Framework (NSRF) as well as the RRF. Some key digital services for higher education students and teachers for 2021 include ATLAS, a centralised online service
to interconnect companies offering internship positions with all academic institutions in Greece (ATLAS), and a project to interconnect the information systems of the higher education institutions (HEI) Career Offices and the Hellenic Authority for Higher Education (HAHE) to facilitate information and good practices exchange. Adding to that, during 2021, 25 university projects participated in the action "Provide digital equipment to support university students and staff for distance learning due to COVID-19 pandemic", and the country also adopted a law introducing 19 "Centres of Excellence" at the Greek HEIs rewarding best quality and innovation practices in Higher Education.

Lastly, during 2021, the interaction between industry and the labour market has been strengthened through the founding of the National System of Vocational Education, Training (VET) and Lifelong Learning contributed to the mapping of labour market needs at the local and national level. In addition, Model Vocational Lyceums (EPAL) have been introduced together with new experimental and thematic vocational training institutions. Among the key reform initiatives regarding VET are the establishment of national and regional councils (The National Central Council of Vocational Education and Training (KSEEK), the Regional Councils for the Connection of Education with Production and the Labour Market in each region of the country, (SSPAE) and investments across all levels of VET (communication campaign for raising awareness on Vocational Education 2020-2027 to Greek society, and upgrade of all laboratory centres which is among the RRP measures).

Summing up this analysis, it is imperative for the country to step up its efforts in order to develop the digital skills of the whole population, especially if the end aim is the creation of an environment where everyone is empowered and feels digitally safe, contributing significantly to the Digital Decade target of 80% of the population having at least basic digital skills in the EU by 2030. Similarly, a strong push to increase the number of digital experts will allow Greece to reap the full benefits of the digital transition in all sectors of the economy and contribute to the Digital Decade target of 20 million ICT specialists in employment in the EU by 2030.
5. RESULTS AND DISCUSSION

5.1 Results of Literature Review

Businesses can benefit from revitalizing their client interactions as well as their business operations by undergoing digital transformation. When it comes to the management of a digital workplace, industry executives and academicians alike acknowledge that leadership abilities and technical skills are complementary to one another. Philip & Aguilar (2022) used an activity in the classroom that was delivered over the course of numerous semesters in an effort to get a sense of how students see the leadership abilities and competencies that are necessary for successfully guiding a business through a digital transformation. According to the findings, younger generations acknowledge that conventional leadership abilities, in addition to digital literacy, are essential components of a successful corporate leader's toolkit. They discuss the necessity of enhancing business management curriculums at both the graduate and undergraduate levels in order to give students the opportunity to investigate and build leadership abilities that will allow them to acquire those leadership skills that we allow them to thrive in a complex digital working environment.

According to Monteiro & Leite (2021) a consequence of COVID-19 pandemic was the inability of physical-space classes and in person tutoring to take place, which led to the abrupt digitalization of educational institutions. This unprecedented situation highlights the necessity of rethinking both the opportunities and the barriers for the growth of digital skills of students and the younger generation. A study was developed that aimed to identify the digital competencies of university students along with revealing how digital literacy impacts the flourishing of personal as well as social abilities and skills. The digital literacy framework developed by Martin and Grudziecki (2006) worked as the basis for the design of the research. An online questionnaire was developed for the collection of data during the very beginning of HEIs closures due to COVID-19 in Portugal. The findings indicate that a nearly universal command of search and data editing abilities exists, alongside a more limited capacity for creating and developing of innovative digital solutions. According to the majority of students, before the COVID-19 outbreak, the digital tools were utilized mostly for communication inside institutions and between classmates, while no interest was expressed in improving skills related to lifelong learning and networking. The inadequacy of a
respectable share of educators to adapt and involve using the current pedagogical mediums and support, acts as barrier for the successful implementation of digital transformation in higher education.

One of the greatest challenges that businesses are called to overcome is figuring out how to capitalize on the potential presented by newly developed information technology. There is a broad need for professional with leadership and entrepreneurial skills who can make good use of the opportunities that emerging technologies are presenting and create new, competitive business models, in order for organizations to seamlessly implement digital transformation. Gilli et al. (2022) by screening 239 job advertisements addressing candidates with expertise in digital transformation, examined the skills and characteristics required, in order to present empirical evidence concerning the seeking competencies related to the management and exploitation of digital transformation. According to the findings of their study, low is the importance of both technical and in-depth mastering of information technologies among the requirements of those job advertisements. In reality, experts in digital transformation, like any other process of strategic change, should largely possess the abilities of cooperation, strategic thinking, leadership, customer orientation, and communication. Furthermore, the analysis of the authors demonstrates the prominence of personality characteristics, along with the common required skills. These traits include proactiveness and creativity, both of which are frequently mentioned explicitly in job advertisements. Communication skills and strategic thinking, as well as cross-functional team collaborating and customer-oriented mentality are highlighted among a numerous list of 21st century skills. They are mentioning those experts as “digital leaders” who are called to demonstrate a blend of technical, cognitive and non-cognitive skills as they have to lead and balance between teams of technology, business and HRM professionals. In the end it is the human factor and not technology alone that drives digital transformation, and in parallel professionals with sculpted leadership skills, and not only technical and technological competencies, that can provide solutions to contemporary businesses and organizations through their digital transformation journey.

The implementation of new technology, the adaptability of the human factor in accordance with the utilization of organizational and pedagogic factors in a comprehensive and holistic manner, supports and serves as a compass throughout the process of digitally transforming teaching methods and procedures. One of the goals
meant to get achieved via Education 4.0 is the provision of technical, cognitive, interpersonal, social, and technological abilities, necessary for students so as to meet the demands of the Fourth Industrial Revolution. Katyeudo & de Souza, (2022) developed and experimented with the TADEO method, an acronym that stands for "Transformação Digital na Educação" in Portuguese and translated into digital transformation in education. The TADEO method was used in basic subject classes in elementary and higher education to help students better understand climate change through the creation of projects that would reduce environmental issues brought on by human activity while also preparing and helping them develop the soft and hard skills necessary for 21st-century. In order to achieve this, teaching and learning experiences were created using a combination of the forces driving digital education transformation, taking into account the context and individual characteristics of both students and teachers. The study underlines those high levels of interest, motivation, and improved academic achievement can steam from a curriculum that emphasizes finding solutions to real-world challenges while the digital transformation of education can be realized only through the comprehensive application of distinct types of drivers like pedagogical, technological, organizational and mostly human and not just via digital technology.

The topic of digitalization in higher educational institutions has risen concerns for a substantial number of educational stakeholders. The ability to both use digital tools and deploy a digital skillset is becoming increasingly essential in many aspects of our lives, especially in a contemporary business environment. In order for the younger generation to be able to respond to this demand, it is crucial that education systems prepare them accordingly. One of the primary goals of educational institutions, and especially universities is to start redesigning their curriculums aiming at the training and shaping of future professional with leadership and especially information literacy skills, who can manage challenging problems and provide solutions. Moreover, the educational technology breakthroughs in HEIs are a subject of thorough research and discussion, with a variety of regulations, projects, and strategies being suggested as potential solutions. Although for the majority of the younger generation digital technology is more than familiar, there are still substantial digital gaps and mediocre educational preparation that have a negative impact on the future workforce being employed in a digital society. As a result, there is a dire need for HEIs institutions to
undergo a digital change in a holistic way, to prepare students for a fully digitalized world and meet the expectations of the future digital society.

Akour & Alanezi (2022) focused on the results of the compelled digital transformation that higher education institutions had to undergo due the COVID-19 pandemic, pointing out that HEIs must assure the inclusion of pedagogical strategies for fostering digital literacy among students and teachers in higher education. Moreover, concerns are being expressed regarding the digital divides and the absence of the emerging technologies from the curricula of higher education, which leads to scarcity of employable graduates and high rates of unemployment. Government funding cuts will result in public universities' budgets contracting, and the current unpredictable economic environment is causing institutions to lose students. The universities are in need of upgraded IT infrastructure, as they currently have to limit their capacity to fully embrace the digital revolution, and financial investments are more than necessary to tackle such problems. In order to prepare students for the changing culture of institutions, the educational system must reassure that they provide sufficient guidance and apply a skill-based model of education, which promotes lifelong learning. By digitally transforming educational system and processes, the improvement of learning and teaching operations will be extremely beneficial to all parties. On one hand, students, along with HEIs will have the knowledge regarding the required skills and competencies essential in a constantly evolving digital workplace due to extreme technological advances and automation. Also, HEIs can meet the expectations and tailored learning experiences of students thanks to innovative technological tools. On the other hand, the institutions will reconsider the way they educate young generation to deploy those skills, by offering upgraded courses focusing on technical, cognitive and soft skills, in parallel with knowledge-based, and digital competencies. Digital transformation will force universities to apply approaches that foster interdisciplinary, comprehensive, and team-based strategies. Hence, universities will shape a society of digital learners, with social and emotional intelligence and a skillset of leadership, digital and technical skills that will allow them to survive in a knowledge-based ecosystem of work. To support and exploit digital revolution, educators, administrators, and students must work together, while a culture of participation must also be promoted.

Twenty-first-century organizations require dynamic and different employee competencies as a result of digital transformation. Given these circumstances, it becomes more crucial for employees to actively upgrade their skills and talents.
Although employees’ perceptions concerning the cultural and organizational changes of businesses may play a significant role in their motivation to engage in such beneficial activity, they have been largely neglected by the developing studies on the development of employee proactive skills. Ostmeier & Strobel (2022) attempt to fill this knowledge gap by applying the cognitive-affective personality system (CAPS) theory to clarify how employee behavior is impacted by macrolevel growth. By surveying twice 710 graduates of various organizations and industries who have graduated from HEIs along with analyzing existing data on the digital maturity of the industry, they concluded that there are beneficial indirect impacts of industry digital maturity on proactive skill development, which are thought to be produced by employees’ perceptions of digitalization as a manageable process and a business opportunity for the organization they work for. Organizational managers could purposefully design employee communications on the effects of macrotrends, e.g., digitalization for their organization in order to foster skill development among employees. Concerning what was previously mentioned, they could imitate the strategies employed by similar organizations to realize their strategy. As a result, this could affect how employees perceive things, which could help managerial communication goals of encouraging personal skill development. Ostmeier & Strobel research focuses on recent college grads, thus its findings could be proven useful when developing HR strategies for this generation future workforce and in the end, boost employees' motivation to actively and continually improve their knowledge and abilities.

The revitalization of the global economy is significantly aided by the application of digital technologies. The European Union has committed to both providing support for economic recovery and resilient digital change. The worldwide coronavirus pandemic brought to light the lack of Slovakia’s digitalization, as well as the lack of literacy of its population and poor digital communication between citizens and national governmental authorities. Sfokova et al. (2022) research underlines the importance of the digital skills and their inclusion to strategies of educational reform, on a national and international level. Acquiring skills in information and communication technology, undoubtedly enables the professional success of citizens. What is more, one of the key components of eGovernment is digital skills, which allow citizens to use the services to communicate with the government. The necessity of communicating via the Internet, various e-based applications, and has increased as a direct result of both digitalization and globalization. The ongoing turmoil is having an
impact on the citizens' ability to access online services. The authors analysed indicators of digital economy, such as the e-Government digital skills index (EGDI) and the digital economy and society index (DESI). The analysis shows a stagnation during the period of 2018-2019 in fundamental digital skills, while the year 2020 was characterised by a tremendous drop of the citizens’ digital competency. E-Government Digital Index is the next index. Another index that is put under the authors’ microscope is the E-Government Digital Index, where human capital and digital skills are examined. By building a questionnaire survey addressing the Slovak citizens, Stofkova et al. (2022) gathered data in order to analyse and identify the digital abilities of citizens in the context of the growth of e-Government, as well as to describe the use of e-Government services by EU citizens, with a particular emphasis on the Slovak Republic. According to the results of the survey, the vast majority of schools in Slovakia provide only a small amount of assistance (45%) for digital education, which is far below from the average for the EU-27, which is 68%. The study also found that young people have a lower level of digital literacy, which is essential to become employable in the labour market. The Ministry of Education, Science, Research and Sport of the Slovak Republic has adopted an action plan for 2019–2022 to improve the results in the DESI index by 2025 and focus on the digital skills that are required by employers, nevertheless the authors highlight the importance of initiating innovative, inclusive and personalized programs to assist students in elementary and secondary schools in the development of their soft, technical and digital skills via the incorporation of new technology into classroom. Such actions will prepare students for the demanding digital workplace and personal growth, reduce the levels of unemployment, boost the economy and finally upgrade the living standards.

The foundation of digital citizenship lies under the digital literacy and efficiency of civilians not only on a personal, but also on a professional level. Students are expected right after their graduation to acquire a complete set of skills and competencies encapsulated under the umbrella of digital literacy. As a consequence of the coronavirus pandemic, educational systems all around the world were forced to the digitalization with a number of disruptive adjustments. Tejedor et al. (2020) chose three different countries: Spain, Italy, and Ecuador to research and introduce a comparative study of how its countries’ higher education systems endured the lockdown in the context of digital literacy growth. A quantitative method with an exploratory-correlational scope was taken for the methodological approach of the study. The medium to collect the data
was a questionnaire distributed to 376 students. Four dimensions were particularly studied: “Teacher’s professional engagement and collaboration”, “Digital learning and sources”, “Teaching and teacher’s guidance and skills”, “Supporting-empowering students”. The findings emphasize on the importance of improving key areas such as the digital literacy and readiness of the teachers to interact in a digital education system, re-invented and adaptable learning resources that could be integrated in educational institutions, student-university communication, and teaching methods that are suitable for the contemporary learning environment. In light of these findings, the authors suggest that higher education should be re-examined and the key components of this transformation, which are innovative teaching, communication, and digital competences, need to be reinforced, in order for higher education system to be able to achieve one of its key goals, which is the cultivation of digital literacy.

According to Karaboga et al. (2020) the future workforce will be defined by the ability to work in a digital environment, and terms like "digital talents," "digital fluency," "digital networks," and "digital platforms" will be frequently used in the near future. A global talent gap in digital skills has emerged as a result of the rapid digital transformation efforts taking place all over the world. Governments all around the world, higher education institutions and business corporations should work together to close this gap and broaden a country’s digital talent ecosystem. In order to educate and prepare graduates that are employable in a digitally driven world, universities need to have a clear understanding of the digital skills and capabilities that businesses expect from their employees. To facilitate the digitization of their services and processes, governments should seek out digital expertise. Also, in order for businesses to be successful in their digital transformation efforts and to obtain a competitive advantage, they should attract digital talents. The authors, refer to the effects of how digital change and a lack of digital expertise are negatively affecting governmental institutions, private businesses, and academic institutions. In addition, Karaboga et al, 2020 consider of great significance the partnership between the above-mentioned stakeholders, in order to foster the growth and maintenance of a nation’s pool of digitally competent individuals. The improvement of cooperation between governments, industries, and institutions and the initiation of partnerships that will put together an ecosystem of digital talent and effectively close the digital gaps due to the talent scarcity.
HEIs were forced to shift adapt in an extreme digitalization of its culture due to the COVID-19 pandemic. These institutions' readiness and resilience in the digital and educational spheres, as well as their acceptance of the deployment of digital technology, are crucial success factors for this change. Aljanazrah et al. (2022) investigate the viewpoints of professors and students, examine the difficulties, attitudes, opportunities, and lessons learned of digital transformation in times of crisis at the university level, using as a theoretical framework the Unified Theory of Acceptance and Use of Technology (UTAUT). A qualitative approach was followed in this research so that the purpose of the study could be accomplished, with 14 focus group interviews with 62 teaching staff, undergraduates and graduate students. The data acquired from the focus group sessions were analysed applying thematic analysis. Among the findings, there are numerous obstacles blocking the digital transformation such as socio-economical level, poor pedagogical, digital and technical infrastructure, and familiarization with software applications. Even though the accessibility of online resources and the digitization of theoretical courses are both seen favourably, nonetheless when practical courses are digitized, students and staff still feel unprepared for online learning and have precautions about it. Both students and instructors need to adequately get prepared for online teaching and learning to be successful; yet, this does not appear to be the case in practice. The findings also uncovered a number of opportunities and advantages accelerated by the educational digital revolution, including the possibility of gaining new educational and technical competencies, as well as flexibility, peer learning and collaboration. But, the digital transformations of HEIs cannot be realized, unless comprehensive and integrated strategies are designed, in combination with precise and detailed educational policies.

An exploratory study of Svark et al. (2022) attempt to empirically investigate the association between a country's level of national intellectual capital (NIC) and its level of readiness for digital transformation at the national level. The countries in question are those that are member-states of the European Union (EU). This study, in addition to constructing the conceptual model of NIC, investigates the impact that NIC dimensions have on digital divide that torments some European countries. The theoretical framework and conceptual model for NIC were established based on a review of the relevant literature as well as the statistical data and indices that are currently available for the EU. The National Information Infrastructure (NIC) and its
components (human, social, structural, relational, and renewable/development capital) are examined in relation to the degree of digital transformation readiness among European nations and the existence of a digital divide. There were found to be significant disparities across EU countries in terms of their NIC and their digital preparedness. In order to investigate the relationship between the several NIC dimensions and digital transformation and the digital gap inside the EU, multiple linear regression was utilized. The results indicate that the suggested NIC model could not be proven in its entirety, despite the fact that a positive connection lies between each component of NIC and preparedness for digital transformation. The results of a regression analysis demonstrated that social capital and working skills, which are both components of human capital, are the most valid indicators while monitoring on a national level the digital transformation. These predictors were able to identify certain aspects of the European digital divide. In terms of the incorporation of digital media in organizations, structural capital, knowledge, and education, as components of human capital, were predictors of the digital divide.

The absence of standard measuring models in the field of NIC exploration means that the results of this study have a limited ability to be generalized. Moreover, this study gives decision-makers an idea of how NIC and digital transformation relate to one another. It also identifies which NIC components need to be improved in order for the EU to satisfy the demands of the digital economy and close the digital gap that separates its member states. In order to form a society of informed and engaged citizens in the public realm, as well as productive businesses and increased economic growth in the private sector. This study provides an original theoretical framework and conceptual model through which to analyze the relationship between NIC and digital transformation, which has not yet been explored at the level of the EU. Authors insist on a successful long-term plan in order to modify education systems to better monitor the academic development and serve all students by decreasing early tracking, grade repetition, and strict primary and secondary education paths, while increasing early childhood education and funding for schools that enroll more disadvantaged students.

The use of social networking platforms, educational video games, and digital fabrication are examples of technology advancements that have increased people’s opportunities to learn and interact with one another in both the educational and
professional spheres. The potential for these technology developments to deepen, enrich, and adaptively direct learning and interaction outweighs the risk that affective learning processes—which are the learners' emotional experiences and expressions during the learning process—will be overlooked. Naykki et al. (2022), propose that the integration of emerging technologies is essential to increase engagement in the learning process in a way that both the cognitive and affective elements of learning are taken into account. In their empirical research, looked into the potential for using various emerging digital tool types as individual and group support for mentally taxing and emotionally fulfilling learning. To support their statements, they analysed 4 case studies involving social networking platforms, computer game programming, "makers culture," and digital manufacturing. By concentrating on their emotive potential, all of these studies examine cutting-edge approaches to technological integration in education. The authors suggest that, in order to increase opportunities for cognitively challenging and affectively fulfilling learning, it is crucial that teachers use cognitive and affective learning processes as the foundation for activity design and provide instructional scaffolding. Furthermore, they suggest that educators need to enhance their digital skills and be aquatinted with Fab Labs (digital fabrication laboratories) and digital fabrication activities and increase collaboration between Fab Lab facilitators and school teachers in order to enhance the application of digital fabrication to formal education. Taking part in creative activities, promoting teamwork, and using technology with ease are crucial 21st-century abilities required in all professions and in everyday life. Naykki et al., 2022 state that future teachers must be given the chance to explore and learn in varied collaborative situations since instructors at all educational levels have an especially important role in helping their pupils acquire these abilities.

In order to administer at-scale training systems more effectively and collaboratively, as well as to reduce costs and errors, digital transformation is a crucial process. The untapped potential of digital transformation is becoming increasingly necessary for educational institutions such as schools, universities, and other types of educational organizations. Demartini & Gateshi (2020) article provides a report on the Riconnessioni project, which spanned three years and brought together the efforts of a variety of stakeholders, including students, educators, principals, and administrative staff. This project was designed for education by linking everything to support the digital world of the future and by forming powerful strategic alliances capable of
generating an ecosystem that connects people, processes, and things into a strong, secure, and intelligent communications network. More than 150 schools around Italy have been selected to participate in the initiative, and 550 educators have been chosen to participate in order to accelerate the learning process. The 550 chosen educators were able to disseminate the information to more than 2,600 of their fellow professionals by employing a training strategy known as "cascade training." The Riconnessioni project demonstrated how a systemic intervention aimed at enhancing teacher/school staff competency and infrastructural domain competence may assist improve the current training program. The initiative also highlighted the crucial role played by instructors in serving as "evangelists" for cutting-edge learning models, methods, and technologies that aid in their colleagues' and students’ acquisition of digital domain knowledge and awareness.

The proliferation of digital infrastructure is resulting in the opening of numerous doors for innovative ideas that have the potential to alter both business and society. Students should be prepared to use technology to improve the efficiency of business, the environment, and society as a whole, and digital innovation should be at the centre of this transformation. This is the overarching goal of education in information systems (IS), which should equip students with the necessary skills. Students majoring in information systems are in the enviable position of receiving instruction in both information technology (IT) and business. As a result, they are able to learn how to evaluate the benefits of technological advancements in relation to the fulfilment of unfulfilled organizational or societal requirements. This calls for adaptability as well as the capacity to interact with others, which necessitates possessing abilities such as problem solving, communication, teamwork, multicultural openness, adaptability, innovation, and creative thinking. Therefore, graduates ought to play a leading position and take the initiative as the inventors of the future. They need to be prepared for this unpredictable, complex, and ambiguous world by the teaching and learning environment, which requires students to progress beyond the present frontiers of knowledge and abilities within a single discipline. Berg’s (2018) article investigates the difficulties of our current higher education environment, which is linked to the development of digital technology; at the centre of the investigation are the students and their wellbeing. The goal of this project is to investigate the abilities that must be developed in order to improve the capability of students majoring in information
systems to take part in, and ultimately direct, digital change in business and society. Between 2016 and 2017, a design-based research methodology was utilized in a mixed-methods design. The abilities needed to better prepare IS students for their future jobs in the digital economy were identified in order to fulfil the objectives. Core subject-matter knowledge, digital skills, inter-disciplinary abilities, communication, teamwork, problem-solving, critical thinking, innovation, creativity, life and work skills, and emotional intelligence were among the skills that were highlighted.

The purpose of Tarabasz et al. (2018) article is to examine and provide more detail on the skill set that is required in the education of managers and business owners in order for them to be able to meet the problems that they will face in their future roles. The essay is of a descriptive nature and is based on a literature review as well as constructive criticism of the literature. A case study of the S.P. Jain School of Global Management in Dubai/Mumbai/Singapore/Sydney is presented, along with the insights of several industry professionals. It appears that the key to success in the digital world is the classroom of the future, which is modelled after the concept of a design thinking lab and is outfitted with the most cutting-edge solutions of Virtual and Augmented Reality (VR, AR), interactive detachable workstations, shareable smartboards, and interactive video display walls. Modern business students are better prepared for the working space of the future thanks to immersive interactions with artificial intelligence (AI), pervasive computing, and technology exposure. These experiences expose students to a wide range of problems that need to be solved and make it possible for students to acquire new skills while easing the transition from education to the job or entrepreneurial practice of their choice. Nevertheless, the development of graduates who are "future ready" necessitates an inventive mentality as well as the flexibility to continuously evolve and adapt, while simultaneously concentrating on disruptive innovation brought about by digital transformation. Gaining a competitive advantage and achieving success in the education market both require a learning environment that makes use of the most recent digital technologies and developments. The article describes the abilities that are expected of future business owners and managers, such as “basic business and entrepreneurship skills, leadership skills, teamwork skills, business communication skills, business intelligence capacities, critical thinking, design thinking, innovation skills, lifelong learning and understanding technology”. According to the authors, such a large transformation of the skill set necessitates quick
action and business school transformation. Traditional "chalk and board" business colleges, emphasizing primarily business skills applicable in the analog world, may go out of business if the reality and demands of future business are not acknowledged and included into the learning process. This presents an opportunity for nimble, industry-connected business schools to assume control of the process of producing and cultivating the next generation of business leaders.

Endovitsky et al. (2021) believe that the challenges of the digital economy can be adequately addressed by focusing on the professional and personal competence development issues. They underlined that it is vital to shift the emphasis from merely obtaining the knowledge component to a personality-oriented, growing cognitive activity inside the traditional education system. This is because the traditional education system is focused on passing on information. The goal of today's educational system should be to instill the desire to learn in the minds of its students. Because individuals are separated from value chains, the digital economy is predicated on the concept of lowering transaction costs in order to compete with traditional economies. Operations that are routine will be automated, which will result in the elimination of a number of professions. This will have an effect on the labor market as well as the structure of the labor market; in order to keep one's competitive edge, the younger generation will need to hunt for a new application and quickly fulfill a profile of professional competences. The most important economic asset for organizations in the future will be their human capital because of the rapid advancement of information and communication technologies. The extent to which a firm makes efficient use of the potential possessed by each employee and cultivates an environment conducive to the harmonious growth of those employees are the primary factors that will determine the company's competitive position in the market. Within the framework of the transformation accelerated by digital technology, the authors underline how essential it is that the business community and the education system evolve into business partners who can mutually influence one another.

Both competency-based medical education and blended courses, which are enabled by digital technology and referred to as bLearning, can be found in many curricular reform initiatives currently being carried out at universities all over the world. It is crucial to use innovative teaching methods and technology that are adaptable and
motivate students to gain the necessary professional skills in today's classrooms. Truhillo et al. (2016) article shows how the use of the blended learning revolutionized the Social Medicine course for second-year medical students at Universidad de los Andes (Colombia), specifically the students' capacity to attain the goal skills. A qualitative case study was conducted to investigate the course's curriculum structure, training and skills, educational model, and learning environments. The research was carried out with the purpose of gaining insight into these topics. During the implementation phase, we discuss the strategies that were employed, the results that were attained, and the problems that were experienced. According to the findings, bLearning not only helped facilitate the transformation of the course design but also fostered flexibility and autonomy in the learning process of the students. In addition, the new structure made it easier to acquire a wide range of competencies, such as cognitive, technical and procedural, integrative and communicative, reflective, and professional ones.

The research conducted by Frolova and Rogach (2021) examines the perspectives of Russian students with regard to the digitization of higher education and how they feel about the incorporation of digital technologies into the learning process. The research was carried out in two distinct phases. In the first stage, which took place between February and April of 2020, a questionnaire survey with a sample size of 1,553 students attending universities in Russia was carried out. During the second stage, which took place between January and February of 2021, they held two focus groups with a total participant count of twenty-four. This gave them the opportunity to refine the data that they had previously collected. The authors reach the conclusion that the experience of students with distance learning during the epidemic is the most important factor in determining their attitude toward the digitization of education. According to the findings of the research, the expectations of students are related to the content element of utilizing digital technology in the instructional process. These expectations include the development of practical skills and the maintenance of interest in learning. However, young people are not fully focused on the intake of educational content in order to develop their skills in the area of study that they have selected. In the virtual educational space, the availability of educational materials and video recordings of lectures does not act as a compensator for important dysfunctions such as a decline in the share of live communication, narrowing of communication channels, lack of
motivation to learn, etc. This educational requirement set the stage for the prospects of a transition in the professional function of the educator, from "translator of knowledge" to "moderator of the creative space."

5.2. Discussion of the findings

According to the case studies of the three nations listed above, in addition to the theoretical foundation, certain European countries have taken some significant steps during the process of digitally transforming their educational systems. The pandemic served as a catalyst for actions that ultimately led European nations to develop practices favouring DX on a national level. These initiatives were enabled by the pandemic. Firstly, over 79% of people in Finland acquire basic digital skills, which is extremely close to meeting the objective of 80% set by the European Union for the Digital Decade. In addition to this, 48% of users acquire advanced digital skills, while the share of ICT specialists is 7.4% and the share of ICT graduates is 7.5%. These numbers are approximately double the percentage of ICT graduates that the EU averages at 3.9%. The growth of citizens' digital skills and abilities is a priority for the government of Finland, which places a significant amount of focus on the matter. As a leader in the field of education, the Ministry of Education and Culture has initiated a new literacy program that will run from 2020-2022. The goal of this initiative is to facilitate the development of skills and capabilities that are associated with information and communication technology (ICT), media literacy, and programming. Following the distribution of a special grant by the Finnish government to 46 separate initiatives in order to facilitate the writing of competency descriptions for the years 2021-2022, the program was finally put into motion. In addition to this, they placed an emphasis on early childhood education as well as pre-primary, primary, and lower education by granting money to 22 and 24 different providers. With regard to higher education, in 2021 all of the HE institutions signed a compact of joining the long-term project of Digivision, and the Ministry of Education and Culture awarded a grant in the amount of 20 million euros [Digivision, 2021]. All 38 institutions have made a commitment to constructing a digital future that will improve learning, teaching, and the upgrading of the higher education system and continuous learning, as well as the employment of Finish citizens on both a national and international level. It is anticipated that the
educational ecosystem that is now being developed will be completely ready to provide all of its services to educational institutions and students by the year 2025.

The reform of continuous learning was offered to the Finnish Parliament in the year 2020. The proliferation of digital technologies, combined with the ever-shifting requirements of the labor market, led to the adoption of strategies that promote lifelong learning. This was done in order to increase the number of opportunities available to people of working age to improve their existing skills and competencies and to acquire new ones. With the help of this reform, the active labor force will be able to make it through this rapidly transforming digital environment, and the availability of trained experts will be safeguarded. Together with the Ministry of Economic Affairs and Employment, the Ministry of Education and Culture has launched a digital service that promotes lifelong learning by interconnecting education and training, information about the labor market, and a variety of online services on a single platform. This service was developed in cooperation between the two ministries (Ministry of Education and Culture, 2020).

The case of Spain reveals that 64% of the overall population possesses at least some level of fundamental digital literacy, which is slightly higher than the average across Europe. There is no question that additional progress can be made in order to meet the European Union's aim of 80 percent by the year 2030. The shortage of information and communications technology specialists is Spain's most pressing issue. The country's percentage of employed ICT specialists is only 4.1%, which is lower than the average of 4.5% across Europe. Also, graduates of information and communications technology make up only 4% of the workforce, and only 1% of ICT roles are held by women; this low number has been stable over the past four years. Therefore, even though Spain's performance is growing better, the fact that there is a shortage of basic and advanced digital skills in the total population acts as a burden for a seamless digital transition. This is the case despite the fact that Spain's performance is getting better (2025 Digital Spain).

The Recovery and Resilience Plan (RRP) of Spain draws attention to the necessity of improving the digital skills of the Spanish population. This, along with the improvement of digital connectivity and the deployment of digital technologies, can be
of benefit to the growth of the digital economy and competitiveness on both the national and international levels, particularly for small and medium businesses.

The launch of Digital Spain 2025, an agenda for Spain's journey toward digital transformation that is aligned with the policies of the European Commission, provided the answer to the problem of how to assist Spain in overcoming its vulnerabilities. There are ten main points of interest, which are as follows: Digital Connectivity, 5G Technology Boost Strategy, Digital Skills, Cybersecurity, Public Sector Transformation, Digital Transformation and Entrepreneurship, Sectoral Digitization Tractor Projects, Focus on Investment Attraction and Audio-Visual Talent, Data Economics and Artificial Intelligence, and Digital Rights are some of the topics that will be discussed at the conference. The Ministry of Economic Affairs and Digital Transformation, which is in charge of overseeing the program while it is being carried out, has placed a strong emphasis on enhancing the digital skills of both the working population and the general population. It has been mentioned in the past that, in order to close the digital gaps, it is quite essential to provide digital skills and competencies from a very young age. This is because the younger generation is more likely to comprehend and learn everything that has to do with digital technologies and skills, because they were born into a digitalized environment and were exposed to it from a young age (Livingstone et al., 2021).

Similarly to the case of Finland, Spain is encouraging students to develop their digital abilities through the implementation of the Digital Education and Uni-Digital Plan. This plan aims to increase the number of people working in digital professions. To begin, during the academic year of 2020-2021, the initiative of Digital education was introduced, and it is planned to allocate 260 million euros to provide publicly owned centers with technological devices and enhanced connectivity. This is done with the vision of closing digital educational gaps, such as accessibility of technology, productive usage of digital tools by groups that tend to become marginalized due to age or socio-economic criteria, and training to develop and use telecommunications technology. Secondly, during the academic year of 2020-2021, the initiative of Digital education was introduced. An investment of 76.85 million euros has been made in the Uni-Digital Plan with the intention of prioritizing digitalization processes in higher education, modernizing the educational system, methods, and digital equipment, and increasing the rate of digitization of the university system by 10% until 2025, in
comparison to the rates of 2019, by increasing the number of courses related to digital skills and upgrading existing courses.

When we compare the primary findings of the case studies to those of the literature review, we discover that they are comparable. This is because it is abundantly evident that digital skills and education are both extremely important. According to the literature review, the digital transformation is causing a shift in the personnel abilities that are necessary for the success of organizations. This shift is important since the digital transformation is forcing the workforce to become more complex. In light of these conditions, it is becoming an ever more critical requirement for individuals to make conscious efforts toward enhancing their existing skill sets. The growing body of research on employee proactive skill development has, for the most part, neglected the potential impact that employees' perceptions of large-scale changes in the settings of their businesses could have on their willingness to engage in such beneficial conduct. This is despite the fact that employees' perceptions of large-scale changes in the settings of their businesses have been shown to have a significant relationship with employees' willingness to engage in. The implementation of digital technology is providing a huge boost to the process of reviving the economy of the entire world. The European Union has pledged to combining support with the recovery process with resilient digital transformation. The COVID-19 pandemic brought to light Slovakia's lack of digitization as well as its population's incapacity to effectively connect digitally with the authorities of the country. It is essential for students to be able to make efficient use of digital technology, and this skill should be incorporated into educational policies. People's chances of being successful in the labor market and improving their capacity to communicate with public administration are both improved when they have abilities in information and communication technology (ICT). As a direct consequence of both digitalization and globalization, the significance of communication through the use of the internet, numerous applications, and many other electronic tools has significantly expanded. One of the most basic aspects of e-government is digital literacy, as citizens need to be able to use e-government services in order to communicate with the public administration. The persistent upheaval is making it more difficult for citizens to access online services.

Citizenship should be built on a foundation of digital literacy so that individuals can be effective and efficient in their personal and professional life in the 21st century.
Students who graduate from educational institutions of higher learning are held to the expectation that they would possess a comprehensive set of skills and abilities, one of which is digital literacy. Because of the global lockdown that was imposed because of the COVID-19 pandemic, educational systems all around the world were forced to deal with a number of disruptive alterations. These changes included a reduction in the number of days that school was in session.

From case studies and literature review, we can propose that it is imperative for Greece to increase its efforts in order to develop the digital skills of the entire population. This is especially true if the end goal is the creation of an environment where everyone is empowered and feels digitally safe, which would contribute significantly to the Digital Decade target of 80% of the population in the EU having at least basic digital skills by the year 2030. In addition, a robust effort to increase the number of digital experts will enable Greece to fully reap the benefits of the digital transition in all areas of the economy. As a result, this effort will contribute to the Digital Decade goal of 20 million ICT specialists in employment within the EU by the year 2030.

Greece's HEIs continue to have a diminished impact. To prepare graduates for the workforce, it is advised that a graduate apprenticeship program be created. It is also suggested that stand-alone modules focused on critical skills be added to each program of study. Deans, department heads, and teaching staff members should also commit to skills programs and endeavor to create a skills-based curriculum that would give students marketable talents.
6. CONCLUSIONS

According to the literature review, which supported the findings of the case studies as a result of the growth of digital infrastructure, various doors are being opened for innovative ideas that have the potential to change both business and society. Students should be prepared to use technology to improve the efficiency of business, the environment, and society as a whole, and digital innovation should be at the centre of this transformation. Students should be prepared to use technology to improve the efficiency of business, the environment, and society as a whole. This is the overriding objective of education in information systems (IS), which is intended to provide students with the appropriate capabilities. Students who choose to concentrate their studies on information systems are placed in the enviable situation of being able to take courses in both information technology (IT) and business. They are able to learn how to evaluate the benefits of technical breakthroughs in connection to the fulfilment of unfulfilled organizational or societal requirements as a consequence of this, which enables them to learn how to evaluate the benefits of technological advancements. This requires flexibility as well as the ability to interact with other people, which necessitates possessing abilities such as problem solving, communication, teamwork, multicultural openness, adaptability, innovation, and creative thinking. Adaptability is also required because of the capacity to interact with others. As a result, graduates should assume a leadership role and be the ones to take the initiative as they are the creators of the future. They need to be prepared for this unpredictable, complex, and ambiguous world by the teaching and learning environment, which requires students to progress beyond the present frontiers of knowledge and abilities within a single discipline.

The classroom of the future, which is inspired by the idea of a design thinking lab and is outfitted with the most cutting-edge solutions of Virtual and Augmented Reality (VR, AR), interactive detachable workstations, shareable smartboards, and interactive video display walls, is the key to success in the digital world. Students at today’s business schools are given more opportunities to engage in immersive experiences using artificial intelligence (AI), pervasive computing, and other technologies, which enables them to better prepare for the workplace of the future. These experiences allow students to acquire new skills while easing the transition from education to the job or entrepreneurial practice of their choice. Students are exposed to
a wide range of problems that need to be solved, and these experiences also make it possible for students to acquire new skills.

Implications & Recommendations: The cultivation of graduates who are "future ready" necessitates an inventive mentality as well as the flexibility to continuously evolve and adapt, while simultaneously focusing on disruptive innovation brought about by digital transformation.

Obtaining a competitive edge and being successful in the education market both demand the learning environment to make use of the most recent digital technologies and advances. This is necessary in order to achieve success in every sector. In the next chapters, the article presents a description of the skills that are anticipated of future business owners and managers, identifies available solutions and technologies to enhance classroom experiences, and gives an example of how technology may be utilized in the real world. In addition, it reveals a way for business schools to undergo a transition so that they can meet the challenges of the future labor market and provide their graduates with the necessary skills and the practical experience they need to be successful. This is made possible by the fact that it reveals a pathway for business schools to undergo a transition.

The challenges of the digital economy can be appropriately addressed by concentrating on the concerns surrounding the development of professional and personal competency. It is to change the focus of the traditional education system from only acquiring the knowledge component to a personality-oriented, expanding cognitive activity. This is because the traditional education system focuses on teaching students’ information. The desire to learn should be instilled in the mentality of today’s pupils as the primary focus of the educational system that we have in place. In order for the digital economy to remain competitive with traditional economies, it is founded on the idea of reducing the costs associated with conducting transactions. This is because individuals are not directly involved in value chains. Automating tasks that are currently performed manually will lead to the elimination of a significant number of professional responsibilities as a result. This will have an impact not only on the labor market but also on the structure of the labor market; in order to maintain one's position at the forefront of competition, an individual will need to search for a new application and swiftly fulfill his profile of professional competence. Because of the rapid development
of information and communication technology, an organization's human capital will be their most valuable economic asset in the future. The major criteria that will define a company's competitive position in the market are the amount to which it makes effective use of the potential that is possessed by each employee and cultivates an atmosphere that is conducive to the harmonious growth of those employees. The corporate world and the education system both need to develop into business partners who are able to have an impact on one another in order to make the most of the opportunities afforded by the revolution that is being brought about by digital technology.

In this digital environment, small and medium-sized firms (SMEs) are confronted with substantial challenges in the modern day, such as increased levels of unpredictability and volatility. The challenges that are given can be addressed with a combination of two different strategies: one is agility, and the other is digitization. Both of these concepts give rise to a vast number of opportunities and call for the acquisition of new skill sets.

Expectations of students are connected to the instructional component of making use of digital technology in the teaching process. Among these expectations is the maturation of one's practical abilities as well as the preservation of one's enthusiasm for academic pursuits. However, young people are not fully focused on the intake of educational information in order to develop their skills in the area of study that they have selected. This is a problematic issue, since education is the best way for them to enhance their skills. The availability of educational materials and video recordings of lectures does not act as a compensator for important dysfunctions in the virtual educational space, such as a decline in the share of live communication, narrowing of communication channels, lack of motivation to learn, etc. despite the fact that these things are readily available. This educational requirement prepared the groundwork for the possibilities of a shift in the educator's professional duty from "translator of knowledge" to "moderator of the creative space."

The implementation of digital technology is providing a huge boost to the process of reviving the economy of the entire world. The European Union has pledged to combine support with the recovery process with resilient digital transformation. The COVID-19 pandemic brought to light Slovakia's lack of digitization as well as its
population's incapacity to effectively connect digitally with the authorities of the country. It is essential for students to be able to make efficient use of digital technology, and this skill should be incorporated into educational policies. People's chances of being successful in the labor market and improving their capacity to communicate with public administration are both improved when they have abilities in information and communication technology (ICT). As a direct consequence of both digitalization and globalization, the significance of communication through the use of the internet, numerous applications, and many other electronic tools has significantly expanded. One of the most basic aspects of e-government is digital literacy, as citizens need to be able to use e-government services in order to communicate with the public administration. The persistent upheaval is making it more difficult for citizens to access online services. Analyses of indices that pertain to the digital economy, such as the digital economy and society index (DESI) and the e-Government digital skills (EGDI) from 2018 to 2021, revealed that the state of the digital economy remained the same in 2018 and 2019, and that in 2020, there was a decline in fundamental digital skills. The digital economy and society index (DESI) and the e-Government digital skills (EGDI) are examples of indices that pertain to the digital economy. The importance of human capital in addition to digital capabilities is highlighted in many articles.

Citizenship should be built on a foundation of digital literacy so that individuals can be effective and efficient in their personal and professional life in the 21st century. Students who graduate from educational institutions of higher learning are held to the expectation that they would possess a comprehensive set of skills and abilities, one of which is digital literacy. Because of the global lockdown that was imposed because of the COVID-19 pandemic, educational systems all around the world were forced to deal with a number of disruptive alterations. These changes included a reduction in the number of days that school was in session. The significance of enhancing key variables such as the digital capabilities of the teachers, sources for learning that may be altered, communication between institutions and students, and teaching methodologies that should be suitable to the contemporary situation. Findings of empirical articles suggest that the learning process in higher education be rethought and that attention be paid to the most crucial parts of this transformation, which are principally communication, education, and digital skills. In the event that this does not occur, digital literacy will
not be ensured, and higher education will fall short of achieving one of its key purposes as a result of this.

The ability of individuals to function effectively within a digital setting will come to characterize the workforce of the future, and the term "digital talent" will assume an increasingly significant role in this context. When discussing the design of a digital work, you are most likely to hear phrases and terms such as "digital talents," "digital fluency," "digital networks," and "digital platforms." There is currently a significant gap in the supply of digital talent on a worldwide scale. This gap is a direct result of the rapid pace at which digital transformation is being implemented in every region of the world. It is essential for businesses, national governments, and educational institutions teaching at the university level to work together in order to bridge the current talent gap and create an ecosystem for digital talent in a given nation.

Universities need to have a solid understanding of the digital capabilities that businesses require from their employees in order to produce graduates who are employable in digitally driven business contexts. This understanding is necessary in order for universities to produce graduates who are employable in digitally driven business contexts. The acquisition of digital skills should be pursued by governments in order to promote the streamlining and digitization of the services and processes they provide. Businesses need to make an effort to recruit digital talents if they want their digital transformation initiatives to be successful and if they want to gain a competitive advantage in their respective markets. Within the confines of their research, Karaboga et al. (2020) focused on the ways in which governmental organizations, private businesses, and academic institutions are being impacted by the rapid pace of digital transformation as well as a shortage of digital competence. After that, they underlined how important their relationship is in promoting the creation and maintenance of digitally adept persons inside a nation, and they emphasized the necessity of their partnership in doing so.

The socio-technical systems theory, skill-biased technological development, and the political economy of digital transformation are the three theoretical perspectives that carry the most weight. The essays provide ideas that complement one another on subjects that cut across different fields, such as the gap in income, the unemployment caused by technology, and the polarization of jobs.
Researchers also bring to light opinions that are frequently at odds with one another regarding the ownership of technology, the possibility of a paradise without work, educational reforms, and the requirement of human-centricity in the application of technology. They present critical views about the aspects that will define the job of the future in terms of skills, creativity, and chances for autonomous employees. They draw on the findings from the entire spectrum of theoretical and analytical perspectives in order to support their arguments. They are able to make links between the numerous findings as a result of this. They also discuss the political and institutional dynamics that will be defining the working environment in the future.

The COVID-19 crisis necessitated and accelerated the transition to digital infrastructure in educational institutions of higher learning. Acceptance of the adoption of digital technologies inside those institutions is important in order for this transition to be effective. Additionally, digital and educational preparedness and resilience on the part of such institutions is necessary.

Digital transformation faces a lot of challenges due to the findings of the investigation. The social context, the technical and pedagogical infrastructure, the ease of use of software, digital pedagogy, and online evaluation are some of the challenges that need to be overcome. Many individuals have positive opinions regarding the ease with which they can access internet resources and the fact that theoretical classes have been digitized. However, both students and faculty members continue to have the perception that they are not adequately prepared for online education, and they have expressed unfavorable opinions when practical classes have been digitized.

This perception stems from the fact that online education is still relatively new. In order for online teaching and learning to be successful, both students and instructors need to put in appropriate preparation work; yet, this does not appear to be the case in the actual delivery of the course. The studies also discovered a number of chances and advantages made available by the digital revolution. Some examples of these opportunities and advantages include the possibility of gaining new educational and technological competencies as well as flexibility. It has been suggested by the researchers that this study be repeated at other universities, as well as in a variety of social and cultural settings, and that a mixed approach technique be used when
attempting to validate the findings. Additionally, it has been suggested that this study be repeated in a variety of social and cultural settings.

The exploratory study by Svark et al. (2022) aims to empirically investigate the association between a country's level of national intellectual capital (NIC) and its level of readiness for digital transformation at the national level. This is done by comparing the levels of NIC in different countries. The nations in concern are those that are now affiliated with the European Union (EU). In addition to developing a conceptual model of NIC, the primary purpose of this research is to analyze the role that NIC dimensions play in the formation of the digital divide that exists between the countries of Europe.

The conceptual model and theoretical framework for NIC were developed on the basis of a review of the pertinent literature as well as the statistical data and indicators that are currently available for the EU. This was done in order to ensure that the research was as accurate as possible. This model investigates the relationship between the National Information Infrastructure (NIC) and its components (human, social, structural, relational, and renewable/development capital) and the degree to which European countries are prepared for digital transformation and the existence of a digital divide. Specifically, the model focuses on the relationship between the NIC and its components (human capital, social capital, structural capital, relational capital, and renewable/development capital). In terms of their national identification systems (NIC) and their level of digital readiness, there were found to be substantial differences among the EU member states. Multiple linear regression was applied so that researchers could explore the relationship between the many NIC aspects and digital transformation, as well as the digital divide that exists throughout the EU.

Despite the fact that a positive connection existed between each component of NIC and preparedness for digital transformation, the findings of this study revealed that the suggested model of NIC could not be proven in its entirety. This was the case despite the fact that a positive connection existed between each component of NIC and preparedness for digital transformation. According to the findings of a regression analysis, social capital and working skills, which are both aspects of an individual's human capital, are the most accurate predictors of digital transformation on a national level. These predictors were successful in identifying particular features of the digital gap that exists between the member states of the EU. In terms of the incorporation of
digital media into organizations, the components of human capital such as knowledge, education, structural capital, and structural capital were predictors of the digital divide.

The absence of standard measurement models in the field of NIC exploration indicates that the findings of this study have a limited ability for generalization. This is because standard measuring models are not available. The findings of this research offer an indication to those responsible for making decisions on the relationships that exist between NIC and digital transformation. In addition to this, it highlights the components of NIC that need to be improved in order for the EU to be able to tackle the challenges posed by the digital economy and to bridge the digital divide that now exists across the member states of the EU.

In the public sphere, the use of digital technology is crucial to the formation of informed and engaged citizens. In the commercial sector, the application of digital technology is essential to the formation of productive firms and improved economic growth.

As a result of developments in technology such as social networking platforms, games created expressly for educational purposes, and digital fabrication, the educational and professional opportunities for people to learn from one another and engage with one another are growing, and this is a positive development. These technological advancements have the potential to deepen, enrich, and adaptively guide learning and interaction; however, they also hold the potential risk of neglecting people's affective learning processes.

Affective learning processes can be defined as the learners' emotional experiences and expressions while they are in the process of learning. Naykki et al. (2022) propose that technologies and their usage in particular should be created with the goal of increasing learning and engagement in a way that recognizes both the cognitive and affective aspects of learning as key components of the learning process. This would be done in a way that recognizes both the cognitive and affective aspects of learning as key components of the learning process.

During the course of their empirical research, they investigated the possibilities of utilizing various types of newly developed digital tools as a support for individual and group learning that is both intellectually taxing and emotionally significant. This type of learning is important because it can help people become more self-aware of
themselves and their relationships with others. They provide four case studies of experiments dealing with social networking systems, programming with computer games, "makers culture," and digital manufacturing as illustrations of digital education. These case studies focus on social networking systems, programming with computer games, and digital manufacturing. All of these initiatives investigate innovative approaches to introducing technological components into educational environments, with a particular focus on the potential for these components to elicit a range of feelings in participants.

By undergoing digital transformation, businesses stand to profit from both rejuvenating their relationships with customers as well as their day-to-day business processes. Both industry executives and academicians agree that leadership qualities and technological capabilities are complementary to one another when it comes to the administration of a digital workplace. The younger generations are coming to the realization that traditional leadership skills, in addition to digital literacy, are key components of a successful corporate leader's toolkit.

It is essential to improve business management curricula at both the graduate and undergraduate levels in order to provide students with the opportunity to investigate and develop leadership skills that will enable them to confidently lead amidst the complexities of a digital workplace. This opportunity must be provided in order to fulfill the necessity of improving business management curricula at both the graduate and undergraduate levels.

Face-to-face classes and tutoring are no longer available as a result of COVID-19, which indicates the necessity to reconsider the chances and barriers for the development of digital skills among pupils. The fact that face-to-face classes and individual tutoring are no longer possible as a result of the digitalization of higher education institutions (HEI) is evidence of the necessity for this.

There is a barrier to the successful implementation of digital transformation in higher education, both in the here and now as well as in the years to come, and that barrier is the inability of a large number of educators to engage in the production of available pedagogical aid.

One of the most significant challenges that companies are confronted with at the present time is figuring out how to make the most of the opportunities offered by
the recently established information technology. In order for organizations to successfully master digital transformation, they need leaders who are able to seize the opportunities that digitalization presents for their businesses and translate those opportunities into new business models. Only then will organizations be able to realize their full potential. In order to provide empirical evidence regarding the competencies sought by practitioners for managing digital transformation.

Gilli et al. (2022) analyzed the skills and characteristics explicitly called for in 239 job advertisements aimed at digital transformation experts. The purpose of this study was to provide empirical evidence regarding the competencies sought by practitioners for managing digital transformation. These job postings are directed for those with expertise in digital transformation. According to the conclusions of their research, job requirement profiles place just a minimal degree of importance on technical competencies and an in-depth knowledge of information technology. As was the case in previous rounds of strategic change processes, digital transformation experts should primarily possess the skills of collaboration, strategic thinking, leadership, customer orientation, and communication. In addition, in contrast to studies that are solely conceptual and focus only on skills and talents, the significance of particular personality traits is a primary focus of our research, which contrasts favorably with other types of research. These characteristics include proactiveness and inventiveness, both of which are regularly cited directly in job advertisements that are related to them. Creativity is another a virtue that is frequently emphasized openly in job advertisements. (Gilli et al. 2022)

The digital transformation of instructional procedures can be guided and supported by the integrated use of technological, human, organizational, and pedagogical drivers. This serves as both a compass and a support system for the transition. Students should be equipped with the cognitive, social, interpersonal, and technological skills necessary to meet the demands of the Fourth Industrial Revolution and other global concerns, such as reducing the consequences of climate change based on people's understanding of its causes. This is the objective of Education 4.0.

Concern is being expressed by a significant number of individuals involved in the education system over the topic of digitalization in higher educational institutions (HEIs). It is becoming increasingly vital in many facets of life, but particularly in the
business world to have the capacity to use digital technologies. Because of this, one of the key aims of educational institutions such as colleges has shifted to the preparation of future managers to deal with problems and hunt for answers. As part of this preparation, information literacy has emerged as a crucial set of capabilities. In higher education, research into educational technology breakthroughs is now being explored and debated, and a number of legislation, programs, and tactics have been presented as viable solutions. As soon as they are born into the world, children in today's culture are presented with a variety of digital technologies in their early developmental years. These distinctions have an effect on younger generations and the digital destinies of those younger generations, and there are still many other sorts of digital disparities that exist in our society.

The students of today are not as well equipped for the technologically advanced society that they will inhabit as their forebears were. Universities and the way that education is delivered need to undergo a significant amount of digital transformation in order to match the expectations of today's youth and adequately prepare them for the fully digitalized environment in which they will live in the future. Because of the COVID-19 outbreak, higher education institutions (HEIs) and the educational system as a whole have been compelled to undergo this kind of reform in a relatively short length of time.

The digital revolution is causing a shift in the personnel abilities that are important for the success of companies, and this transition is being caused by the necessity of digital skills. In light of these conditions, it is becoming an ever more critical requirement for individuals to make conscious efforts toward enhancing their existing skill sets.

The growing body of research on employee proactive skill development has, for the most part, neglected the potential impact that employees' perceptions of large-scale changes in the settings of their businesses could have on their willingness to engage in such beneficial conduct. This is despite the fact that employees' perceptions of large-scale changes in the settings of their businesses have been shown to have a significant relationship with employees' willingness to engage in.
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