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Digital Entrepreneurship for Employability Paths

Project Ref: 2019-1-PL01-KA202-065880

Intellectual Output 2:

Digital Entrepreneurship dynamics

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About the project

This report is the result of the Intellectual Output (IO) 2 of the Digital Entrepreneurship for Employability Paths (DEEP) project funded with support from the Erasmus+ Programme of the European Union (reference number: 2019-1-PL01-KA202-065880).

The main objective of the DEEP project is to improve chances for professional success of VET students with different backgrounds by developing their entrepreneurial and digital skills. To do this, DEEP employs innovative approach by teaching these skills in an integrated and interdisciplinary manner, in contrast to their separate treatment in the curricula of state education in most European countries. On the other hand, the project also provides VET teachers, trainers and mentors with the necessary tools and knowledge to help their students effectively acquire entrepreneurial and digital skills.

The DEEP project is implemented by a consortium that includes: Center for Social and Economic Research (CASE), Customized Training Solutions (CTS), IDP SAS Di Giancarlo Constantino, Institut de Haute Formation (IHF) aux Politiques Communautaires, Internet Web Solutions, Law and Internet Foundation, and Mindshift Talent Advisory.

Executive summary

The European Priorities for 2019-2024 include enabling and strengthening the digital transformation for individuals and businesses. Three main pillars created in this respect focus on: 1) securing technology that supports European societies; 2) ensuring a fair and competitive digital economy; and 3) supporting an open, democratic and sustainable society. To achieve this, the European Union (EU) aims to create a global model for the digital economy that protects digital standards and supports economies in going digital.

The demand for digital skills is boosted by digitalisation in all sectors. However, the supply of digital skills is undermined by both a lack of adequate training and the limited use of technology for education purposes. In 2019, 9% of all EU companies, including 46% of large EU enterprises, recruited or tried to recruit information and communications technology (ICT) specialists. At the same time, between 2012 and 2019, the share of companies that reported having hard-to-fill vacancies for ICT specialists increased by 2 percentage points for all EU companies and almost doubled for large enterprises (from 17% to 30%).

The DEEP data collected in this project confirm that over 40% of the companies that participated in this study are missing some elements of the digital competences needed for their entrepreneurial activity. The competences largely sought by companies and missing among individuals include:

- Ability to protect personal data and privacy (60% of European companies);
- Ability to solve technical problems (58% of European companies);
- Ability to identify needs and technological responses (58% of European companies);
- Ability to manage digital identity and the ability to elaborate and re-elaborate digital content and programming (54% of European companies).

The study also reveals that individuals' perceptions about the competences they lack in order to be competitive on the labour market are very much in line with those identified by employers. The following competences were listed by individuals as completely lacking:

- Programming (67% of individuals);
- Ability to identify digital competence gaps by themselves (42% of individuals);
- Ability to identify needs and technological responses (40% of individuals);
- Ability to solve technical problems (40% of individuals).

While the importance of digital technologies and ICT is deeply rooted and recognised at the EU level, entrepreneurship skills in particular have not been a priority until the recent decade. Thus, no comprehensive evaluation of entrepreneurial skills proficiency is available at the EU level.

The country analysis summarised below shows that digital entrepreneurship skills shortages persist at the national level as well. In addition, this study was aimed at the examination of the national strategies and policies supporting EU efforts in digital entrepreneurship skills transformation, and at the identification of national barriers for further consideration.

Bulgaria. According to the Digital Economy and Society Index (DESI), in 2019, Bulgaria was the worst performing country in regards to digital skills. Bulgaria is also among the most laggard countries when the European Index of Digital Entrepreneurial System (EIDES) is concerned. On the other hand, in general, national policies in Bulgaria addressing the challenges related to digital entrepreneurship skills are adequate, with several well-specified goals and with the aim to attract the involvement of many stakeholders – businesses, policy makers and civil organisations at the national and regional levels. Moreover, the country has implemented different policy tools such as strategies, action plans and concepts to successfully embed the innovative competences. The elements still missing, which make the overall system inefficient, include the lack of innovative education approaches, too little collaboration between the public and private sectors, and the need to improve the collaboration between businesses and schools.

Italy. Despite its status as a G7 country, Italy ranks at the bottom of ICT cultural embracement among all 27 Member States and is one of the most digitally tardive countries worldwide. Despite the investments and efforts of the government, Italians are the most digitally unskilled and, not surprisingly, the ones who struggle the most with digital technologies. Furthermore, Italy has one of the most underperforming entrepreneurial environments among all Western countries, and in some traits, has results comparable to those of many second and third world economies. The biggest threats the digitalised renewal of Italian small and medium-sized enterprises (SMEs) face are the low interest of SMEs to invest in ICT and the insufficient reach of micro-enterprises. Italy's cultural attachment to traditional models is so deeply rooted that its digital transformation might take much longer and require more social efforts than expected. The resilience of the Italian economic and entrepreneurial ecosystem for further competitive landscapes also depends on a reliable, smart and inclusive education and training plan centred on digital entrepreneurial skills widespread across all formal/non-formal vocational education and training (VET) settings.

Poland. Poland is far below all European countries in terms of individuals possessing digital skills and abilities (it ranks 25 out of 28 European countries in the DESI Index). The performance of Polish adults in such skills as literacy, numeracy and problem solving is one of the weakest in the EU as well. Almost half of Polish adults cannot use a computer. When it comes to entrepreneurial skills, here Poland is also ranked as a country with one of the weakest digital entrepreneurial ecosystems across EU countries. Poland belongs to the *Laggards Group*, which means that the country does not catch up to the rest of the EU countries. Unfortunately, digitalisation and the development of digital skills are still understood narrowly by Polish policy makers. Investments in digital skills are often reduced to the development of infrastructure and the provision of the necessary hardware and software, rather than the development of human skills and competences. This also applies to entrepreneurs, who are still not willing to use even simple

software to facilitate the circulation of documents or issue invoices. The adequately crafted VET system is important to improve the digital entrepreneurship performance in the country.

Portugal. Since 2015, Portugal is classified as a medium-performance country according to the Digital Economy and Society Index (DESI). The country's greatest challenge has been to overcome the severe digital skills deficit of its citizens, particularly among the elderly and those with low levels of education or income. In terms of digital entrepreneurship systems, Portugal is classified as a *Catcher-up Country* (EIDES), meaning that despite being below the EU average, its development is growing in a way that allows it to catch up to the European leaders. Entrepreneurship in Portugal has been seen as key to the development of the Portuguese national economy – a driver to boost employment, business diversification and innovation. During the last 10 years, Portugal set forth several political instruments to foster both digital and entrepreneurship skills. Nevertheless, secondary education and vocational training scarcely address entrepreneurship and there is plenty of room to develop methodologies and programmes with positive effects in terms of the development of digital entrepreneurial competences.

Spain. Spain ranks 11th out of 28 EU Member States in the Digital Economy and Society Index (DESI). Nevertheless, around one-fifth of people in Spain are not yet online and close to half of them lack basic digital skills. On the top of this and despite the growing demand for digital skills on the labour market, the supply of ICT specialists is still below the EU average. Spain has good telecommunications and technology infrastructure, but there is ample room for improvement in the digitalisation process of companies, which have the means but lack trained professionals and a digital culture. Since 2005, national policies have been implementing modifications to the regulatory framework of the education system in order to meet the objectives of the European Digital Agenda. Additionally, many projects and initiatives have been implemented at the national and regional levels supporting digital entrepreneurship skills. Nevertheless, a high degree of skills mismatches in companies limits their capacity to innovate and capitalise from innovation. The current situation of digital competences in Spain is seen as not only the responsibility and consequence of the educational system, but also of the companies, which should adapt their business models and introduce the upskilling of their employees.

In summary, while EU tools have led to the establishment of an inclusive and comprehensive framework for digital entrepreneurship skills development, some Member States still seem to be at the forefront of the conceptualisation and implementation of the relevant policy initiatives. The country analysis has revealed some obstacles in policy implementation supporting the EU strategy. First of all, policy responses related to digital entrepreneurship should be addressed to several stakeholders. While there are countries, like Poland, where the infrastructure is still being developed, and as a consequence, less attention is paid to the development of digital entrepreneurship skills, in other countries, like Spain, more effort is placed on modifications to the educational system and human upskilling. Nevertheless, in both countries, a clear reluctance from the companies' side in being engaged in the digital transformation and in VET system is observed. Therefore, the engagement of different stakeholders is a key element for stable

improvement of the VET situation. Second, initiatives should be undertaken at multiple levels – not only national, but also regional and local. In Italy, for example, where business is still perceived in a very traditional way, social engagement and changing perceptions starting at the local level might be a key to the successful implementation of digital transformation within VET in general. Last, but not least, all countries analysed struggle with the shortages in the VET educational systems. This mainly includes the need to implement innovative educational approaches, new methods of learning, improve the relationship between businesses and schools, include more practical exercises and experiences by educational institutions, and upskill teachers in appropriate digital entrepreneurship competences.

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Introduction

The digitalisation of societies around the world is a steady and constant process. Referred to as the "fourth industrial revolution", it is being recognised as a transformation that has changed European Union (EU) industries, as well as the social, economic and environmental ways in which people live and consume. The advent of digital technologies in daily life has radically disrupted how governments perceive and react to the needs of their citizens; how cultures and social actors communicate; and how services and goods are consumed. Furthermore, the digital transformation is perceived as a significant economic opportunity for Europe, which already has a leading position in many sectors: pharmaceutical, mechanical engineering, automotive and tourism. It has been estimated that 75% of the value of the digital economy in Europe will derive from these traditional businesses[1]. Enterprises that have already implemented new digital technologies perform better than their peers with no such technologies.

On the other hand, while having the potential to substantially increase growth and innovation and improve overall well-being, it raises concerns on the eventual relevance and redundancy of certain jobs and skills. According to the European Commission, around 40% of companies still have not adopted any new advanced technologies (e.g. mobile apps, social media, the cloud, big data analytics, e-commerce or the internet of things). Only 57% of Europeans have the digital skills needed for the digital world we live in. One in six Europeans aged 16-74 have no digital skills at all and one in four have only a low level of digital skills. Furthermore, while 90% of jobs require basic digital competences, 35% of the labour force lacks them. 38% of EU companies report that the lack of digital skills negatively affects their performance and competitiveness[2]. The figures vary between countries, sectors and individual companies, which may result in potential increases in skills gaps and inequalities between workers in Member States, sectors and companies which fall behind in technological adaptation and those at the forefront of digitalisation (OECD, 2019)[3]. Intrinsic to the ongoing transformation, digital skills therefore become crucial for the employability, competitiveness and sustainable development of the Member States and the EU as a whole.

To tackle this challenge, in 2013, the EU launched a multi-stakeholder partnership "The Grand Coalition for Digital Jobs" with the aim to facilitate collaboration among businesses, education providers and the private and public sectors to increase the share of individuals with information and communications technology (ICT) education. In 2017, the Digital Skills and Jobs Coalition brought together stakeholders from different environments to ensure that everyone can acquire

[1] https://ec.europa.eu/jrc/sites/jrcsh/files/JRC98723.pdf
[2] https://ec.europa.eu/digital-single-market/en/news/digital-skills-gap-europe
[3] OECD (2019). OECD Skills Outlook 2019. Thriving in a Digital World. Available at: https://www.oecd-ilibrary.org/sites/df80bc12-en/index.html?itemId=/content/publication/df80bc12-en&mimeType=text/html

digital skills. The Coalition's primary target is to train 1 million young people for digital jobs through short-term training programmes.

The aim of the DEEP project is to support the initiatives and activities introduced by the EU and to increase the share of tools to acquire new digital and entrepreneurial skills available at the EU level. The first stage of the project is aimed at identifying the skills gaps and needs at the EU level as well as the national policies and initiatives that support the development of digital entrepreneurships skills. The mapping exercises conducted by country experts as part of this project are summarised in the later sections of this report.

The countries chosen for this analysis are those with medium and low performance in terms of acquiring digital skills and supporting digital entrepreneurship competences. These include two of the largest countries in Eastern Europe: Bulgaria and Poland, and three countries from the lagging Southern Europe: Italy, Portugal and Spain. By gathering experiences at the national level, the aim of this report is to share best practices among the countries and to provide policy recommendations at the EU level.

The structure of the report is the following. In the first section, the terms digital skills and digital entrepreneurship skills will be discussed and defined and the results of the online study identifying digital skills shortages at the EU level will be presented. In the second section, the country analyses are presented and the supply and demand of digital entrepreneurship skills is examined in detail. In the third section, national policies on digital skills and technologies are summarised. In the last section, conclusions and policy recommendations for the EU are provided.

I. Digital entrepreneurship skills in the European Union

Definition

The definition of digital skills and digital entrepreneurship skills used for the purposes of this project derive from the Digital Competence Framework for Citizens (DigComp) European Initiative. DigComp was elaborated by the Human Capital and Employment Unit (Joint Research Centre) on behalf of the Directorate General for Employment, Social Affairs and Inclusion of the European Commission. The framework has evolved in recent years. The first version of the framework (DigComp 1.0) was created in 2014, the second version (DigComp 2.0) in 2016, while the most recent version (DigComp 2.1) in 2017.

The definition we follow in this project includes five dimensions which are depicted in detail below:

- Dimension 1: Competence areas identified to be a part of digital competence;
- Dimension 2: Competence descriptors and titles that are pertinent to each area;

- Dimension 3: Proficiency levels for each competence;
- Dimension 4: Knowledge, skills and attitudes applicable to each competence;
- Dimension 5: Examples of use of the competence to different purposes.

Regarding the first two dimensions of the framework, DigComp identifies the following five competence areas along with 21 digital competences:

Competence area	Competence
1. Information and data literacy	**1.1 Browsing, searching and filtering data, information and digital content** To articulate information needs, to search for data, information and content in digital environments, to access them and to navigate between them. To create and update personal search strategies. **1.2 Evaluating data, information and digital content** To analyse, compare and critically evaluate the credibility and reliability of sources of data, information and digital content. To analyse, interpret and critically evaluate the data, information and digital content. **1.3 Managing data, information and digital content** To organise, store and retrieve data, information and content in digital environments. To organise and process them in a structured environment.
2. Communication and collaboration	**2.1 Interacting through digital technologies** To interact through a variety of digital technologies and to understand appropriate digital communication means for a given context. **2.2 Sharing through digital technologies** To share data, information and digital content with others through appropriate digital technologies. To act as an intermediary, to know about referencing and attribution practices. **2.3 Engaging in citizenship through digital technologies** To participate in society through the use of public and private digital services. To seek opportunities for self-empowerment and for participatory citizenship through appropriate digital technologies. **2.4 Collaborating through digital technologies** To use digital tools and technologies for collaborative processes, and for co-construction and co-creation of resources and knowledge. **2.5 Netiquette** To be aware of behavioural norms and know-how while using digital technologies and interacting in digital environments. To adapt communication strategies to the specific audience and to be aware of cultural and generational diversity in digital environments. **2.6 Managing digital identity** To create and manage one or multiple digital identities, to be able to protect one's own reputation, to deal with the data that one produces through several digital tools, environments and services.
3. Digital content creation	**3.1 Developing digital content** To create and edit digital content in different formats, to express oneself through digital means. **3.2 Integrating and re-elaborating digital content**

	To modify, refine, improve and integrate information and content into an existing body of knowledge to create new, original and relevant content and knowledge. **3.3 Copyright and licences** To understand how copyright and licences apply to data, information and digital content. **3.4 Programming** To plan and develop a sequence of understandable instructions for a computing system to solve a given problem or perform a specific task.
4. Safety	**4.1 Protecting devices** To protect devices and digital content, and to understand risks and threats in digital environments. To know about safety and security measures and to have due regard to reliability and privacy. **4.2 Protecting personal data and privacy** To protect personal data and privacy in digital environments. To understand how to use and share personally identifiable information while being able to protect oneself and others from damages. To understand that digital services use a "Privacy policy" to inform how personal data is used. **4.3 Protecting health and well-being** To be able to avoid health-risks and threats to physical and psychological well-being while using digital technologies. To be able to protect oneself and others from possible dangers in digital environments (e.g. cyber bullying). To be aware of digital technologies for social well-being and social inclusion. **4.4 Protecting the environment** To be aware of the environmental impact of digital technologies and their use.
5. Problem solving	**5.1 Solving technical problems** To identify technical problems when operating devices and using digital environments, and to solve them (from troubleshooting to solving more complex problems). **5.2 Identifying needs and technological responses** To assess needs and to identify, evaluate, select and use digital tools and possible technological responses to solve them. To adjust and customise digital environments to personal needs (e.g. accessibility). **5.3 Creatively using digital technologies** To use digital tools and technologies to create knowledge and to innovate processes and products. To engage individually and collectively in cognitive processing to understand and resolve conceptual problems and problem situations in digital environments. **5.4 Identifying digital competence gaps** To understand where one's own digital competence needs to be improved or updated. To be able to support others with their digital competence development. To seek opportunities for self-development and to keep up to date with the digital evolution.

Source: Vuorikari, R., Punie, Y., Carretero Gomez S., Van den Brande, G. (2016). DigComp 2.0: The Digital Competence Framework for Citizens. Update Phase 1: The Conceptual Reference Model. Luxembourg Publication Office of the European Union. EUR 27948 EN. doi:10.2791/11517

Regarding Dimension 3, the latest version of the framework (DigComp 2.1) identifies eight proficiency levels of competences – from performing simple tasks with guidance at Level 1 to

resolving complex problems with many interacting factors at Level 8. The levels for each digital competence have been defined through learning outcomes (knowledge, skills and attitudes). Thus, there are 168 descriptors of competences (21 competences by eight proficiency levels).

Additionally, DigComp 2.1 provides practical examples of the use of digital competences at each level, which is Dimension 5 of the framework. The examples are presented for two areas of use: employment and learning (see DigComp 2.1, pp. 18-19).

It is worth mentioning that the European Commission carries out a number of activities aimed at disseminating the DigComp. Among others, a user guide to the DigComp was recently published. The publication describes several examples of applying the DigComp in EU Member States. One example comes from Poland. The European Computer Competence Certificate Foundation has developed a digital competence certification system based on the DigComp. Proficiency in each of the five areas of competence is certified at four levels (A, B, C or D).

Trends in digital and entrepreneurship skills

Digital skills

While the demand for digital skills is boosted by the digitalisation of all sectors, the supply is undermined by a lack of proper training and the limited use of technology for education purposes. In 2019, 9% of all EU companies, including 46% of large EU enterprises, recruited or tried to recruit ICT (information and communication technology) specialists. At the same time, the share of companies that reported having hard-to-fill vacancies for ICT specialists increased by 2 percentage points (pp) between 2012 and 2019 for all EU companies and has almost doubled for large enterprises (from 17% to 30%)[4]. As depicted in recent estimates, by 2020, there will still be about 756,000 unfilled ICT vacancies throughout the EU.[5]

Demand, therefore, is growing continuously, with 90% of all current jobs requiring at least some level of digital skills. However, the EU still lags behind the top global performers in terms of digital skills availability and development (e.g. East Asia), with 44% of all citizens and 36% of the labour force lacking appropriate digital competences (see Figure 1). Furthermore, significant cross-country divergences persist within the EU itself, where the Southern and Eastern Member States stand out by having on average about 43% of the labour force with no basic digital skills.

It was estimated that about 15% of EU employers consider that some of their workers are not sufficiently proficient in the tasks they carry out using digital technology[6]. Similarly, as OECD

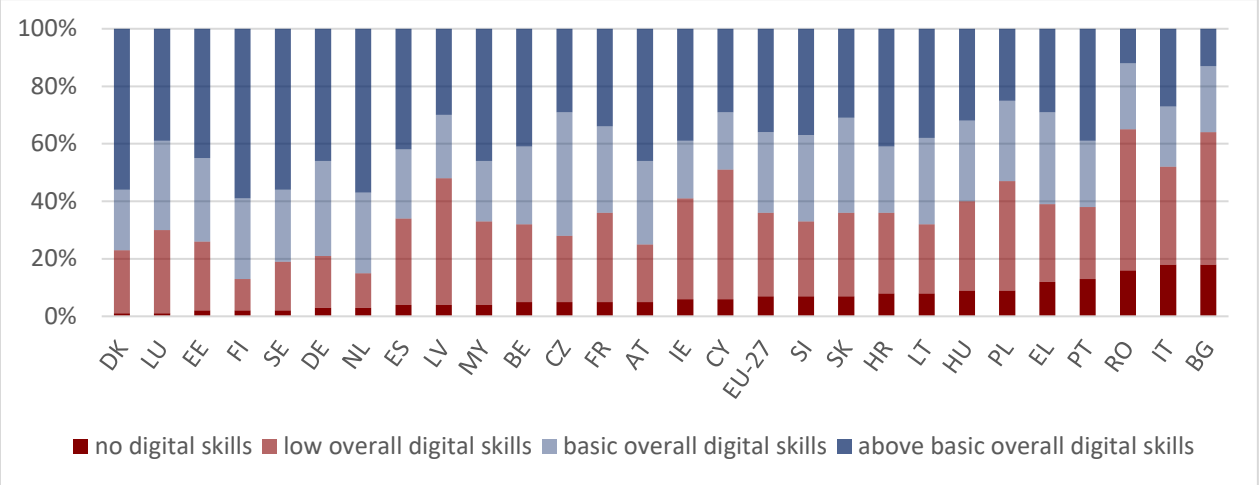
[4] Eurostat. Enterprises that recruited or tried to recruit ICT specialists, available at: https://ec.europa.eu/eurostat/web/digital-economy-and-society/data/database

[5] Kiss, M. (2018). Digital skills in the EU labour market, European Parliamentary Research Service, available at: https://www.europarl.europa.eu/RegData/etudes/IDAN/2017/595889/EPRS_IDA%282017%29595889_EN.pdf.

[6] Curtarelli, M., Gualtieri, V., Shater Jannati, M., and Donlevy, V. (2017) ICT for work: Digital skills in the workplace, available from: https://ec.europa.eu/digital-single-market/en/news/ict-work-digital-skills-workplace.

points out, on average over 40% of employees that use ICT on a daily basis do not have the skills needed to effectively use relevant software.[7] The lack of skills supply therefore may limit the potential of the EU economy and its workers to fully benefit from the opportunities brought about by digitalisation.

Figure 1. Digital skills of the EU-27 labour force, (% of individuals, by skills level).

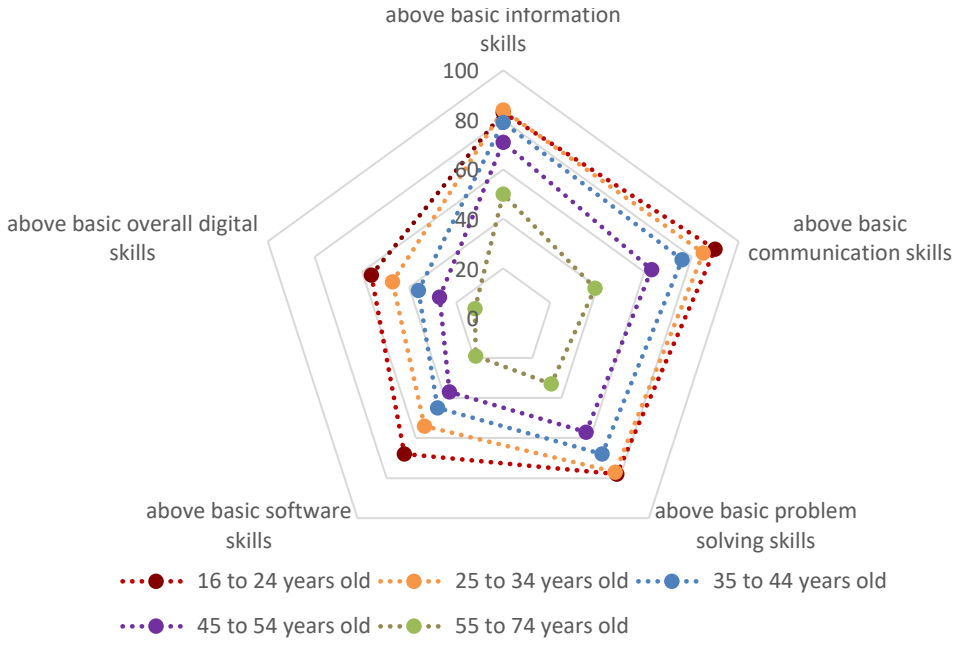


Source: Eurostat. Individuals' level of digital skills, 2019

Furthermore, when different age groups are considered (see Figure 2), it is evident that the younger population has a higher overall digital competence relative to others. Specifically, the share of individuals with above basic overall digital skills decreases gradually from 56% for the population aged 15 to 24 years old to 27% for those aged 45 to 54 years old, and to only 12% for those aged 55 to 74 years old. The only exception is the information skills category where: 1) the highest rate is achieved by individuals between 25 and 34 years old and not 16 to 24 years old, though the difference is marginal (only 1 pp); and 2) the gap between the share of people with above average skills at 16 to 24 years old and 45 to 54 years old is the smallest relative to other types of skills (only 12 pp).

[7] OECD (2016a), "Skills for a Digital World: 2016 Ministerial Meeting on the Digital Economy Background Report", OECD Digital Economy Papers, No. 250, OECD Publishing, Paris, http://dx.doi.org/10.1787/5jlwz83z3wnw-en.

Figure 2. Digital skills – EU-27, by type and age group (% of individuals).



Source: Eurostat. Individuals' level of digital skills, 2019

Based on the definition provided above, during the implementation study of the DEEP project, we asked individuals as well as companies about the digital skills needed on the European labour market. The results identified huge gaps in the demand for skills and the available supply. Over 40% of the companies that took part in this study reported lacking some elements of the digital competences required for their entrepreneurial activity. The competences primarily sought by companies and lacking among individuals include[8]:

- Ability to protect personal data and privacy (60% of companies);
- Ability to solve technical problems (58% of companies);
- Ability to identify needs and technological responses (58% of companies);
- Ability to manage digital identity, ability to elaborate and re-elaborate digital content and programming (54% of companies).

The study also revealed that individuals' perceptions about the competences they lack in order to be competitive on the labour market are very much in line with those identified by employers. The following competences were listed as completely lacking by individuals:

- Programming (67% of individuals);
- Ability to identify digital competence gaps by themselves (42% of individuals);

[8] Detailed results of the study are presented Annex I to this report.

- Ability to identify needs and technological responses (40% of individuals);
- Ability to solve technical problems (40% of individuals).

These trends highlight the growing need for a comprehensive approach to skills acquisition and development, as formal education alone is not sufficient to meet the challenges brought about by the accelerating pace of technological transformation. Currently unemployed or inactive people are particularly at risk as their effective reintegration to the labour market is contingent on the availability of proper training and their capacity to acquire relevant skills[9]. In this light, the digital skills framework has to be improved to anticipate the rapidly evolving skills demands and to adapt the pathways and training programmes to support adequate and timely skills supply.

Entrepreneurship skills

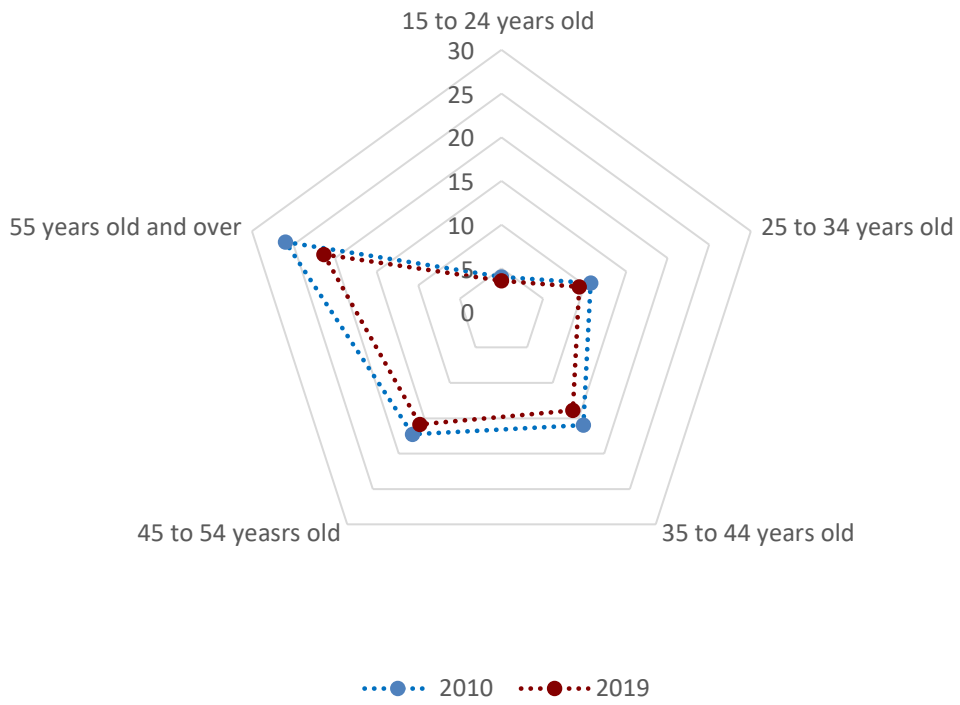
While the importance of science, engineering and technology is deeply rooted and recognised at the EU level and by national stakeholders, entrepreneurship skills in particular have not been a priority until the recent decade. At the same time, the intrinsic low tangibility and transversal character of the entrepreneurial competence results in a general lack of consensus on its components and distinctive elements. The concept therefore is often misunderstood and unevenly incorporated in training and education practices.

While entrepreneurship education and entrepreneurial spirit have benefited from greater recognition and occupied a higher place on the EU agenda over the recent decade, the lack of appropriate entrepreneurship skills remains one of the main challenges for the EU economy and its sustainability. At the same time, demand for entrepreneurial competence is less tangible as it is often either intrinsic to the supplier or fostered by public policies in the field.

Thus, while no comprehensive evaluation of entrepreneurial skills proficiency is available at the EU level, a proxy in the form of the self-employed labour force allows us to understand underlying trends and the prevalence of the entrepreneurial mindset among different countries and age groups. With regard to the Member States, in particular, there is an evident preference for self-employment among the Southern and Eastern regions. Further, the availability of entrepreneurial skills is particularly relevant for the younger population for which it appears more challenging to find a job given the ever shrinking and increasingly competitive labour market. Yet, as Figure 3 depicts, the lowest share of self-employed workers relative to total labour force is also found among the youngest strata (about 3.6% for the 15 to 34 years old group). Interestingly enough, the overall share of self-employed workers has been constantly decreasing. This tendency however could be due to the increasing number of large entrepreneurship projects which eventually outgrow the self-employment category, hence are not captured by the data.

[9] http://www.europarl.europa.eu/RegData/etudes/IDAN/2017/595889/EPRS_IDA(2017)595889_EN.pdf

Figure 3. Share of self-employed individuals – EU-27, by age.



Source: Eurostat. Employed persons by age groups and Nace Rev. 2 activity

The evolution of the EU political agenda in recent years has underlined a growing awareness that entrepreneurial competences and attitudes can be learned and nurtured, which in turn leads to a growing number of initiatives that support the development of an entrepreneurial mindset and culture throughout the EU. Once properly explored, entrepreneurship skills potential may open up a wider horizon of growth and employment opportunities.

Digital-entrepreneurship skills nexus

The accelerating pace of transformation and the emerging challenges related to globalisation, technology and the economy call for the greater flexibility, complementarity, and the eventual transversality of skills. The EU-level framework therefore has been continuously underlying the importance of a comprehensive and anticipatory approach to skills formation. Further, the growing recognition of the importance of grassroot initiatives and the capacity to make use of emerging opportunities and ideas and to transform them into tangible resources fed into promotion of, in particular, the digital-entrepreneurship skills nexus as the backbone of labour market adaptation and economic growth.

Further, as evidenced by the 2020 outbreak of the COVID-19 pandemic, the availability of adequate digital skills in both work and education are crucial for the economic and social resilience of individual Member States and the EU as a whole. At the same time, both digital and

entrepreneurial competencies will only gain greater importance in the post-crisis recovery as a crucial component necessary to promote and support EU competitiveness and social inclusion.

Policy responses regarding digital-entrepreneurship skills

The dynamics of the recent decade contributed greatly to the development of the EU skills framework, which has increased in its scope and scale since the 2006 Recommendation on Key Competences for Lifelong Learning[10] and the recognition of digital skills and a sense of initiative and entrepreneurship as one of the eight key competences necessary for development, employability, and a knowledge-based society.

The 2009 strategic framework for European cooperation in education and training (ET 2020)[11], in particular, stands out as one of the major milestones in this process. Building on the achievements of the Education and Training 2010 work programme[12], it identified four strategic objectives for EU-wide cooperation. These include 1) ensuring effective lifelong learning and mobility; 2) improving the quality and efficiency of education and training; 3) promoting social inclusion, equality and active citizenship; and 4) enhancing creativity and innovation within education and training. The last objective specifically targets the development of digital and entrepreneurial competences as a way to reconcile professional demand for transversal skills and individual well-being. In this light, the ET 2020 boosted the lifelong learning approach and established a framework for knowledge sharing and the dissemination of national best practices throughout the EU.

Further, the 2016 New Skills Agenda for Europe[13] contributed to the establishment of a comprehensive skills formation framework at the EU level. Not only did it highlight the strategic importance of adequate transversal skills for the growth and competitiveness of the EU, but it also put forward the need for a systemic and cooperative approach to ensure the timely acquisition and proper adaptation of skills. In this light, the Commission has launched 10 actions aimed at promoting and supporting skills formation and the development of human capital throughout the EU. With regard to technological transformation and the ever-growing relevance of digital skills, in particular, the Commission 1) asked Member States to develop national digital skills strategies and 2) launched the Digital Skills and Jobs Coalition which aimed at bringing together relevant stakeholders at the EU and national levels to address the need for digital skills in the labour market, education, and society as a whole. The Coalition has identified four priority goals to be achieved by the year 2020: 1) train 1 million young unemployed persons for vacant digital jobs via traineeships, apprenticeships and training programmes; 2) support the upskilling and retraining of the workforce, in particular, within the small and medium-sized enterprise (SME) sector; 3) modernise education and training to provide students and teachers with

[10] Recommendation of the European Parliament and of the Council of 18 December 2006 on key competences for lifelong learning, available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32006H0962.
[11] available at: https://ec.europa.eu/education/policies/european-policy-cooperation/et2020-framework_en.
[12] available at: https://op.europa.eu/en/publication-detail/-/publication/59381b9f-3a72-4bca-9b8f-1f9029644152/language-en.
[13] available at: https://ec.europa.eu/social/main.jsp?catId=1223&langId=en.

opportunities to use digital tools and materials and to develop and upgrade their digital skills; and 4) reorient and make use of available funding to support digital skills and carry out awareness raising campaigns on their importance for employability and competitiveness.

In parallel, the EU framework for digital-entrepreneurial skills was strengthened by the 2013 European Digital Competence Framework for Citizens[14] (DigComp) and its further updates – DigComp 2.0 and DigComp 2.1, as well as the 2016 Entrepreneurship Competence Framework[15] (EntreComp). Both DigComp and EntreComp aim to establish comprehensive conceptual frameworks by identifying the scope of digital and entrepreneurial competences respectively and to provide a set of tools to fill existing skills gaps throughout the EU. To this end, DigComp established a conceptual reference model which includes 21 competences along five areas, namely 1) information, 2) communication, 3) content creation, 4) safety, and 5) problem solving. Its 2016 update – DigComp 2.0 – streamlined the vocabulary and refined the descriptions of selected competences. EntreComp, in turn, was developed in an attempt to achieve a consensus on the understanding of the less-tangible entrepreneurship skills by identifying their key components. The latter depicts entrepreneurial competence as the ability to realise opportunities and ideas by mobilising resources which are highlighted, interconnected and could be material (e.g. production means), non-material (e.g. skills) or personal (e.g. motivation and self-efficacy). Further, in line with the European Qualifications Framework (EQF) established as part of the New Skills Agenda for Europe, both frameworks have identified eight levels of proficiency which serve as a common reference point and an evaluation grid. In this light, the Frameworks feed into the development of EU-wide, national and local initiatives which promote and support targeted training and education to boost the digital-entrepreneurship skills nexus within the general population, as well as within the current and soon-to-be labour force.

More recently, the European Commission launched its Digital Education Action Plan[16] and Entrepreneurship 2020 Action Plan[17] to support technology use and the development of the digital and entrepreneurial competences of EU citizens. The 2018 Digital Education Action Plan therefore underlined the persistent lack of technology usage for educational purposes and highlighted the need to stimulate and scale up the purposeful use of digital and innovative education practices. It also identified the following measures as priorities to help meet the existing digital skills challenges and opportunities: 1) improve the use of digital technology for teaching and learning; 2) develop digital skills and competences; and 3) improve education via better data analysis and foresight. The Entrepreneurship Action Plan in turn aims to boost the entrepreneurial mindset and culture within the EU to open up the EU's entrepreneurship

[14] available at: https://ec.europa.eu/jrc/en/digcomp.
[15] available at: https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/entrecomp-entrepreneurship-competence-framework.
[16] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the Digital Education Action Plan, available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2018:22:FIN.
[17] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Entrepreneurship 2020 Action Plan. Reigniting the entrepreneurial spirit in Europe, available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52012DC0795.

potential and boost EU competitiveness. To this end, entrepreneurial education and training, the removal of administrative barriers and the nurturing of an entrepreneurial culture in the EU have been identified as priority areas for intervention.

The development of the digital and entrepreneurial skills agenda within the EU also benefits from a number of EU-level and national funds supporting dedicated projects. These include, among others, European Structural and Investment Funds, a part of which has been earmarked for digital skills training and ICT education following the 2013 Council Conclusion[18]. Specifically, over the years 2014-2020, the European Social Fund (ESF) and the European Regional Development Fund (ERDF) alone have provided over EUR 30 billion[19] for training and vocational education and training (VET), including, among others, projects supporting the development of transversal skills. Similarly, nearly EUR 15 billion has been committed by the Erasmus+ programme to support skills development in education and training. The budget planning for 2021-2027 has already included a special provision for the support of education and skills development and proposed EUR 9.2 billion funding for the new Digital Europe Programme[20], which focuses on boosting the strategic digital competences of EU citizens and companies.

European Initiatives re digital-entrepreneurship skills

Alongside greater recognition of the importance of digital-entrepreneurship competences throughout the years, the European Commission has also introduced and expanded a number of initiatives to promote and support skills acquisition and development, as well as to help Member States develop their national policies and practices in the field.

This type of support framework is provided largely within the actions launched by the New Skills Agenda for Europe, as well as the Digital Education Plan and the 2020 Entrepreneurship Education Plan. EU Code Week[21] is one example of the recent rise in the popularity of digital skills. Fostered by the Digital Education Action Plan, EU Code Week aims to promote coding and digital literacy throughout the EU and beyond and appears therefore as part of the EU-wide Digital Single Market Strategy. Since 2015, the number of participating countries has almost doubled, while the number of participants has increased sevenfold (from 570 thousand to 4.2 million in 2019).

Furthermore, EU-level initiatives such as Upskilling Pathways[22] and the Blueprint for Sectoral Cooperation on Skills[23] feed into the harmonisation of national and sectoral practices and performance in terms of skills availability and development. Upskilling Pathways, in particular, stands out as one of the most comprehensive and inclusive initiatives at the EU level and as one of the key milestones of the overarching European Pillar of Social Rights. It targets adults, either

[18] available at: https://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/139197.pdf.
[19] European Structural and Investment Funds Open Data Portal, available at: https://cohesiondata.ec.europa.eu.
[20] available at: https://ec.europa.eu/digital-single-market/en/news/digital-europe-programme-proposed-eu92-billion-funding-2021-2027.
[21] available at: https://codeweek.eu/about.
[22] available at: https://ec.europa.eu/social/main.jsp?catId=1224&langId=en.
[23] *Ibidem.*

employed or not, with a low baseline level of skills and the need to strengthen them. The initiative benefits from the existing national structure and consists of three key steps, namely an initial skills assessment, a tailored offer of education and training and the validation and recognition of the skills acquired. In addition, the implementation of the Upskilling Pathways initiative is supported by EU-level funding, like the ESP, the ERDF, Erasmus+, the Structural Reform Support Programme (SRSP) and others.

Along with other initiatives introduced by the New Skills Agenda for Europe, the Digital Skills and Jobs Coalition[24], in particular, has given place to over 300 initiatives and 118 organisations taking concrete commitments (pledges)[25] to address the digital skills gap via dedicated training, awareness raising, job placement and digital skills certification. Further, the Coalition has showcased national best practices and Digital Single Market ambassadors via the European Digital Skills Awards[26] and Digital Champions[27], respectively. The latter targets, in particular, the young population and supports the development of their digital and entrepreneurial competences by sharing national best practices in terms of skills nurturing. As a result, the European Commission along with Digital Champions has identified nine model projects[28] throughout the EU, including, among others, IT for SHE[29] (Poland), which encourages and provides digital training for women, and MediaMasters[30] (Netherlands), which introduces young people to digital skills via games. The European Digital Skills Awards, in turn, celebrate national best practices and success stories by recognising initiatives that have improved the digital skills of EU citizens. Since the first edition in 2016, 765 projects applied by 2018 and 14 outstanding projects were presented with the Award. Examples of winning initiatives include Coding Bootcamp Praha[31] (Czech Republic) and Fit4coding[32] (Luxembourg), which offers coding education to those who want to change their career from more traditional sectors to IT.

At the same time, a number of EU-wide skills initiatives contribute to the increase of digital and entrepreneurship skills. These include, in particular, the Digital Opportunity traineeships scheme[33] and Erasmus for Young Entrepreneurs, which aim at providing first-hand experience in digital and entrepreneurial competences, respectively. While both initiatives primarily target the young population, Erasmus for Young Entrepreneurs[34] (EYE) also provides opportunities for experienced host-entrepreneurs to benefit from a fresh perspective on their business. Thus, providing a cross-border exchange of new entrepreneurs, EYE supports the sharing of knowledge, best practices and soft skills between the young or soon-to-be entrepreneurs and small businesses in participating countries. The Digital Opportunity traineeships scheme in turn is

[24] available at: https://ec.europa.eu/digital-single-market/en/digital-skills-jobs-coalition.
[25] available at: https://pledgeviewer.eu.
[26] available at: https://ec.europa.eu/digital-single-market/en/digital-skills-initiatives.
[27] available at: https://ec.europa.eu/digital-single-market/en/digital-champions.
[28] available at: https://ec.europa.eu/digital-single-market/en/model-projects.
[29] available at: http://www.itforshe.pl/pl/.
[30] available at: https://ec.europa.eu/digital-single-market/en/digital-skills-initiatives/mediamasters.
[31] available at: https://www.codingbootcamp.cz.
[32] available at: https://digital-luxembourg.public.lu/initiatives/fit4coding.
[33] available at: https://ec.europa.eu/digital-single-market/en/digital-opportunity-traineeships-boosting-digital-skills-job.
[34] available at: https://www.erasmus-entrepreneurs.eu.

implemented via Erasmus+ and focuses on companies of all sizes and sectors to find students and recent graduates (about 6,000) ready to apply and boost their digital skills.

II. Country trends in digital entrepreneurship skills

II.1 Bulgaria

Trends in digital and entrepreneurship skills

Digital skills are of high importance for the labour market of Bulgaria. Indeed, this importance stems from the fact that the current digital transformation has influenced the arrangement of human capital, institutional structures and organisational capacities. Nevertheless, digital transformation in Bulgarian companies lags behind in comparison with companies in other Member States. SMEs also lag behind in realising their products with the help of e-trade in comparison with other countries in the EU. This sluggish expansion of e-commerce in Bulgaria is a consequence of the lack of active online customers and an insufficient supply of electronic public services. According to data provided by the National Statistical Institute (NSI), in 2017, there a was a slight decrease in the extent to which SMEs were implementing and incorporating digital technologies in comparison to the large enterprises in the country[35].

On the other side, the competences of employees are also crucial for the successful functioning of businesses. The current digital transformation of the economy has increased the demand for digital skills in the workforce. The development of new skills and competences can be achieved through the implementation of policies that are targeting the qualifications of the workers. The most commonly used training plans for improving the digital competences of employees are conducted in the fields of social networking, planning of resources, security, IT development, the creation of applications and websites and data modelling, among others[36].

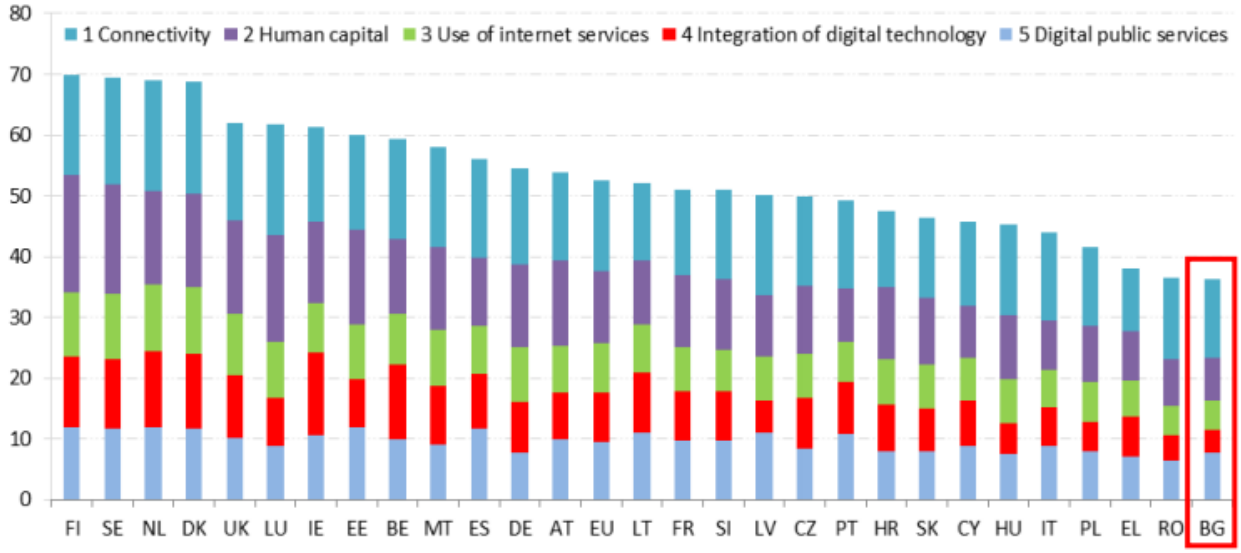
Additionally, the COVID-19 pandemic, which caused rapid and drastic changes to our everyday lives, has influenced the growing importance of digital technology and the Internet. Thus far, the response of most Bulgarian institutions and state systems has shown adequacy and readiness to cope with the challenges of the crisis.

Digital skills

The Bulgarian economy is particularly dependent on the availability, access and adoption of ICT. Rapid changes in and the short-lived nature of ICT products demand greater expertise and adaptability from businesses and their employees. Taking this into account along with the relevant European and national policies and action plans, Bulgarian ICT strategies centre on the supply of digital skills for managing the demand and digital potential of the industry.

[35] Ahmedova, S. (2020). Digital transformation of the Bulgarian industry. *IOP Conf. Ser.: Mater. Sci. Eng. 709 022061.*
[36] *Ibidem.*

Figure 4. Digital Economy and Society Index (DESI) 2019 ranking.



Source: https://ec.europa.eu/digital-single-market/en/scoreboard/bulgaria

According to the Digital Economy and Society Index (DESI), in 2019, Bulgaria was the worst performing country for digital skills. Bulgaria ranks last with a score of 36.2 points, as compared to the EU average of 52.5 points. Despite the fact that since 2017, the values of the index have increased from 32.4 points, the scores of the country are still the lowest within the EU. Indeed, Bulgaria has progressed in relation to connectivity because high-speed and mobile networks are widely accessible. Moreover, significant advancement has been achieved with the implementation of e-government and its increasing usage as well as the growing supply of digital public services in the corporate sector. Nevertheless, the country's performance concerning the digital skills of human capital is below the average for the EU – only 29% of Bulgarians have basic digital skills, as compared to the EU average of 57%. Furthermore, those with competences that are appraised at above the basic level account for only 11% of the population.

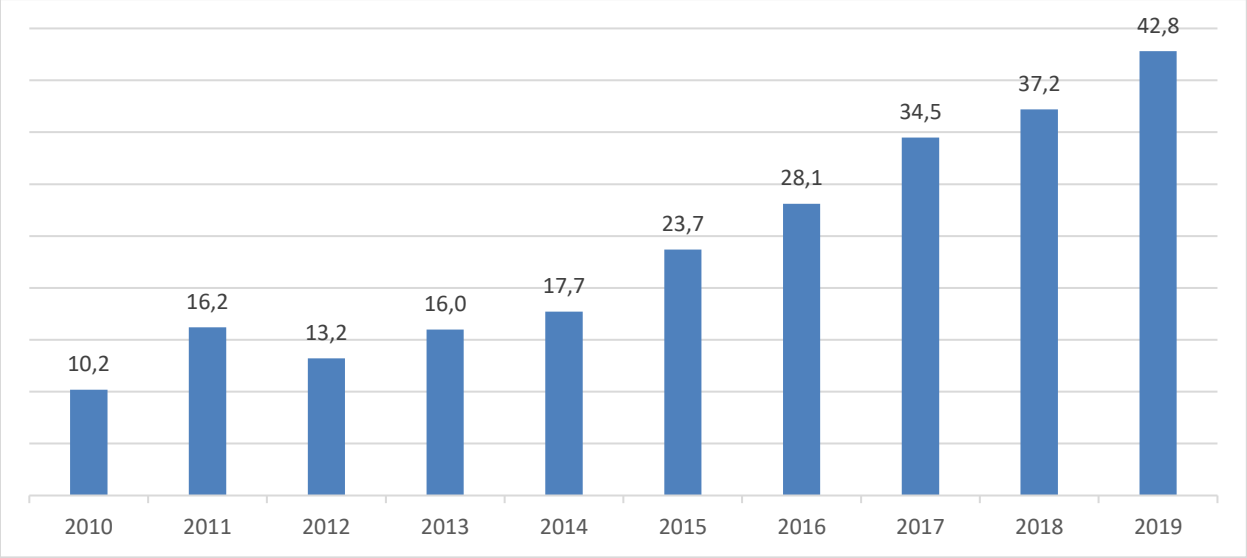
Regarding businesses, they are not making use of the full spectrum of opportunities offered by e-commerce. In fact, only 6% of SMEs trade online and only 2% of their revenue is from the online sector. The Bulgarian government has implemented a National Programme entitled "Digital Bulgaria 2025" that drafts measures for bettering the connectivity and integration of digital technology in the public and corporate sectors. Thus far, however, outcomes are not satisfactory[37].

In order to examine the demand for digital skills in Bulgaria, the number of employed persons with ICT education is analysed. The aim is to follow the numbers and to identify trends in the

[37] European Commission, 2019, Shaping Europe's digital future, Bulgaria, DESI country profile, available at: https://ec.europa.eu/digital-single-market/en/scoreboard/bulgaria.

demand for digital skills on the Bulgarian labour market. This indicator concerns people between the ages of 15 and 74 years old.

Figure 5. Number of employed persons with ICT education aged between 15 and 74 years in Bulgaria (2010-2019) (in thousands)[38].



Source: Eurostat Database

The number of the employed persons (aged between 15 and 74 years) with ICT education grew from 10.2 thousand in 2010 to 42.8 thousand in 2019. Despite fluctuations at the beginning of the period, from 2013 onwards the values of the indicator have been steadily increasing. Hence, it becomes evident that the demand for digital skills on the labour market of the country has also been growing from 2010 until 2019. These figures indicate that the value of digital competences has been rising and, thus, the implementation of digital skills in the school curriculum proves to be of crucial importance.

When it comes to the supply of digital/ICT skills in Bulgaria, the educational system plays a key role. Bulgarian schools provide ICT classes that contribute to the development of basic digital skills. However, higher education institutions and their programmes are focused on building partnerships with the industrial sector and on training future workers. Under the European programme "Human Resources Development", a number of projects aimed at adapting university curriculums to the needs of industry have been financed. For instance, Sofia University, and in particular the Faculty of Mathematics and Informatics (FMI), has been working together with the Bulgarian ICT sector to meet employer demands. To this end, the faculty has opened Bachelor's programmes harmonised with the skilled workforce required by the industry. Furthermore, the goal of Master's programmes at the FMI is to provide a higher level of digital

[38] Eurostat, 2020, Database, available at: https://ec.europa.eu/eurostat/data/database.

and interdisciplinary competencies, which again are in line with businesses' needs. Accordingly, the Ministry of Education and Science (MES) participates in a project on student practices where employers cooperate with universities on the practical preparation of students. Moreover, the MES has been working on an assessment system of the universities in Bulgaria that will influence the provision of subsidies for higher education institutions and programmes that offer the skills demanded by the labour market, provide a high quality education and, eventually, match their students' employability with the obtained qualification[39].

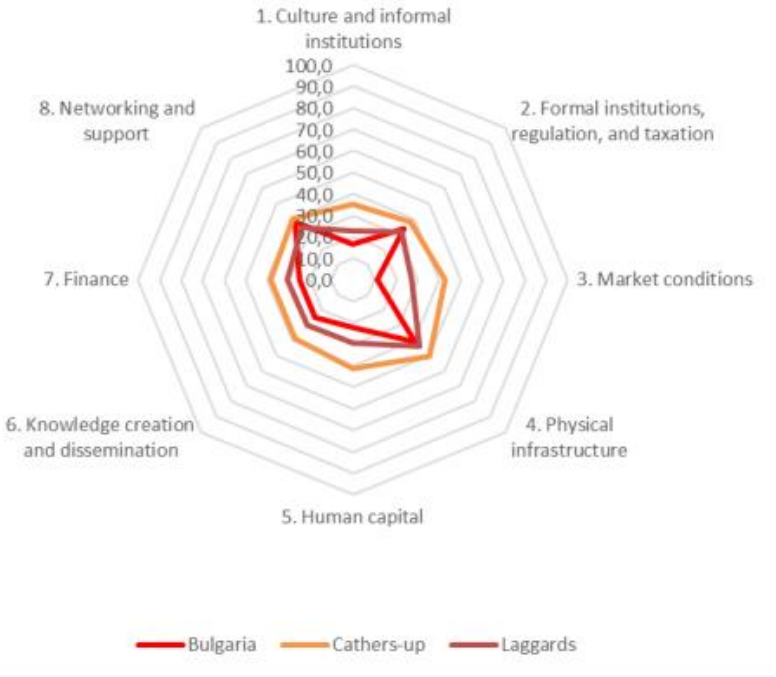
Entrepreneurship skills

Entrepreneurship is critically important for the healthy functioning of the Bulgarian economy. Indeed, entrepreneurs boost economic growth and employment rates. And the creation of businesses results in higher incomes which ultimately lead to growing tax profits and more government expenditures. In fact, the higher the national income, the greater the opportunity for the government to invest in troubled sectors of the economy and human resources. Entrepreneurship also brings about social transformation – it increases the population's standard of living and economic freedom[40]. Finally, entrepreneurship stimulates creative thinking and innovation, as entrepreneurs search for solutions to the new problems they encounter[41].

According to the European Index of Digital Entrepreneurship Systems (EIDES), Bulgaria is classified as a "laggard" country. The EIDES index ranks countries on eight different pillars related to various aspects of digitalisation. Bulgaria's worst performance can be found for Pillars 1 (culture and informal institutions) and 3 (market conditions). From this, it can be inferred that state is not ensuring the market conditions necessary for entrepreneurs and their activities. The lack of an appropriate market environment can lead to a lack of social engagement and a low interest in entrepreneurship. However, Bulgaria ranks high for Pillars 2 (formal institutions, regulations, and taxation), 4 (physical infrastructure) and 8 (networking and support). Bulgaria also performs relatively well in terms of Pillars 5 (human capital), 6 (knowledge creation and dissemination) and 7 (finance). However, these scores are still below those of other "laggard" EU countries[42].

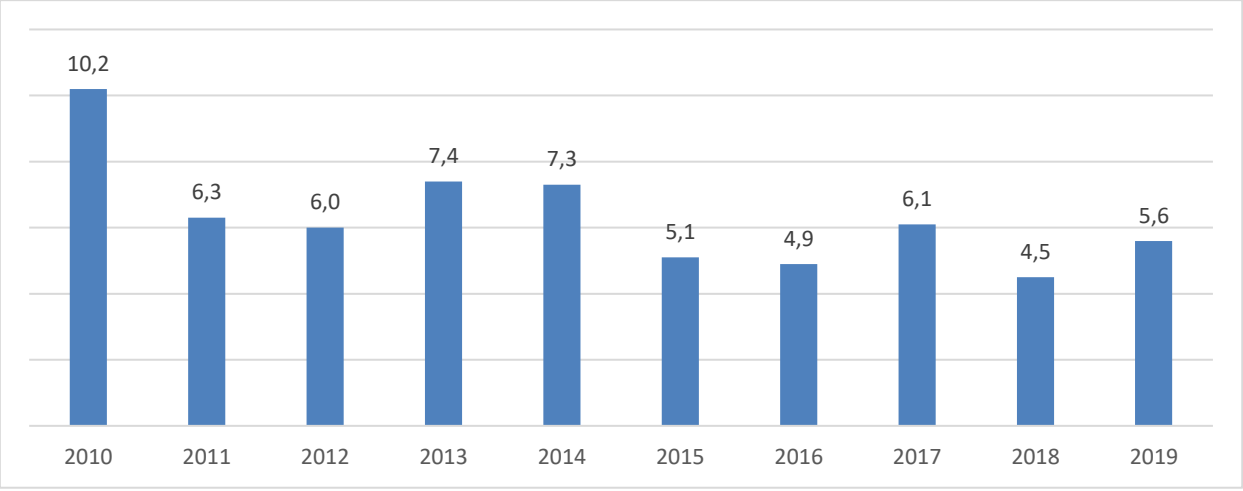
[39] Gourova, E., Ionkov, N. and Dragomirova, M. (2014). E-skills Challenges in Bulgaria. Conference Paper. 12th International Conference E-society 2014, Madrid, Spain.
[40] Investopedia, 2019, Why Entrepreneurship is Important to the Economy, available at: https://www.investopedia.com/articles/personal-finance/101414/why-entrepreneurs-are-important-economy.asp.
[41] Global Entrepreneurship Monitor Bulgaria, 2019, Why is entrepreneurship important?, available at: https://gemorg.bg/zashto-e-vazhno-predpriemachestvoto/.
[42] Autio, E., Szerb, L., Komlósi, E. and Tiszberger, M., EIDES 2019 – The European Index of Digital Entrepreneurship Systems, EUR 29892 EN, Publications Office of the European Union, Luxembourg, 2019, ISBN 978-92-76-12269-2, doi:10.2760/107900, JRC117495.

Figure 6. Performance of Bulgaria in relation to the eight pillars of the European Index of Digital Entrepreneurship Systems (EIDES)[43].



Source: Autio et al. (2019)

Figure 7. The number of self-employed aged between 15 and 24 years in Bulgaria (2010-2019) (in thousands)[44].

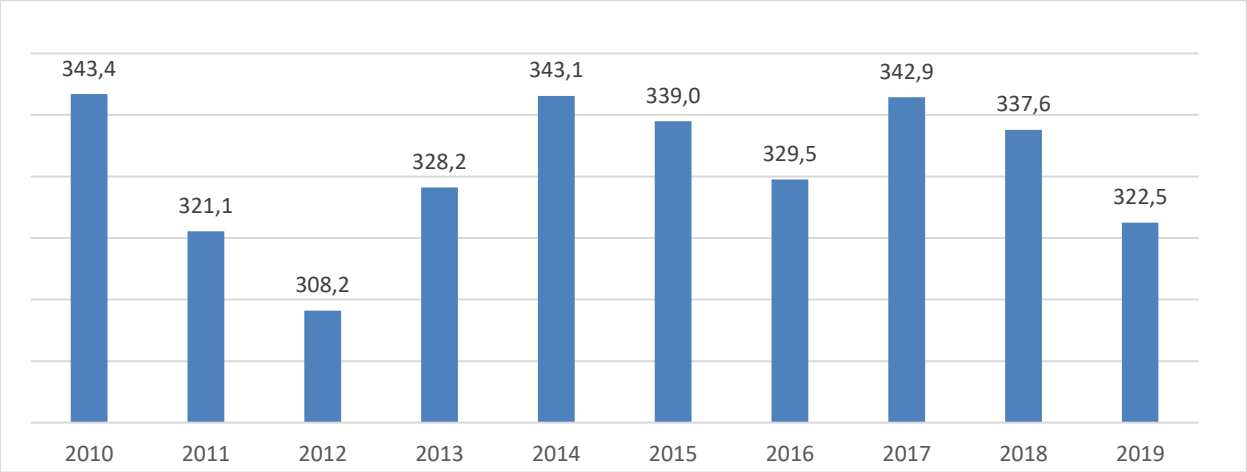


Source: Eurostat Database

[43] Autio, E., Szerb, L., Komlósi, E. and Tiszberger, M., EIDES 2019 - The European Index of Digital Entrepreneurship Systems, EUR 29892 EN, Publications Office of the European Union, Luxembourg, 2019, ISBN 978-92-76-12269-2, doi:10.2760/107900, JRC117495.

[44] Eurostat, 2020, Database, available at: https://ec.europa.eu/eurostat/data/database.

Figure 8. The number of self-employed aged between 24 and 74 years in Bulgaria (2010-2019) (in thousands)[45].



Source: Eurostat Database

In order to study the demand for entrepreneurship skills in Bulgaria, the number of the self-employed is presented above, as a proxy for the entrepreneurship. The group aged between 15 and 24 years is examined first and then the focus shifts to the those aged between 24 and 74 years.

Figure 7 shows that the overall number of the self-employed aged 15-24 years decreased from 2010 to 2019. However, there were significant fluctuations during this period: the highest value occurred in 2010 (10.2 thousand) and the lowest value occurred in 2018 (4.5 thousand).

The data provided in Figure 8 shows a similar overall decreasing trend: from 343.4 thousand in 2010 to 322.5 thousand in 2019. The highest value was also attained in 2010 (343.4 thousand), while the lowest was recorded in 2012 (308.2 thousand). Overall, the variations during the period are noticeable and significant.

The demand for entrepreneurship is influenced by many factors, two of which are mentioned below:

- *ICT development*, which leads to the reorientation of resources and the outbreak of new products. This increases the demand for entrepreneurial activity;

[45] Eurostat, 2020, Database, available at: https://ec.europa.eu/eurostat/data/database.

- *Unemployment*, which leads to increasing demand for entrepreneurship but at the same time results in fewer entrepreneurial opportunities because business creation is being supressed on a macrolevel[46].

Regarding the supply of entrepreneurship skills in Bulgaria, the focus shifts to entrepreneurial education and training. Entrepreneurial education can be found at all levels of Bulgarian education – primary, secondary and higher education. Bulgaria's main "suppliers" of such skills are schools, VET institutions, universities/colleges and educational institutions specialised in business and other professions. In practice, highly qualified employees are the engine of a country's economic prosperity, competitiveness and productivity. According to GEM's report, those with secondary education are usually involved in early phase entrepreneurial activities. However, those with a secondary education attained from a VET institution exceed the number of entrepreneurs with a regular secondary education. Furthermore, those with a VET high school education along with a Bachelor's and Master's degree account for 81% of opportunity-motivated early phase entrepreneurs. On the other side, entrepreneurs who have attained middle schools and a Master's degree start their own business due to both opportunity-motivated and necessity-motivated factors. Indeed, persons with a secondary VET education and a Bachelor's degree are more opportunity-driven rather than necessity-motivated because a qualified workforce is in demand and they do not face the necessity to make their own business as a way to be employed. In other words, their entrepreneurial attempts are motivated by the available opportunities, while the attempts of poorly educated persons are necessity-driven[47].

However, though, the quality of entrepreneurial education in the Bulgarian national education systems is insufficient. This can be attributed to the fact that teachers are not equipped with the necessary skills and lack the entrepreneurial capabilities to teach and motivate students. Experts have identified a number of flaws in primary and secondary education in Bulgaria; however, they assess the conditions of business education and training more highly. The problems with secondary education, indeed, are greater due to the fact that this level of training is crucial for the individual's integration into society through skills for life[48].

One of Bulgaria's first training programmes in the field of entrepreneurship was launched in 1991 at the University of National and World Economy (UNWE). Later, the Center for Entrepreneurship Development was founded at the UNWE, which enhanced the dissemination of entrepreneurship

[46] Management, Trade and Marketing College Sofia, available at: https://www.mtmcollege.org/obuchenie/opencourse-entrepreneurship/E_Entrepreneur/6_%D0%A7%D0%B0%D1%81%D1%82_I/%D0%A2%D0%B5%D0%BC%D0%B0_2/6.pdf?Mobile=1&Source=%2Fobuchenie%2Fopencourse-entrepreneurship%2F_layouts%2Fmobile%2Fview.aspx%3FList%3D24ffb47c-423f-457b-808d-a84dcce45116%26View%3D76a75b22-2191-4b0b-a9df-57204949d356%26RootFolder%3D%252Fobuchenie%252Fopencourse-entrepreneurship%252FE_Entrepreneur%252F6_%25D0%25A7%25D0%25B0%25D1%2581%25D1%2582_I%252F%25D0%25A2%25D0%25B5%25D0%25BC%25D0%25B0_2%26CurrentPage%3D1

[47] Andonova, V. and Krusteff M. (2017). GEM National Report on entrepreneurship in Bulgaria, available at: https://gemorg.bg/wp-content/uploads/2017/10/GEM-Annual-Report-ENG-2017-final-WEB.pdf/

[48] *Ibidem.*

training throughout other universities in the country. Today the centre is called the Institute of Entrepreneurship Development (IED) and it has supported the establishment of Bachelor's and Master's degrees at the UNWE[49]. Nevertheless, many other universities in Bulgaria also offer Bachelor's and Master's degree programmes in entrepreneurship.

Digital-entrepreneurship skills nexus

The recent technological developments have influenced not only our everyday lives but also conventional business approaches, standards and means. Indeed, digitalisation has led to the establishment of new enterprises and start-ups that integrate technologies as a basic component of their business standards and activities. In this regard, ICT appears as a facilitator of entrepreneurship[50]. However, regarding digital entrepreneurship and start-ups, Bulgaria does not serve as a role model. Nevertheless, the ecosystem for digital entrepreneurs in the country has recently been flourishing due to government policies and stimulus[51].

Bearing in mind the rapid development of digital technology and the emerging field of digital entrepreneurship, educational systems in Bulgaria should meet the demands of the market by supplying it with a qualified workforce. However, its conservative educational system is still treating digital and entrepreneurial skills separately. Additionally, despite being taught in isolation from one another, the advancement of digital and entrepreneurial competences in the country is at primary phase.

II.2 Italy

While some countries are very effective at embracing the new digital paradigms – exploiting them for the general well-being of their socio-economic ecosystems – others are struggling to cross the intangible borders that exist between the analog and digital era.

Despite its status as a G7 country, and as shown by the literature reviewed, Italy ranks at the bottom of ICT cultural embracement among all 27 Member States and is one of the most digitally tardive countries in the world. This delayed acceptance of ICT has serious consequences for the digital competitiveness of the national industrial network, 66% of which is comprised of micro and small enterprises.

From the analysis below, three key factors emerge as the main barriers to the digital empowerment of the Italian socio-economic ecosystem:

[49] Todorov, K. and Papazov, E. (2009). A Successful Model of Entrepreneurship Education and Training in Transition Countries: the Example of Bulgaria, available at: http://jei.uni-ruse.bg/Issue-9-2009/3Edited_article_bg_todorov_papazov.pdf.
[50] Elia, G., Margherita, A. and Passiante, G. (2020) "Digital entrepreneurship ecosystem: How digital technologies and collective intelligence are reshaping the entrepreneurial process", Technological Forecasting and Social Change, Elsevier, vol. 150(C).
[51] Georgiev, Y. (2018). Efficient Innovation: Entrepreneurship in Bulgaria. https://emerging-europe.com/voices/entrepreneurship-in-bulgaria/

- Overall digital illiteracy of the general population;
- Lack of a wide-ranging perception of digital markets as a competitive solution for the prosperity of SMEs;
- Lack of economic resources. Digital innovation and the adoption of ICT are not without cost. Italian SMEs are still recovering from the recession of 2011, and limited economic resources trigger the perception of the digital empowerment of their firms as a residual option rather than a primary priority.

The very low interest in digital technologies as demonstrated by the current entrepreneurial generation is inclining the future adequacy of the Italian business network to sustain an innovative, supportive, competitive and sustainable growth.

The top-down and highly hierarchal measures that came after the policy discussion have proven to be marginally inefficient and inadequate, and more in general way less effective than the expectations.

The resilience and enhanced competitiveness of the Italian economic and entrepreneurial ecosystem depends on a very simple tool: a reliable, smart and inclusive education and training plan centred on digital entrepreneurship across all formal/non-formal VET settings.

Italian SMEs and micro-entrepreneurs lack a serious understanding of the incredible potential that is missed by turning their backs on digital culture and ICT.

Finally, digital entrepreneurship education for established entrepreneurs requires much more than sterile academic teaching: it requires a straightforward but radical paradigm shift to sustain entrepreneurs from necessity-driven to opportunity-led business models and managerial approaches.

Trends in digital and entrepreneurship skills

Digital skills

As announced a few years ago by the Ministry of Social and Economic Development (MiSE)[52], it is more than necessary to consolidate the accomplishment of a society where citizens are free to move, but also to trade and enjoy services and contents, regardless of who and where they are.

The approach centres on seven pillars:

1. Digital market and investments: improving interoperability, fostering e-commerce, harmonising fiscal policies;

[52] The Digital Single Market: The Italian Position. MISE, available at: https://www.sviluppoeconomico.gov.it/images/stories/pubblicazioni/Position_paper_on_DSM_ITALY_EN.pdf.

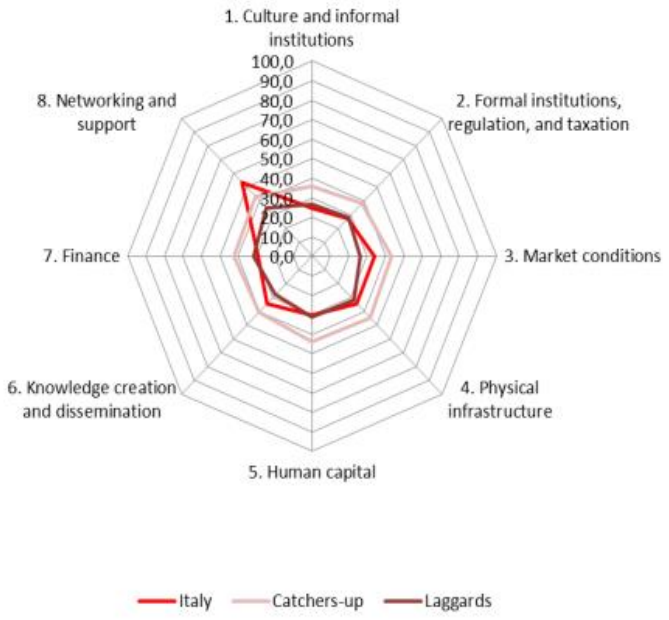
2. Access to fast and superfast Internet: telecommunication and services networks, connecting all EU citizens to the Internet at high speed by 2020;
3. Internet governance and consumers' trust: increasing safety and security;
4. Creative industries: supporting online copyright and audio-visual;
5. Research & Innovation: releasing the innovative potential through new models of digital manufacturing and start-ups;
6. The social advantages of ICT: improving literacy, skills and inclusion in the digital world;
7. E-government and digital infrastructure: modernising the public sector and the digital network, Big Data and Cloud Computing.

Despite the numerous initiatives implemented through multiple educational channels and public awareness campaigns, eight years after the public announcement of Italy's "digital revolution", enterprises are still facing a number of challenges, including:

- Lack of consistent institutional back-up for digital entrepreneurship;[53]
- Lack of consistent cultural embracement of ICT and digital solutions for entrepreneurial competitiveness[54] (Figure 9);
- Lack of employees with strong digital skills and the inability of companies to attract highly-skilled foreign employees – a strong gap that persists from 2018;[55]
- Lack of a cohesive "digital skills strategy"[56] which causes Italy to be persistently ranked at the bottom of the annual DESI (Digital Economy and Society Index) (Figure 10);
- The digitalisation strategy has been translated on the operational level following a delegation-criteria. The transfer of responsibility from Central State to Regions has proven to be not efficient at all preventing the emergence of a systemic strategic as initially foreseen.[57]

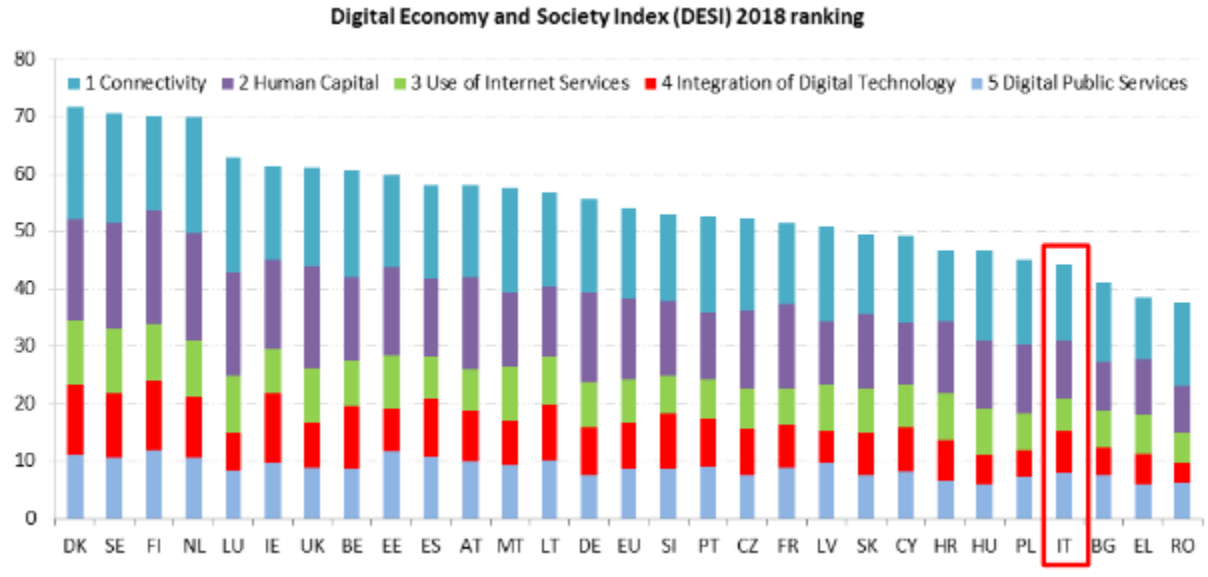
[53] EIDES (2018). The European Index of Digital Entrepreneurship Systems, EU Commission (https://publications.jrc.ec.europa.eu/repository/bitstream/JRC112439/jrc112439_eides_report.pdf)
[54] EIDES (2019). The European Index of Digital Entrepreneurship Systems, EU Commission (https://publications.jrc.ec.europa.eu/repository/bitstream/JRC117495/jrc117495_eides_2019_final_with_identifiers.pdf)
[55] IMD World Digital Competitiveness Ranking 2018, available at: https://www.imd.org/wcc/world-competitiveness-center-rankings/world-digital-competitiveness-rankings-2018/ & IMD Digital Competitiveness Ranking 2019, available at: https://www.imd.org/wcc/world-competitiveness-center-rankings/world-digital-competitiveness-rankings-2019/#:~:text=The%20United%20States%20held%20on,%2C%20Sweden%2C%20Denmark%20and%20Switzerland.
[56] Digital Economy and Society Index (DESI) – Country Report: Italy
Report 2018: (https://ec.europa.eu/information_society/newsroom/image/document/2018-20/it-desi_2018-country-profile_eng_B4406C8B-C962-EEA8-CCB24C81736A4C77_52226.pdf)
Report 2019: (https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=59897)
Report 2020: (https://ec.europa.eu/digital-single-market/en/desi)
[57] OECD (2016). Supporting Youth Entrepreneurship in Italy. A Review of Policies and Programmes, available at: (https://www.oecd.org/employment/leed/Italy-Youth-Entrepreneurship-Report-FINAL.pdf)

Figure 9. The European Index of Digital Entrepreneurship Systems: Italian country snapshot.

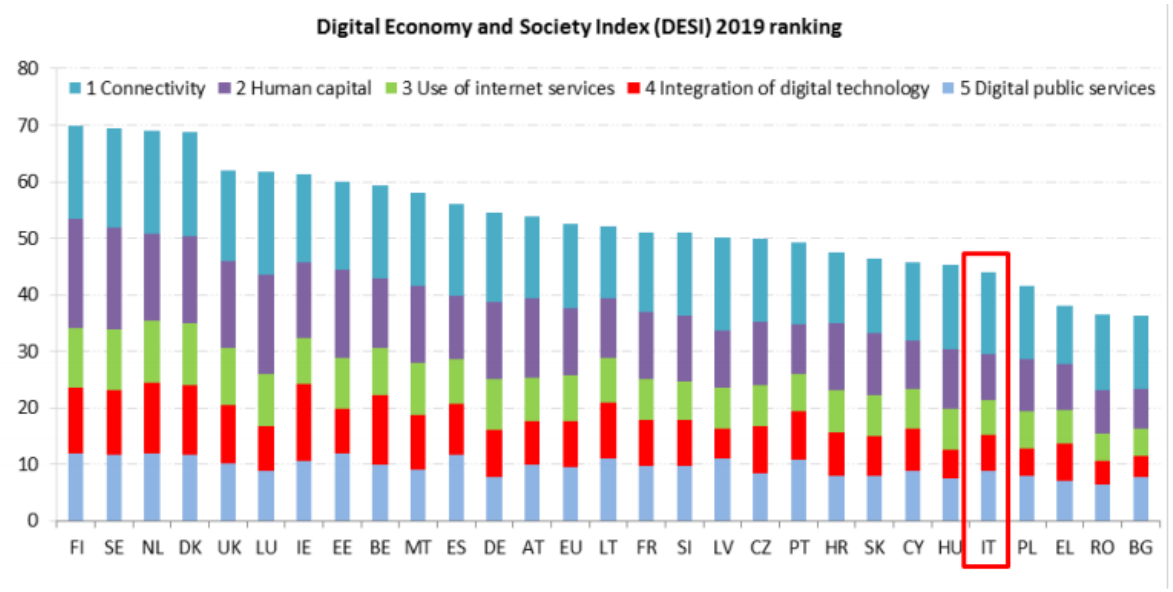


Source: EIDES 2019

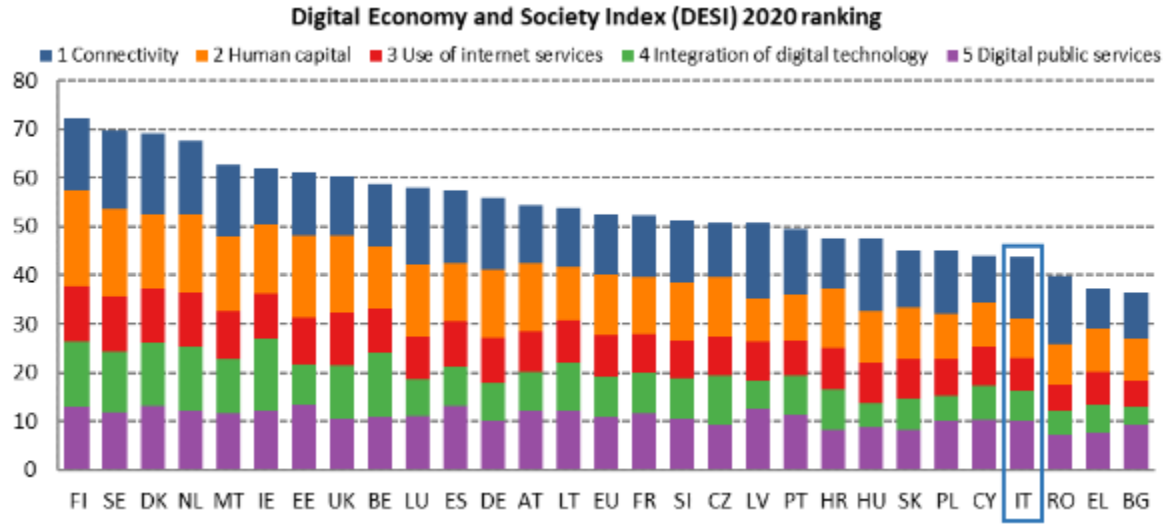
Figure 10. Italian DESI performance over the last three years.



Source: DESI 2018



Source: DESI 2019



Source: DESI 2020

From a cultural perspective, Italian entrepreneurs are far behind their international colleagues in understanding, valuing and exploiting the competitive and strategic opportunities represented by digital solutions for business management, strategic competitiveness and financial sustainability:

- 40% of Italian entrepreneurs do not believe/ignore/are afraid of “the digital machine” and perceive the World Wide Web as a 0-value-added tool for their business;

- Only 5% of the firms are fully committed to e-commerce[58] while another 80% of Italian enterprises do not intend to commit their financial resources to new digital and structuralised solutions for their business[59].

Such dangerous trends are even more significant among SMEs and micro-enterprises, which represent the real economic "muscle" of the country: 66% of Italian SMEs are culturally detached to anything that relates to digital and ICT topics[60] and the level of digitalisation appears substantially different between large and small enterprises.

Despite the investments and efforts of the government, Italians are, for the most part, highly digitally unskilled and, not surprisingly, those who struggle the most with digital technologies (male, 50-55 years old) match the traits of the average Italian entrepreneur (male, older than 50 years old)[61].

In 2016-2017, less than three companies out of 10 made technological investments or intended to invest in 2018-2019. High levels of digitalisation were reached by 44% of companies with at least 250 employees and by 12.2% of companies with 10 to 49 employees[62].

Of those proactively engaged in deep IT exploitation processes, 30% analysed big data, 13% used 3D printers or 3D virtual modelling, and 26% used robotics.

Less than one-quarter of businesses with at least 10 employees (22.4%) recognise human capital as one of the three main competitive factors for 2018-2019, along with public infrastructure (48.5%) and access to ultra-fast broadband and high-speed connections (30.8%).

The overall snapshot highlights Italian entrepreneurs strong lack of awareness of IT culture[63].

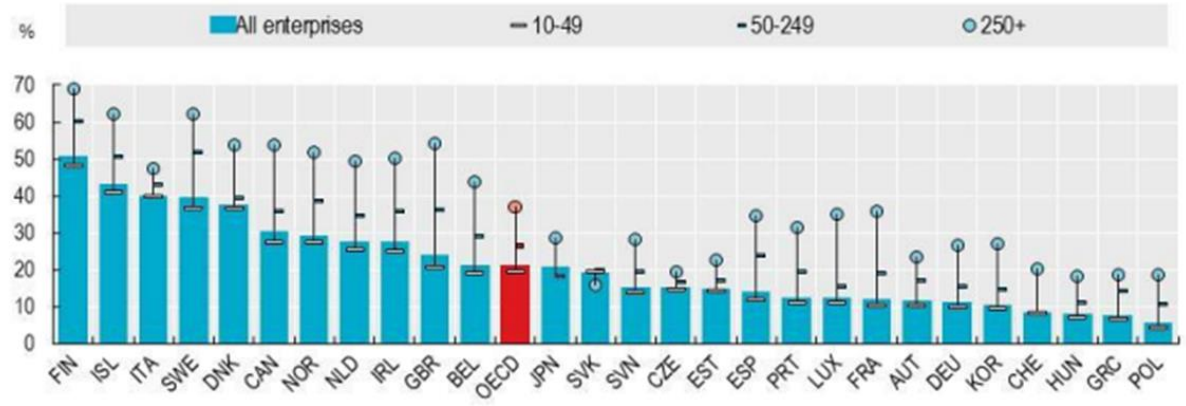
Surprisingly, Italian e-commerce market turnover grew by 17% to in 2017, reaching EUR 23.6 billion. The number of "digital" shoppers reached 22 million in 2017 (+10% from 2016) and in the same year product sales (EUR 12.2 billion, +28%) overtook those of services (+7%) for the first time. The e-commerce industry is estimated to represent 5.7% of the total Italian retail industry[64].

In 2018 and 2019, Italian e-commerce accounted for the 15% of total extra-EU exports[65] and an official report published by the Communication Office of Amazon estimated that in the same year

[58] Strategia per la crescita digitale 2014-2020, Presidenza del Consiglio dei Ministri, 2015
[59] Level of digital innovation in companies in Italy 2017, by investment size, Statista Research Department, 2020
[60] Rapporto sulla Competitività dei settori produttivi; ISTAT – 2018 & 2019
[61] ISTAT, Entrepreneurship in Italy, 2015
[62] ISTAT, Enterprises and ICT in Italy, 2018
[63] ISTAT, Citizens, Enterprises and new technologies, 2012-2018 (https://www.istat.it/en/archivio/citizens+and+new+technologies)
[64] Italian market: E-commerce (https://import-export.societegenerale.fr/en/country/italy/ecommerce)
[65] 2018 and 2019 SBA Fact Sheet – Italy, European Commission

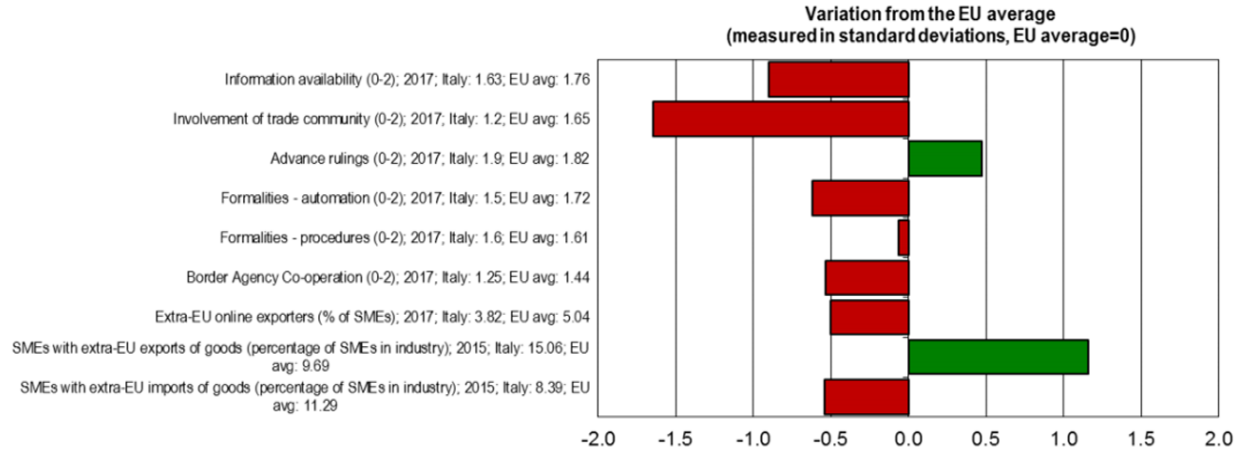
Italian small and medium enterprises selling on Amazon were more than 12,000 and Delivered Export Sales Over EUR 500 million[66] (Figure 11).

Figure 11. SMEs impact on digital markets.



Source: Enhancing the Contributions of SMEs in a Global and Digitalised Economy, OECD 2017

Figure 12. Italian SMEs – Internationalisation performance.



Source: 2018 SBA Fact Sheet

Italy is the 13th largest market for e-commerce with a revenue of USD 16 billion in 2019 and with an increase of 15%, the Italian e-commerce market contributed to the worldwide growth rate of 13% in 2019[67].

[66] Italian Small and Medium Enterprises Selling on Amazon are 12,000 and Delivered Export Sales Over €500 Million in 2018 (https://www.aboutamazon.eu/press-release/italian-small-and-medium-enterprises-selling-on-amazon-are-12-000-and-delivered-export-sales-over-500-million-in-2018)

[67] E-commerce market analysis: The eCommerce market in Italy, available at: https://ecommercedb.com/en/markets/it/all

These positive trends are the result of the efforts of a small number of entrepreneurs and, for the most part, Italian SMEs are highly underrepresented in digital markets[68]. This represents a significant untapped potential that clearly stands as a missed opportunity not only for the entrepreneurial network but for the national economy overall[69].

Italian SMEs still face a number of barriers to the full exploitation of e-commerce,[70] such as:

- Lack of systemic and comprehensive knowledge concerning ICT and digital solutions for entrepreneurship;
- Lack of a systemic and comprehensive understanding of foreign cultures, markets and languages;
- Lack of understanding of the legal aspects concerning e-commerce;
- Lack of understanding about the appropriate digital channels for an online payment system;
- Lack of financial resources available for professional translation or export consultations impedes the digital and international competitiveness of a large number of Italian entrepreneurs.

Entrepreneurship skills

According to the yearly reports published by the Global Entrepreneurship Monitor (GEM), Italy has one of the most underperforming entrepreneurial environments among all Western countries – and in some traits, has results comparable to those of many second and third world economies. These negative trends are not isolated to a single year but are reconfirmed every biennium since the economic recession of 2011 (triggered by the financial crisis of 2008).

As shown in Figure 13, among Italian entrepreneurs, entrepreneurship is more often perceived as a tangible opportunity to achieve a sort of “financial well-being” with very little consideration given to entrepreneurship as a socially impactful life-long mission.

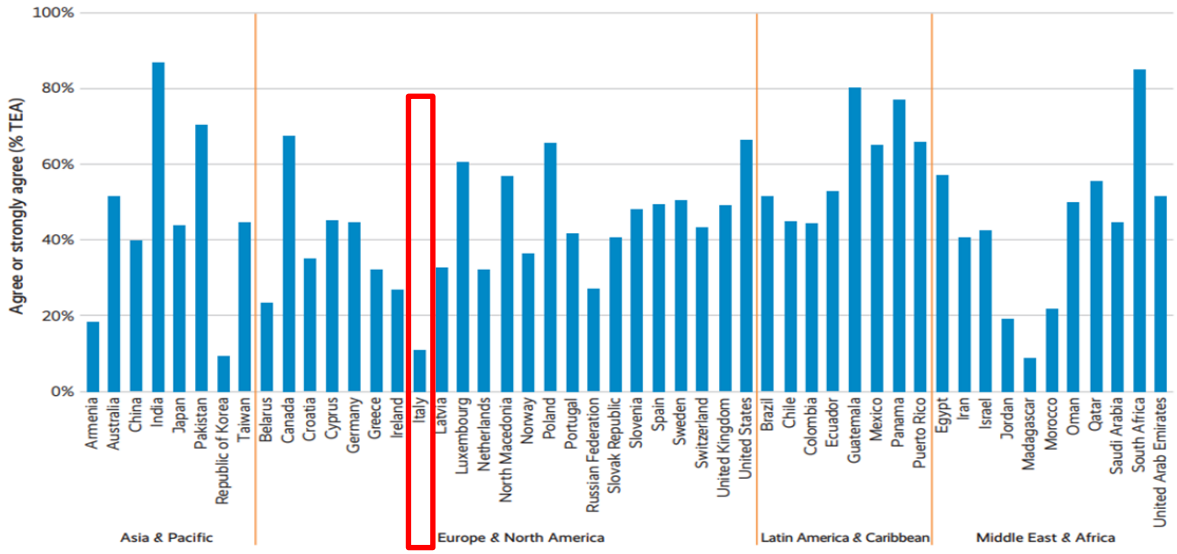
In other words, entrepreneurial spirits are motivated by selfish reasons with no space for considerations of another nature.

This type of mindset favours the exploitation of short-term benefits and tends to marginalise long-term priorities and opportunities – which innovation and digital empowerment truly are.

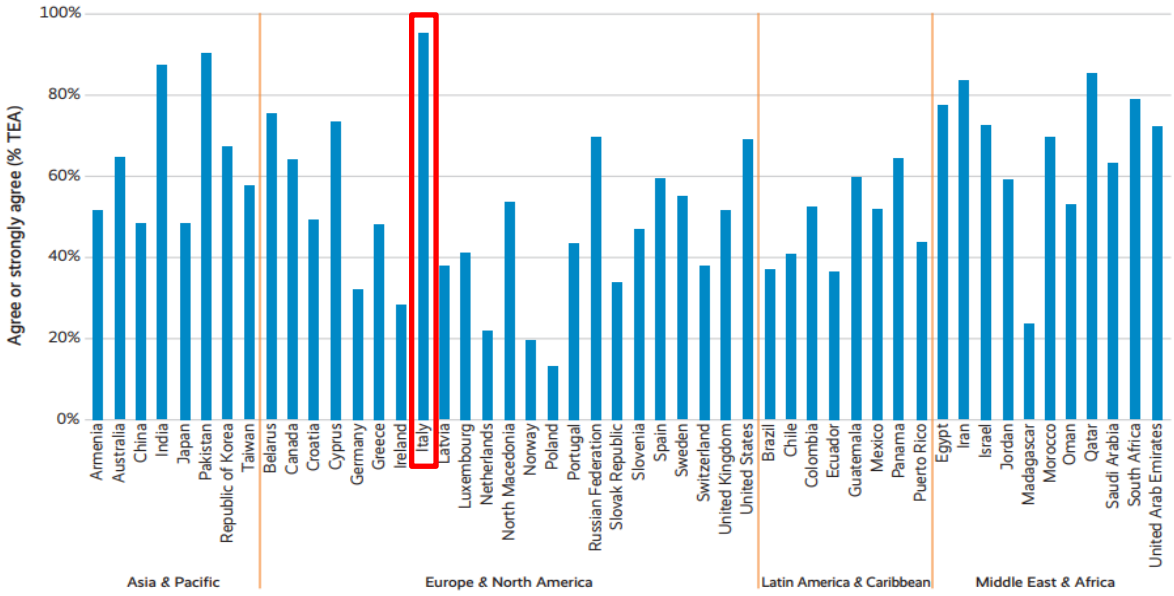
[68] As a result, the share of Italian SMEs selling online is the third lowest in the EU.
[69] OECD (2017). Enhancing the Contribution of SMEs in a Global and Digitalised Economy, available at: https://www.oecd.org/industry/C-MIN-2017-8-EN.pdf.
[70] Does e-commerce facilitate or complicate SMEs’ internationalisation?; Multinacionales en un Cambiante Contexto Internacional; Elia, Giuffrida e Piscitello, n.909, 2019.

Figure 13. Motivations and Aspirations: Why do people start or run a business?

"To make a difference in the world"



"To build great wealth or very high income"



Source: Global Entrepreneurship Monitor 2019/2020 – Chapter 4

If the 2011 economic recession might be perceived as the ultimate spectrum of the described scenario, it is also true that the government and public authorities have their own shares of responsibilities.

The political instability that Italy has been experiencing for more than 10 years has prevented the emergence of a long-term national strategy in support of entrepreneurship and consistent entrepreneurial education frameworks – both from a financial and skills-development perspective.

The Start-up Act[71], which is legislation promoted by the Ministry of Economic Development (MiSE), was meant to facilitate, exploit, valorise and support the scale-up process of innovative start-ups and nascent SMEs.

However, as highlighted in an open letter addressed to the Prime Minister's Office and MiSE written by Luca de Angelis, Italian economist graduated at the Harvard Business School, the Start-Up Act lacks severely in terms of efficacy and adequate systems to support the scale-up process of innovative firms in the long run mainly because of its sole reliance on short-term solutions[72].

Throughout the 2015-2020 timeline[73], Italy was ranked below the GEM average in all considered performance parameters[74] except R&D transfer (Figure 14).

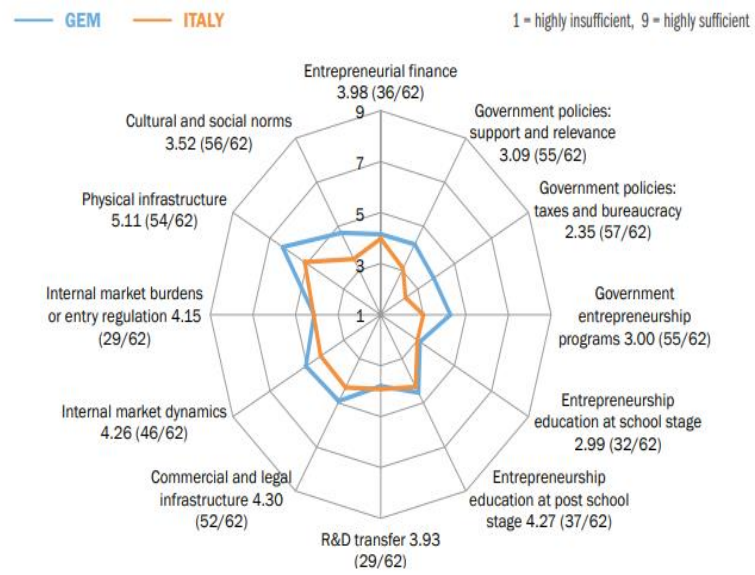
[71] https://www.mise.gov.it/index.php/it/impresa/competitivita-e-nuove-imprese/start-up-innovative/start-up-act-normativa

[72] Italy and Start-ups: harnessing a country of innovators. A Policy Analysis of the Italian Startup Act and its effects on the Startup Ecosystem. Luca de Angelis, Harvard Kennedy School | Harvard Business School. 2017 (https://www.hks.harvard.edu/sites/default/files/degree%20programs/MPP/files/17%207%2010%20MPP_PAE_Luca%20de%20Angelis_Italy%20and%20Startups.pdf)

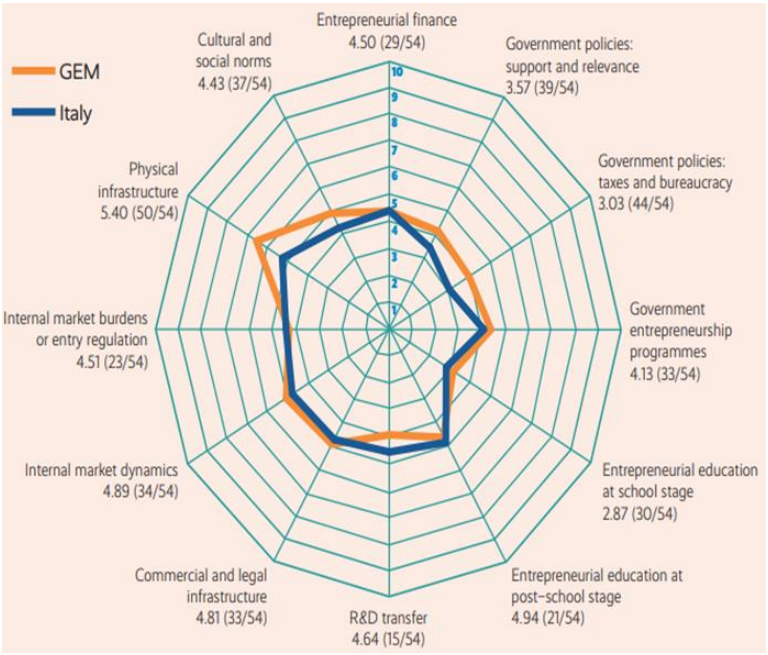
[73] GEM Global Report
2015/2016: https://www.gemconsortium.org/file/open?fileId=49480
2016/2017: https://www.gemconsortium.org/file/open?fileId=49812
2017/2018: https://www.gemconsortium.org/file/open?fileId=50012
2018/2019: https://www.gemconsortium.org/file/open?fileId=50213
2019/2020: https://www.gemconsortium.org/file/open?fileId=50443

[74] Entrepreneurial finance; Government policies: support and relevance; Government policies: taxes and bureaucracy; Government entrepreneurship programs; Entrepreneurship education at school stage; Entrepreneurship education at post school stage; R&D transfer; Commercial and legal infrastructure; Internal market dynamics; Internal market burdens or entry regulation; Physical infrastructure; Cultural and social norms.

Figure 14. Global Entrepreneurship Monitor (GEM) – Italian overview.



Source: GEM 2015/2016 – Italian Snapshot



Source: GEM 2019/2020 – Italian Snapshot

In particular, the most critical factors that discourage digital entrepreneurship and entrepreneurial aspirations are:

- Obstacles concerning funding and bureaucracy – on a global scale, the World Bank ranks Italy 119th in "easy access to finance and credit"[75]. This data is consistent with the findings of the Global Competitiveness Report published in 2019 by the World Economic Forum: "finance for SMEs" and "venture capital availability" in Italy are far below the average of all industrialised countries[76];
- Labour and antitrust regulation – Italy has the same ranking on the Corruption Index[77] as many of the poorest economies in the world, which signals that Italian regulators face challenges ensuring fair competitive conditions for all agents in the market;
- Sharp contrasts between the regions, in particular the longstanding wealth gap between the northern and southern regions, make it difficult to implement policies on a national scale;
- A persistent and fundamental lack of a strong, consolidated, robust and resilient entrepreneurial culture, which is missing from all levels of the educational system[78].

Entrepreneurial skills and competences training is a hybrid phenomenon that collocates at the intersection of independent contributions all standing from different assumptions.

The literature on entrepreneurship skills is in Italy is of rather limited nature. While the literature on managerial topics is published regularly, academic research on the intangible dimensions of entrepreneurship (such as skills, capabilities, competences and leadership, among others) is distributed irregularly over time.

Digital-entrepreneurship skills nexus

According to an EY report on digital ecosystems[79], out of all G20 countries, Italy's digital ecosystem is rated as less favourable to promote, reinforce, and enhance digital entrepreneurship.

In Italy, only 21% of individuals aged between 16 and the 65 years old report a good literacy level and computing competences – which represents the third worst result among all countries examined (OECD Skills Outlook 2019[80]).

[75] The World Bank – "Doing Business 2020": Ease of doing business in Italy, available at: https://www.doingbusiness.org/en/data/exploreeconomies/italy#DB_gc.
[76] World Economic Forum – "The Global Competitiveness Report 2019" p.298-302, Klaus Schwab, World Economic Forum, available at: http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf.
[77] Transparency International, Corruption Perception Index 2019, available at: https://www.transparency.org/cpi2019.
[78] Entrepreneurial activity and education in Italy; Nicola Curci (Bank of Italy), Alessandra Micozzi (Polytechnic University of Marche)
[79] Disrupting the disruptors. Disrupting youth entrepreneurship with digital and data: the digital opportunity to empower young entrepreneurs for growth, available at: https://www.ey.com/Publication/vwLUAssets/EY-disrupting-the-disruptors/$FILE/EY-disrupting-the-disruptors.pdf.
[80] OECD Skills Outlook 2019 – Thriving in a Digital World. L'Italia a confronto con altri paesi, available at: https://www.oecd.org/italy/Skills-Outlook-Italy-IT.pdf.

The group of workers who takes part in adequate training programme the least are those with the highest risk to be replaced by work automatisation. This phenomenon is rarely seen in other European countries.

For all of them, the main threat is not just unemployment, but unemployment combined with low skills and inadequate transversal and digital competences – which prevents these people from taking advantage of the benefits arising from the use of the Internet and other new technologies.

With such strong opposition to the digital economy stemming from Italy's entrepreneurial sector, the future well-being and competitiveness of Italian industries depend on how digital entrepreneurship is taught and "communicated" to aspiring digitally skilled entrepreneurs.

Digital entrepreneurship education is highlighted as a core and distinctive element for business success, regardless of the specific market.

The Italian VET ecosystem needs to improve support for digital entrepreneurs by providing knowledge, contacts, training and consistent institutional support.

According to the National Observatory of Digital Competences, the new sets of IT Skills[81] follow under the following taxonomy:

- Software management, which appears fundamental in both operational and decision-making settings;
- Problem Solving 2.0, applied to basic computer science and programming "pills";
- Online content creation and digital design (video making and copyrighting);
- Information and data literacy: searching for information online, managing data, understanding the web potential for information gathering, understanding the basics of search engines, and storing data and information;
- Online customer engagement (social media, analytics, search engine marketing, e-mail marketing and mobile advertising, and social selling).

Moreover, it is extremely important to combine traditional leadership paradigms with the emerging business models that stand on profoundly different decision-making frameworks: it is necessary to rethink how leaders plan, act and relate in this new era where the most valuable assets that a firm might ever possess are represented by information.

[81] Osservatorio delle Competenze Digitali, 2018, available at: https://www.aicanet.it/documents/10776/2337363/OCD_2018_nonICT_navigabile/6fd189d0-0462-4d84-b1f1-6615f37aa965.

In fact, on the basis of research by PWC Italy[82], the real "trigger" and stimulating effect of a reliable and tangible digital entrepreneurship culture comes with:

- The openness of the digital world and the elimination of any barrier/menace to the free availability and consumption of the online content;
- A critical and aware mastery of sophisticated digital skills that goes beyond the "common" knowledge;
- The recognition by teachers, trainers and mentors of their role not as much as mere sterile and mainly theoretic-knowledge transmitters but as pure, genuine and concrete catalysts of experienced-based know how source;
- The digital upgrade of who is called to these empowering responsibilities, making sure that their profile is perfectly aligned to the role they are called to cover and guaranteeing perfect consistency between their professional legitimacy and the needs of the addressed targets.

While the education dimensions bring into the mainstream the core content of the frontlines of digitalisation, the stimulating channels canalise the concrete action plans and consistent mindsets related to the adoption of an ICT culture – removing all the cultural barriers that have existed thus far.

The other element that completes the equation is represented by the actors invested in the leverage and exploitation plan. Their responsibility is to valorise digital entrepreneurship opportunities for the new generation of aspiring digitally skilled entrepreneurs.

The success of this complex process requires the proactive engagement of several actors invested in their role of primary entrepreneurship facilitators[83]:

- Chambers of commerce and business associations

Interviews with the senior staff of business support associations reveal that their role is more important in small cities than in major ones. In smaller cities, ICT aspiring entrepreneurs are more open in accessing the services offered by the associations (consultants, legal advisors, among others) and their close relationship is also mutually rewarding.

- Incubators/accelerators

Findings suggest that regional incubators have a strong appeal because they tend to focus their efforts on local businesses to better monitor and evaluate their development plans.

[82] Digital Skills: Come ripensare l'istruzione e la formazione nell'era digitale: competenze digitali e nuovi modelli per l'apprendimento, available at: https://www.pwc.com/it/it/publications/assets/docs/PwC_Ufficio_Studi_Digital_Skills.pdf.
[83] "Entrepreneurship and New Venture Creation" - Key Elements of the Entrepreneurial Ecosystem Facilitating the Growth of ICT Entrepreneurs in Italy. Lal, Colombo, Corno.

- Venture capitalists/angels

The venture capital market in Italy is one of the least developed in Europe. A large number of venture capital firms are investing in early stage digital entrepreneurship; however, to date, many prefer to invest in other more digitally responsive countries.

- Banks and financial intermediaries

For the most, banks remain outside the realm of digital entrepreneurship. Banks offer a range of standard financial services minimally tailored to the needs of digital entrepreneurs. Very often, Italian Banks have branch operations in other countries, and they do not serve Italian clients residing in Italy. Their operations abroad offer networking services with professionals, consultants and lawyers, without any effective support channel tailored for business scaling.

- Scholars and academics

Scholars and academics are the most interested in the digital transformation of the country. They are pressing for the urgent need to shift from an entrepreneurship paradigm driven by pure profit to one that is led by innovation and opportunity recognition.

II.3 Poland

Trends in digital and entrepreneurship skills

Digital skills

The introduction of ICT and digital technologies in the labour market poses challenges to diverse type of skills of employees, the self-employed and those looking for employment. Poland is not an exception in this respect. Existing studies show that by 2015, the gap in human digital skills that existed in Poland was a major reason for the low digitalisation of the Polish economy[84], and since then, despite numerous policy measures and initiatives, not a lot has changed. In 2015, only one in five SMEs were using social media in their daily activities, whereas the EU average was already 42%. Furthermore, the use of customer relationship management (CRM) or enterprise resource planning (ERP) in Poland was roughly half that of the EU-15 average (28% versus 45%). The share of entrepreneurs using online sales was twice smaller than the EU average[85]. While it has increased from 10% in 2015 to 14% in 2018, the percentage of enterprises using e-commerce sales in Poland is still one of the lowest in the EU-28[86]. This type of situation poses significant challenges for the development prospects of Polish companies in light of the EU's Digital Single Market.

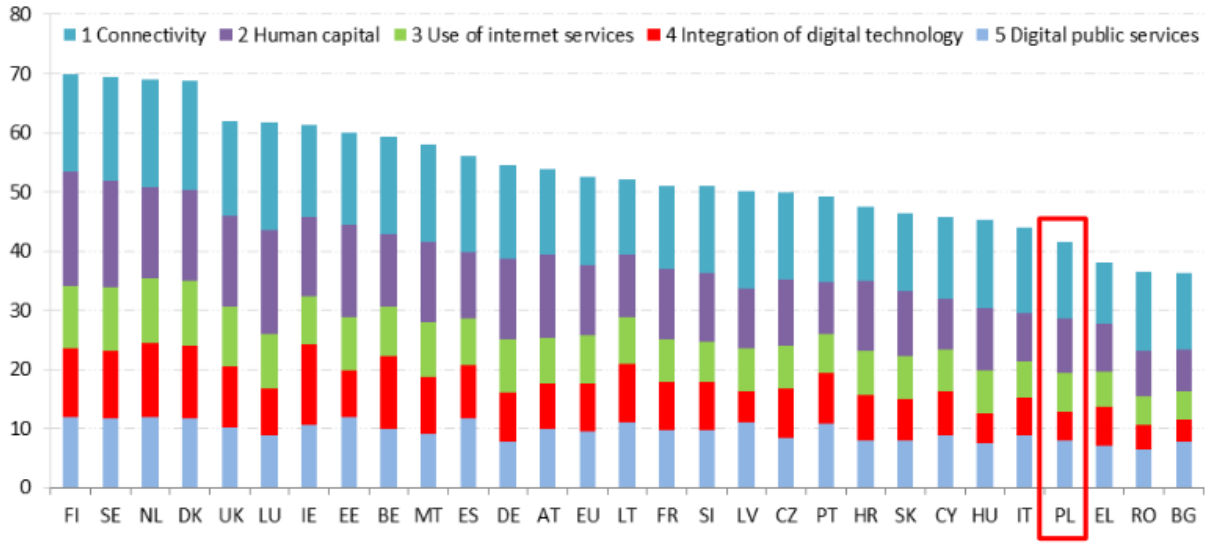
[84] Sledziewska, R. and Wloch, R. (2015). Digital Transformation of Small and Medium-sized Enterprises in Central and Eastern European Countries.
[85] Sledziewska, R. and Wloch, R. (2015). Kompetencje cyfrowe polskich małych i średnich przedsiębiorstw, Raport DeLab UW.
[86] https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=isoc_ec_eseln2&lang=en.

On the other hand, we observe increased demand for digital skills from companies. The competences listed include such skills as the ability to use computer software, knowledge of e-marketing, specific programming skills depending on the sector, or knowledge of advanced statistical measures. Of course, these are the elements of a longer list, which also includes softer competences, like social skills, ability to work in a team and resilience to stress[87]. Nevertheless, digital skills are listed first in all research on the identification of skills gaps on the Polish labour market.

Additionally, the recent COVID-19 lockdown and the forced necessity to use ICT broadly and quickly proved that such abilities are not only helpful in combatting diverse global challenges, but that they can also be more effective in economic, societal and ecological terms.

Unfortunately, however, all statistics on Poland's performance in creating an appropriate ecosystem for the digitalisation of entrepreneurship show that Poland has performed as one of the worst.

Figure 15. Digital Economy and Society Index (DESI) 2019 ranking.



Source: https://ec.europa.eu/digital-single-market/en/desi

European statistics on the Digital Economy and Society Index (DESI) highlight that Poland is far below all European countries in terms of individuals possessing digital skills and abilities. It ranks 25th in the EU-28, with a score of 41.6 points, while the EU average is 52.5. Although it has improved since 2017, increasing from 36.1, it remains one of the lowest ranked in the EU. The areas where Poland struggles the most are: connectivity, use of Internet services and integration of digital technology. Some progress has been observed in human capital and digital public

87 https://static1.squarespace.com/static/58d072963e00bea07a2ca2da/t/59a03b643e00be724a576095/1503696845527/2017_ENG_Closing_the_Skills_Gap_in_Poland.pdf.

services, which is to be expected after the introduction of several different policies and strategies by the Polish government at the national level. Nevertheless, the results are still not satisfactory. Approximately 54% of Poles do not possess basic digital skills. The phenomenon is much higher among the older population, with older adults having difficulties using email and online banking, online entertainment (like watching videos), and online shopping or communicating through social media. This digital exclusion is mainly observed among people aged 45 years and older[88].

Additionally, the OECD's Programme for the International Assessment of Adult Competencies (PIAAC) survey[89] shows that the performance of Polish adults in skills such as literacy, numeracy and problem solving is one of the weakest in the EU. Almost half of Polish adults cannot use the computer or refused to implement the PIAAC survey on a computer.

Existing studies[90] for Poland suggest that, through 2030, labour market success will be strictly correlated with the possession of digital competences and that the digital skills gap will continue to increase, causing not only the risk of underdevelopment for Polish SMEs, but also causing the exit of ICT companies from Poland to Western Asian markets.

Entrepreneurship skills

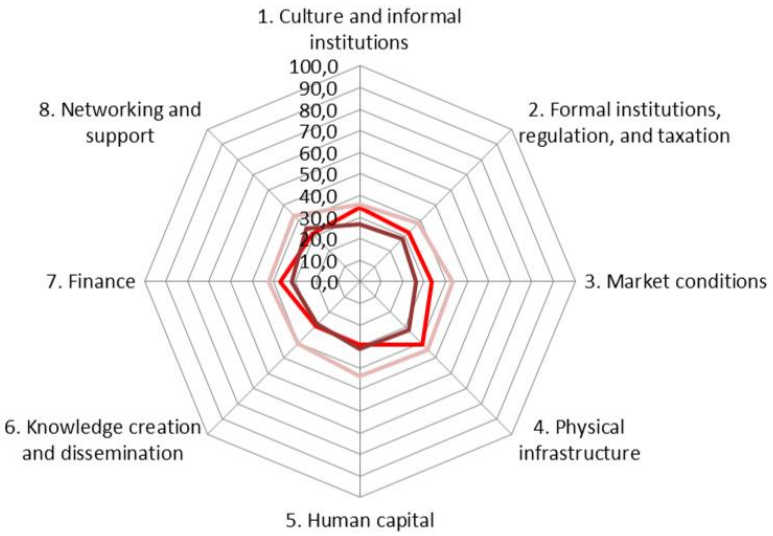
In Poland, in line with global trends, entrepreneurship has undergone in-depth changes. This transformation has been observed not only on the opportunity side for entrepreneurial activities (the introduction of ICT tools, artificial intelligence [AI], or the development of platforms), but also on the side of potential practicing for pursuing new opportunities. An interesting phenomenon is that traditional decisions such as placing and performing business (very much affected by the agglomeration effect[91]) lose significance. The dynamics of SME development seem to be unrelated to the place of doing business. Companies located in urban regions develop at a comparable speed to those in rural regions (14% versus 12%, respectively)[92]. Nevertheless, as shown above, the opportunities are used moderately by Polish companies. Therefore, other elements like the innovativeness of entrepreneurs, their ability to perform business and benefit from new opportunities seem to be key elements for the effective use of the change in "entrepreneurial ecosystems".

The European measure assessing digital entrepreneurship at the company level, called the European Index of Digital Entrepreneurship Systems (EIDES) provides a comparable assessment of the digital conditions of enterprises of different characters to scale-up their activity. The index

[88] https://ec.europa.eu/information_society/newsroom/image/document/2018-20/pl-desi_2018-country-profile-lang_4AA5832E-C9B3-06C3-2FC79E4892C59A17_52340.pdf.
[89] available at: https://www.oecd.org/skills/piaac/data/.
[90] https://www.evidenceinstitute.pl/wp-content/uploads/2019/02/Kompetencje-przysz%C5%82o%C5%9Bci-w-czasach-cyfrowej-dysrupcji-1.pdf.
[91] Styczynska et al., Agglomeration effect in Europe.
[92] Rozwój sektora MŚP w Europie, https://biznes.newseria.pl/biuro-prasowe/handel/jak-polskie-msp,b1522774258.

is created for EU-28 countries. Unfortunately, Poland is ranked as having one of the weakest digital entrepreneurial ecosystems across EU countries. It is classified as a “laggard”. This group includes countries that not only lag behind the EU average, but also those who are not in a position to “catch-up” to the rest of the EU countries.

Figure 16. Poland’s position in the EIAD pillars.



Source: https://publications.jrc.ec.europa.eu/repository/bitstream/JRC112439/jrc112439_eides_report.pdf.

While Poland performs quite well in terms of social desirability and acceptance of entrepreneurship (Pillar 1), as well as in the availability of physical infrastructure (Pillar 4), the country is particularly weak in the delivery of proper skills in terms of human capital (Pillar 5) and knowledge creation and dissemination (Pillar 6). It shows that entrepreneurial education, STEM education and the availability of entrepreneurial skills are much below the EU average and market potential.

These findings are very much in line with GEM (Global Entrepreneurship Monitor) statistics, according to which Polish society has a very favourable attitude towards entrepreneurship. Around 80% of society sees business opportunities in Poland. However, only one in ten Poles declares willingness to open a company, and the number of newly created companies decreased in 2019. While such external conditions for doing business, like cultural and social attitude, access to finance, or public policies supporting entrepreneurship, are perceived positively, entrepreneurial skills and entrepreneurial education are perceived as obstacles for entering the market[93].

[93] https://www.gemconsortium.org/file/open?fileId=50443.

Unfortunately, as much research confirms, formal education in Poland does not seem to play a significant role in the development of entrepreneurial skills in Poland. While some fragmentary measures are introduced during the tertiary level of education, they have no impact on entrepreneurship development[94].

Digital-entrepreneurship skills nexus

Digitalisation has a significant impact on entrepreneurship through different channels: the ability to perform completely new activities or increase the productivity of existing functions and the ability to reorganise value-creating activities on the market, changing the nature of entrepreneurial potential and changing the design of the business model. Global digitalisation – the implementation of digital technologies and infrastructure – has opened up new opportunities not only for well-established companies but also start-ups in how they work and provide services.

As a consequence, modern educational systems, both formal and informal, should not look at digital and entrepreneurial skills in a vacuum, but they should be considered jointly. Unfortunately, this is not the case in Poland. Even the development of digital and entrepreneurial skills separately is still at a preliminary stage. Furthermore, access to comparable and reliable data is limited. While many European institutions measure digital skills (although under different definitions), data on entrepreneurial skills are almost non-existent in Poland. Policies and initiatives undertaken in Poland in this respect are presented in the latter section.

II.4 Portugal

Trends in digital and entrepreneurship skills

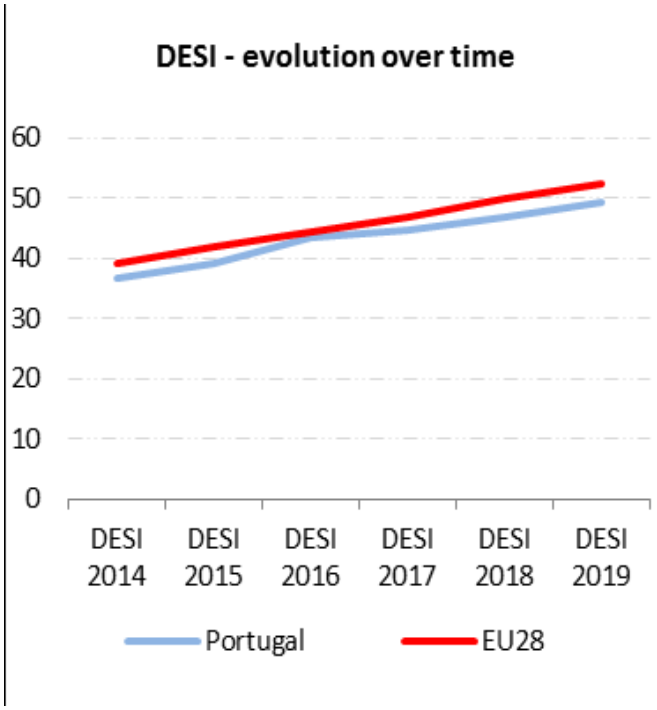
Digital skills

According to the Digital Economy and Society Index (DESI) annual reports, which monitor the digitalisation of EU Member States since 2015, Portugal is a medium-performance country (see Figure 17). From 2015 onwards, the country's greatest challenge has been to overcome the severe digital skills deficit of its citizens, particularly among the elderly and those with a low level of education or income. Most importantly, in 2015 and 2016, the data unveiled the existence of a digital divide in Portugal: half of the Portuguese population lacked basic digital skills. This is an outcome of the Portuguese population's overall low skill levels and relatively high poverty rates, which negatively impacted the further development of digitalisation in the country[95].

[94] Nowak, H. (2016). The role of the Polish higher education system in the development of entrepreneurship. Entrepreneurial Business and Economics Reviews, 4 (1).

[95] European Commission, DESI 2015 Country Profile – Portugal, available at: https://ec.europa.eu/digital-single-market/en/news/desi-2015-country-profiles; European Commission, DESI 2016 Country Profile – Portugal, available at: https://ec.europa.eu/digital-single-market/en/news/desi-2016-country-profiles.

Figure 17. DESI evolution over time (Portugal, 2014-2019).



Source: Digital Economy and Society Index 2019, Country Report Portugal.

Nevertheless, the 2016 DESI reported that the engagement of Portuguese Internet users in several online activities was higher than the EU overall rate: 78% read news online; 49% listened to music, watched films and played games online; 37% used the Internet to communicate via voice or video calls and 70% did that via social networks; and 62% of households subscribed to video on demand services. The country performed below the EU average both in online banking (41%) and online shopping (44%)[96]. The subsequent annual report underlined that the share of digital public services users remained stable and well above the EU average, but warned that the further expansion of e-government services was being held back by the lack of digital skills in significant sectors of the Portuguese population[97].

In 2018 and 2019, Portugal ranked in 19th among the 28 EU Member States[98]. The wider use of fixed and mobile broadband services along with broader Internet usage were considered significant improvements. Furthermore, in 2019, a significant increase in e-overnment services users was highlighted along with substantial growth in online banking and shopping activities. Portugal was also above the EU average in terms of use of social networks, participation in online

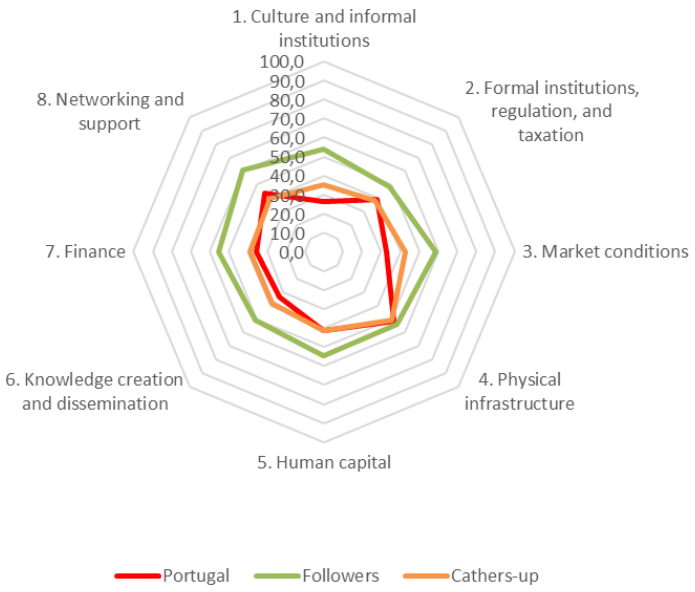
[96] European Commission, DESI 2016 Country Profile – Portugal, available at: https://ec.europa.eu/digital-single-market/en/news/desi-2016-country-profiles.
[97] European Commission, DESI 2017 Country Profile – Portugal, available at: https://ec.europa.eu/digital-single-market/en/news/digital-economy-and-society-index-desi-2017.
[98] European Commission, DESI 2018 Country Profile – Portugal, available at: https://ec.europa.eu/digital-single-market/en/news/digital-economy-and-society-index-2018-report; European Commission, DESI 2019 Country Profile – Portugal, available at: https://ec.europa.eu/digital-single-market/en/news/digital-economy-and-society-index-desi-2019.

votes and consultations, and online news reading. Notwithstanding this, a relatively large number of Portuguese citizens still did not use the Internet on a regular basis and the country was positioned below the EU average in terms of the digitalisation of human capital (ranked 23rd). Finally, Portugal continues to have one of the smallest shares of professionals with specialised ICT skills in total employment in the EU: 2.2% compared to an EU average of 3.7%. In the same vein, the proportion of ICT specialists in total female employment is roughly half the EU average, and the share of ICT graduates in the total graduate pool is very low by EU standards[99].

Entrepreneurship skills

According to the 2018 and 2019 EIDES (European Index of Digital Entrepreneurship Systems) reports, Portugal is classified as a "catcher-up" country and is ranked 18th among its EU counterparts[100]. As displayed below in Figure 18, in 2019, the country's weakest EIDES pillar was "culture and informal institutions" and its strongest pillar was "physical infrastructure".

Figure 18. Portugal's position in the eight EIDES pillars (2019).



Source: EIDES 2019 - The European Index of Digital Entrepreneurship Systems.

[99] European Commission, DESI 2019 Country Profile – Portugal, available at: https://ec.europa.eu/digital-single-market/en/news/digital-economy-and-society-index-desi-2019.

[100] E. Autio, L. Szerb, E. Komlósi, M. Tiszberger, The European Index of Digital Entrepreneurship Systems (Publications Office of the European Union, Luxembourg, 2018), doi:10.2760/39256, JRC112439; E. Autio, L. Szerb, E. Komlósi, M. Tiszberger, EIDES 2019 - The European Index of Digital Entrepreneurship Systems (Publications Office of the European Union, Luxembourg, 2019), doi:10.2760/107900, JRC117495.

Entrepreneurship has been viewed as key to the development of the Portuguese national economy – a driver to boost employment, business diversification and innovation[101]. Entrepreneurship training made its way into Portugal through higher education institutions. The 2016 GEM report discloses that the highest incidence of entrepreneurship is recorded among holders of postgraduate, Master's and doctoral degrees (Total early-stage Entrepreneurial Activity [TEA] rate of 15.1%)[102]. In contrast, content on entrepreneurship is not part of the school curricula in basic and secondary levels of education, at least in a formal and integrated manner[103]. Other entities offer entrepreneurship training, namely the Portuguese national agency for employment and VET (IEFP)[104]. In practice, however, both in secondary education and VET, each teacher/trainer may approach the topic quite freely, for example, by scheduling visits to companies and/or inviting an entrepreneur to give a talk to a class. Therefore, training in entrepreneurship often relies on the common sense, free will and motivation of teachers/trainers who are not given training on the subject themselves[105].

To put it simply, in Portugal, secondary education and vocational training scarcely address entrepreneurship and there is plenty of room to develop methodologies and programmes with positive effects in terms of the development of entrepreneurial competences[106]. Regardless of this scenario, the data available in the 2016 GEM report disclose that Portugal is an innovation-oriented economy with a TEA rate of 8.2%. This figure shows that Portugal is well positioned, ranking 16th among the 27 countries of the innovation-oriented economies group. Moreover, the 25 to 34 age group was reported to have the highest incidence of early-stage entrepreneurial activity (TEA rate of 13.3%). In contrast, the lowest incidence of entrepreneurial initiative was recorded in the 55 to 64 age group (TEA rate of 3.9%)[107].

Digital-entrepreneurship skills nexus

In just a few years, Portugal has become a key technologic start-up community in Europe. Hence, despite unfavourable economic conditions and the country's several structural obstacles, digital and entrepreneurship skills are strongly interconnected. Several factors concur to explain this

[101] Almeida, R. and Chaves, M. "Empreendedorismo como escopo de diretrizes políticas da União Europeia no âmbito do ensino superior," Educação e Pesquisa, 41:2 (2015): 513-526 https://doi.org/10.1590/S1517-97022015041779 [accessed on May 5, 2020]; Global Entrepreneurship Monitor (GEM), Estudo de avaliações sobre as dinâmicas empreendedoras em Portugal - GEM Portugal 2016, vi, available at: http://www.spi.pt/documents/studies/GEM_Portugal_2016_Report.pdf; Fonseca, L. "Marketing como Fator de Sucesso para os Empreendedores em Portugal" (MA Diss., Escola Superior de Comunicação Social de Lisboa, 2017), available at: http://hdl.handle.net/10400.21/8506.

[102] In accordance with the GEM consortium, TEA is the percentage of the 18-64 population who are either a nascent entrepreneur or owner-manager of a new business. GEM, GEM Portugal 2016.

[103] Daniel A. et al., eds., Ensino do Empreendedorismo. Teoria & Prática, Instituto Pedro Nunes - Associação para a Inovação e Desenvolvimento em Ciência e Tecnologia (Instituto Pedro Nunes - Associação para a Inovação e Desenvolvimento em Ciência e Tecnologia, 2015), 15-17, available at: http://jornadas.ipn.pt/wp-content/uploads/2016/05/Ensino-do-Empreendedorismo-Teoria-Pr%C3%A1tica_2015.pdf.

[104] Caetano A. et al., GEM Portugal 2013. 2004-2013: Uma década de empreendedorismo em Portugal (Lisbon: ISCTE-IUL and SPI, 2014), 64; L. Fonseca, "Marketing como Fator de Sucesso", 12.

[105] Daniel A. et al., eds., Ensino do Empreendedorismo, 73.

[106] Daniel A. et al., eds., Ensino do Empreendedorismo, 235.

[107] GEM, GEM Portugal 2016.

situation. First, the national technological and telecommunications infrastructure is well developed. Second, the Portuguese higher education system experienced a significant qualitative advancement and the number of graduates with Master's and doctorate degrees in all knowledge fields, namely ICT, expanded. Third, government policies have targeted both digital and entrepreneurship skills, aiming to anchor the modernisation of the economy and enhance its ability to compete on a global scale, having as an outcome the development of an ecosystem that is beneficial to digital entrepreneurship[108].

II.5 Spain

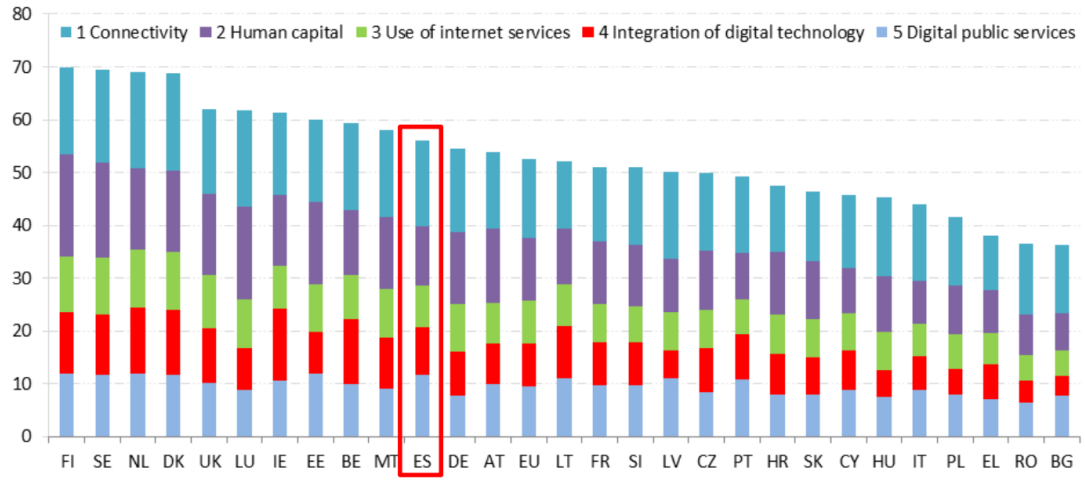
Trends in digital and entrepreneurship skills

Digital skills

The European Commission has been monitoring Member States' digital competitiveness with the Digital Economy and Society Index (DESI)[109] reports since 2015. The set of reports includes both country profiles and thematic chapters.

The DESI country reports combine quantitative evidence from the DESI indicators across the five dimensions of the index with country-specific policy insights and best practices.

Figure 19. Digital Economy and Society Index (DESI) 2019 ranking.



Source: https://ec.europa.eu/digital-single-market/en/desi.

[108] LBC - Leadership Business Consulting, Estudo do Ecossistema de Apoio ao Empreendedorismo de Base Tecnológica em Portugal e Silicon Valley (TICE.PT and Pólo de Competitividade das Tecnologias das Informação, Comunicação e Electrónica, 2013).

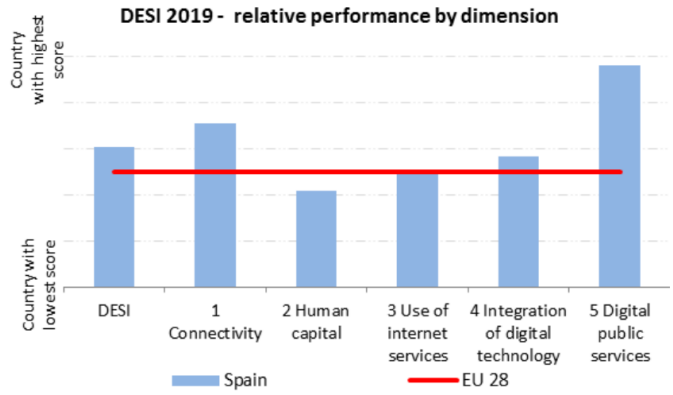
[109] European Commission Digital Economy and Society Index, Country Report Spain. 2019 https://administracionelectronica.gob.es/pae_Home/pae_OBSAE/Posicionamiento-Internacional/Comision_Europea_OBSAE/Indice-de-Economia-y-Sociedad-Digital-DESI-.html#.Xphkp5ntahd.

Spain ranks 11th out of 28 EU Member States in the Digital Economy and Society Index (DESI) 2019.

The increase is caused by the better performance in some of the dimensions included in DESI, namely connectivity and digital public services. Spain, due to the broad accessibility to fast and ultrafast fixed and mobile broadband networks and the increasing take-ups, performs well in connectivity.

With regards to human capital, Spain ranks at the same level as last year, and still scores below the EU average in this dimension. Around 20% of Spanish population is not online yet and nearly half of them lack basic digital skills. Despite growing demand for digital skills, the Spanish supply of ICT specialists is still below the EU average. Regarding integration of digital technologies in the private sector, more Spanish entrepreneurs use social media and big data than in previous years; however, cloud and e-commerce stagnated compared with last year.

Figure 20. DESI 2019 – relative performance by dimension.



Source: DESI (2019). Country Report. Spain.

Table 1. DESI 2019 – Human capital dimension

2 Human capital	Spain		EU
	rank	score	score
DESI 2019	**17**	**44.5**	**48.0**
DESI 2018	17	44.9	47.6
DESI 2017	17	42.2	45.4

Source: DESI (2019). Country Report. Spain.

Table 2. DESI 2019 – Human capital dimension. Historical performance.

	Spain				EU
	DESI 2017	DESI 2018	DESI 2019		DESI 2019
	value	value	value	rank	value
2a1 At least basic digital skills % individuals	**53%** 2016	**55%** 2017	**55%** 2017	***17***	**57%** 2017
2a2 Above basic digital skills % individuals	**31%** 2016	**32%** 2017	**32%** 2017	***14***	**31%** 2017
2a3 At least basic software skills % individuals	**56%** 2016	**58%** 2017	**58%** 2017	***14***	**60%** 2017
2b1 ICT specialists % total employment	**2.4%** 2015	**3.0%** 2016	**2.9%** 2017	***18***	**3.7%** 2017
2b2 Female ICT specialists % female employment	**0.9%** 2015	**1.0%** 2016	**1.0%** 2017	***18***	**1.4%** 2017
2b3 ICT graduates % graduates	**4.0%** 2014	**4.0%** 2015	**3.9%** 2016	***14***	**3.5%** 2015

Source: DESI (2019). Country Report. Spain.

The digitalisation of SMEs could lead to an increase of 5% of GDP in Spain[110]. According to the same source and estimations, 98.65% of enterprises have an Internet connection, but only 22.8% use cloud services. Only 30% out of them admit to using them regularly.

Although e-commerce is on the rise, the percentage of its use is still low, with only 19.6% of enterprises already using this channel for sale. On the other hand, 46.7% of companies use software packages for the integration of the different areas of the company itself, and 37.8% used CRM tools to manage their customer information.

By analysing this data, we can conclude that digitalisation is of paramount importance for the Spanish economy. Spain has good telecommunications and technology infrastructure, but there is ample room for improvement in the digitalisation process for companies that have the means but still lack trained professionals and a digital culture.

According to the 3rd Study on Digital Skills in Spanish Companies, carried out in October 2017 by Kantar MillwardBrown for ICEMD-ESIC[111], these are the 23 most demanded digital skills in order of importance:

[110] Spanish Confederation of Small and Medium Enterprises; Orange. "Orange and CEPYME celebrate the Digitisation of the Pymecon conference with the aim of promoting the modernisation of Spanish companies", October 2, 2019, available at: https://www.cepyme.es/wp-content/uploads/2019/10/NdP-Jornada-Orange-CEPYME-Digitalizacin-pymes.pdf.

[111] Kantar MillwardBrown "3rd research of digital competencies in Spanish companies" October, 2017 https://www.ticpymes.es/siteresources/files/839/54.pdf.

1. Cybersecurity	13. Programmatic advertising
2. Customer service	14. Ethical hacking
3. Digital innovation	15. Digital talent
4. Ecommerce	16. Display marketing
5. Big Data	17. Digital project management
6. Cloud and virtualization	18. Artificial and cognitive intelligence
7. Customer experience	19. Virtual and cognitive reality
8. Web and mobile marketing	20. Branded content management
9. SEO	21. Compliance
10. Social media management	22. Inbound marketing
11. Analytics	23. Blockchain
12. IoT (Internet of things)	

The digital competence index examines the level of implementation of digital competences in Spanish companies:

- 20% of companies are undertaking the digital transformation with guarantees;
- 50% of companies are still far from undertaking the digital transformation in their companies[112].

The business sector is currently suffering from a major imbalance between the supply and demand for professionals who, in addition to the specific knowledge and skills required for their field, have a sufficient repertoire of digital skills. This imbalance occurs in general in all age groups and in particular among young job seekers with vocational training. Students in vocational training do not receive specific training to develop digital skills regardless of the professional speciality chosen.

Entrepreneurship skills

Since 2014, entrepreneurship has been a verb that seems to be on trend in Spain. According to the latest report from the Global Entrepreneurship Monitor (GEM), between 2008 and 2012, during the economic crisis, there were drastic decreases in the rate of entrepreneurship, which decreased from 7% to 5.7% in just four years[113].

Little by little, there has been an evolution in the mentality of the Spanish towards self-occupation. Since 2013, there is a positive trend towards identifying business opportunities. Today, 6.4% of Spain's adult population is entrepreneurial. This trend is reinforced by the fact that almost half of the population between 18 and 64 years of age considers that they have the knowledge, skills and experience to be entrepreneurial, reaching 84% in those who are involved in entrepreneurial activities.

[112] *Ibidem.*
[113] https://www.gemconsortium.org/report/gem-2019-2020-global-report.

Nowadays, entrepreneurship has connotations related to social and economic success, but the truth is that the reality is much harder than one thinks. According to the Entrepreneurship Map 2018, published by the Spain Startup-South Summit, it is estimated that only 5% of Spanish start-ups reach five years of life and 15% do not survive one year[114].

The European Index of Digital Entrepreneurship Systems (EIDES) assesses the digital entrepreneurship of enterprises and provides a comparative assessment of the digital conditions for enterprises of diverse natures to expand their activity. The index is created for EU-28 countries.

EIDES divide countries into four groups: leaders (EIDES score above 60), followers (EIDES score above 45 and up to 60), catchers-up (EIDES score above 35 and up to 45) and laggards (EIDES score below 35).

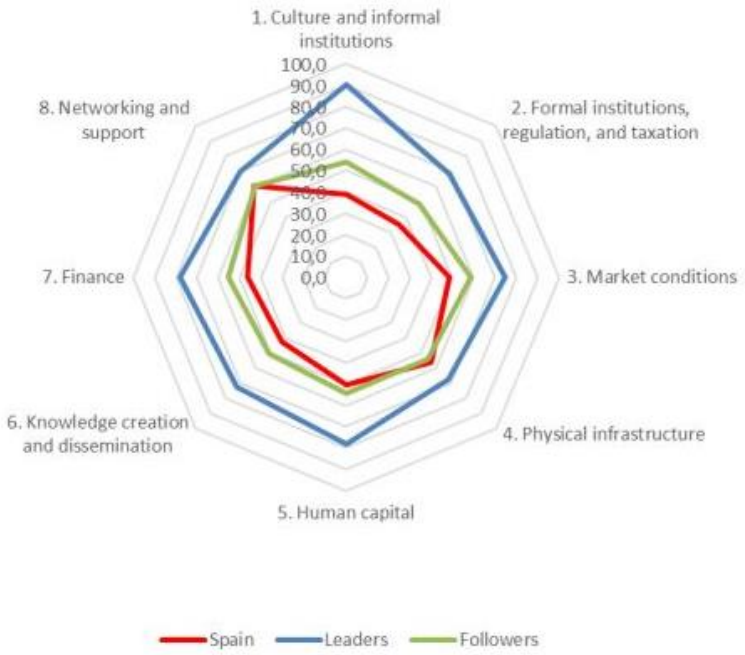
Spain is placed in the second group of the classification – followers – along with Ireland, Belgium, Austria, Estonia, France, and Malta, and is ranked 14th with an average score of 46.3.

Spain slightly exceeds their group average in the networking and support and physical infrastructure pillars. Its weakest pillars are formal institutions, regulation and taxation; culture and informal institutions; knowledge creation and dissemination; and finance.

The Spanish population is enterprising and there are sufficient technical and technological means; however, there is a lack of institutional support (both formal and informal) and a lack of favourable financing conditions together with limitations in education and training concerning mainly digital competences.

[114] Spain Startup-South Summit. Mapa del emprendimiento [Entrepreneurship Map] 2018, available at: https://d3t4nwcgmfrp9x.cloudfront.net/upload/Informe-Mapa-del-Emprendimiento-2018..pdf

Figure 21. Spain's position in the pillars of the EIDES.



Source: EIDES (2019).

Digital-entrepreneurship skills nexus

Digitalisation has had a significant impact on entrepreneurship in Spain. It has provided facilities affordable to any entrepreneurial profile by removing barriers related to finance, location and infrastructure. Furthermore, it offers new opportunities for entrepreneurs in traditional sectors of the Spanish economy as well as many new and innovative fields in which an innovator can compete with other companies on equal terms.

The business world, as well as society as a whole, is part of the social media revolution. Many organisations and companies have adapted to new trends, exploiting the potential of innovative technologies: wiki, to enable more effective virtual collaboration in projects; internal blogs, forums and YouTube channels to encourage global conversations and knowledge sharing; viral campaigns in social networks to attract customers; and new generation products developed jointly with stakeholders. Thus, this new entrepreneur must be in a constant state of transformation to adapt to market trends.

In Spain, the entrepreneur must permanently update his digital knowledge to access or remain in the job market and even more so if he wants to create his own company.

In addition to the initiative of the entrepreneur, the education system must first establish a solid foundation of entrepreneurial knowledge and digital skills and link the two subjects as they feedback together and must always be united.

In Spain, in the context of vocational training, this basis is, at the very least, incomplete. This is because it provides knowledge about entrepreneurship and business management in all training modalities, but it does not sufficiently address the teaching of digital skills nor does it relate digital skills to entrepreneurship, treating them in an isolated and uneven way.

III. Policy responses re digital-entrepreneurship skills

III.1 Bulgaria

III.1.1 National policies towards skills for the future

Bulgaria's national policy in the area of ICT and digital society is a sectoral policy which has an impact on all social and economic spheres in the country and, as such, it can be conducted with the joint efforts of all state institutions and with the participation of business and civic organisations. The aim of the policy is to support smart, sustainable and inclusive digital growth which must guarantee the optimal usage of ICT's potential. The Bulgarian Ministry of Transport, Information Technology and Communications plays the role of coordinator in the implementation of the national ICT policy. One of the priority areas in the national policy concerns the improvement of digital competences and skills. The four goals set out in this priority area are as follows:[115]

Goal 1: The modernisation of school and tertiary education in relation to ICT
This goal will be achieved with the help of the following measures:

- Ensuring the presence of an adequate ICT infrastructure in Bulgarian schools;
- Assessing the digital competences of students who graduate the first stage of high school education (after 10th grade);
- Upgrading the school curriculum and the methods of teaching;
- Implementing new school subjects;
- Improving the skills of teachers;
- Strengthening cooperation between the educational system, industry, and the non-governmental sector;
- Establishing an approach for effective measures in the field of digital measures and employment.

Goal 2: To improve the quality of the workforce in relation to ICT
Measures that will be undertaken include:

[115] Ministry of Transport, Information Technology and Communications of the Republic of Bulgaria. (2019). National Programme Digital Bulgaria 2025 (Национална Програма Цифрова България 2025). Available at: https://www.mtitc.government.bg/bg/category/85/nacionalna-programa-cifrova-bulgariya-2025-i-putna-karta-kum-neya-sa-prieti-s-rms-no-730-ot-5-dekemvri-2019-godina.

- Bettering the digital skills of the workforce by funding trainings in the area of ICT.

Goal 3: To increase the number of qualified specialists in the field of ICT
The measures that will be imposed include:

- Increasing the number of young people educated in the sphere of ICT;
- Improving the skills of specialists in the sphere of ICT.

Goal 4: To ensure the rights of children in the digital environment
The measures that will be imposed are:

- Organising campaigns to inform the public about the risks and responsible behaviour for children on the Internet;
- Establishing trainings in the field of media and digital literacy;
- Organising events and campaigns on the promotion of digital competences and the protection of children's rights;
- Combatting sexual exploitation and the abuse of children.

Law on Preschool and School Education[116]

The Bulgarian Law on Preschool and School Education provides for general education which covers key competences, one of which is related to digital skills. In the process of school training, the Law envisions that persons who are actively learning can study subjects in the field of entrepreneurship. Moreover, entrepreneurship is a category in profile-oriented schools.

Employment Promotion Act [117]

Section IV of the Bulgarian Employment Promotion Act envisions the promotion of entrepreneurship. According to this section, unemployed individuals who want to start their own business for manufacturing goods and services are granted lump sums from the unemployment fund after the approval of a business project. Furthermore, the Law provides for adult learning and occupational guidance, with the State Enterprise "Bulgarian-German centre for vocational training" conducting trainings for persons aged 16 years or above. Trainings conducted by the State Enterprise centre on key competences and occupational guidance. Additionally, the Law envisions that two of the key competences are entrepreneurship and ICT skills.

Law on the Degree of Education, the General Educational Minimum and the Curriculum [118]

The Law on the Degree of Education, the General Educational Minimum and the Curriculum provides for general education in Bulgarian schools. It is conducted through teaching subjects grouped in cultural-educational areas, including mathematics, informatics, and information and communication technologies.

[116] https://www.navet.government.bg/bg/media/ZAKON-ZA-PREDUCHILISHTNOTO-I-UCHILISHTNOTO-OBRAZOVANIE.pdf.
[117] https://www.navet.government.bg/bg/media/ZAKON-ZA-NASARChAVANE-NA-ZAETOSTTA_34.pdf
[118] https://www.navet.government.bg/bg/media/zakon_obr_minimum_uch_plan.pdf.

Vocational Education and Training Act [119]

The Vocational Education and Training Act outlines the common national VET training framework. This framework is a combination of competences in the fields of health and safety at work, the economy, and entrepreneurship.

Action Plan "Entrepreneurship 2020 – Bulgaria"

The national action plan "Entrepreneurship 2020 – Bulgaria" consists of measures that correspond to the Commission's action plan – "Entrepreneurship 2020 – Reigniting the entrepreneurial spirit in Europe". The national coordinator of the plan is the Minister of Economy who, each year, introduces a report for the previous calendar year[120]. The plan has three actions areas. The first area concerns "Entrepreneurial education and training to support growth and business creation" and includes the following measures:

- Developing entrepreneurial skills at the primary and secondary levels;
- Including the development of entrepreneurial competences in the new format of the State Educational Requirements for acquiring a professional qualification;
- Updating the entrepreneurship curriculum in the sphere of vocational education with the participation of workers' organisations;
- Supporting the activities of entrepreneurship centres at higher education institutions;
- Actualising the syllabuses and curriculum in the sphere of entrepreneurship at higher education institutions;
- Participating in joint projects for innovation in higher education (HEInnovate);
- Stimulating the awareness of young people about intellectual property and, in particular, trademarks. The "Brandiko" award granted by the Ministry of Economy is part of a project aimed at achieving this goal;
- Incorporating entrepreneurship into the syllabi of art and sports schools. This is conducted via the stARTs project which provides students with entrepreneurial training and testing on their entrepreneurial skills;
- Raising awareness of franchising as a business model. This measure targets higher education institutions;
- Enabling opportunities for the development and public protection of students' projects and managing virtual undertakings;
- Participating in national competitions of vocational education – "Panorama of Vocational Education";
- Providing opportunities for traineeships and practicum for students in real working environment;

[119] https://www.navet.government.bg/bg/media/ZAKON-ZA-PROFESIONALNOTO-OBRAZOVANIE-I-OBUChENIE_35.pdf.
[120] http://www.strategy.bg/StrategicDocuments/View.aspx?lang=bg-BG&Id=974.

- Transferring knowledge and actions to increase awareness of the following:
  - Vocational training and the acquisition of skills;
  - Demonstration activities and information actions;
  - Short-term transfer of knowledge and visits to agricultural and forestry holdings[121].

Furthermore, the "Entrepreneurship 2020 – Bulgaria" Action Plan established a national network of centres and incubators for business development. It provides a broad spectrum of information and consultancy services for start-ups and existing companies.

Strategy for effective application of information and communication technologies in education and science in the Republic of Bulgaria (2014-2020)

The strategy for the effective application of information and communication technologies in education and science in the Republic of Bulgaria (2014-2020) aims at the overall modernisation and transformation of education and science through ICT. Moreover, its goals are:

- Creating equal opportunities for acquiring high-quality educational services regardless of the student's education and location;
- Preparing individuals to adapt to life in a digital society, and educating them on the opportunities, threats, challenges and risks that come with it;
- Enabling the effective and manageable transition of society towards a knowledge-based economy.

The strategy also incorporates the following elements:

- Developing a common ICT environment for education, science and innovation;
- Introducing integrated digital management in all spheres of education and science and automating the administrative functions of teachers and scientists, among others;
- Prioritising the development of universal and standardised digital content (including access through mobile devices) and significantly decreasing the use of paper in the spheres of education and science;
- Developing and adopting recognised standards and metrics in ICT competences, and implementing ICT skills as part of career development in education and science cadres;
- Implementing national external assessments of digital competences after the completion of secondary education and certifying the ICT skills of students from profile-oriented and professional high schools;

[121] http://www.strategy.bg/StrategicDocuments/View.aspx?lang=bg-BG&Id=974.

- Defining ICT means – measures for educational and scientific development, as well as synchronising the European and worldwide dimensions and classifiers, reference frameworks and programmes, among others; including the monitoring of and active influencing to improve the position of Bulgaria in scientific and educational exchange;
- Attaining coordinated planning for and the realisation of the ICT projects of educational and scientific institutions on a European, national and regional level;
- Developing, through ICT, new educational and scientific services, registers and public information with the objective of attracting potential participants to support the strategy – parents, institutions, authorities, companies and civil organisations, among others.

National Strategy for Small and Medium-sized Enterprises (2014-2020) – Small Business Act

The National Strategy for Small and Medium-sized Enterprises (SMEs) 2014-2020 is in compliance with the SMEs Law. The strategy is a document that sets out the national policy on support for SMEs in Bulgaria. Moreover, it is focused on businesses in extractive and manufacturing industries, as well as on those in the services sector. In general, the policy aims to enhance the competitiveness of SMEs by encouraging the creation of innovative and start-up businesses which are eco-friendly and export driven. Indeed, the document envisions the establishment of such companies by ensuring the necessary conditions and access to funding, by advocating and bettering entrepreneurship skills, and by easing the bureaucratic conditions allocated for small and micro businesses[122].

Concept for encouraging the education of software specialists

The current concept focuses on the shortage of cadres in the rapidly changing software industry in Bulgaria. The solution to this problem will be sought through the national educational system. Despite the limited scope of the concept, in the process of its realisation, good practices for increasing the efficacy of the educational system and its relationship with the needs of the labour market will be identified. It is expected that the good practices will be adapted and applied in other professional spheres. Overall, the main goal of the concept is to establish the conditions required for the supplementary training of around 30 thousand software specialists at state higher education institutions, which offer the highest quality of education in this field. A portion of the expected results will also be sought through vocational training[123].

Other relevant policies

The strategy for the digital transformation of Sofia is focused on smart growth, where the latter is sustained by digital systems and concerns the ecosystem of ICT companies located in the capital. Indeed, the first goal of the strategy is to allow companies to take part in the digital

[122] Ministry of Economy (2020). Strategies and Policy, Small and Medium-sized Enterprises, National Strategy for Small and Medium-sized Enterprises 2014-2020 – Small Business Act, available at: https://www.mi.government.bg/en/themes/national-strategy-for-small-and-medium-sized-enterprises-2014-2020-small-business-act-11-285.html.
[123] Council of Ministers: Portal for Public Consultation (2020). Strategic Documents, Concept for encouraging the education of software specialists, available at: http://www.strategy.bg/StrategicDocuments/View.aspx?lang=bg-BG&Id=977.

transformation of the city. Second, the local strategy aims at enabling access to already existing markets and supporting the creation of new markets for digital products by easing and assisting the supply of digital services. Additionally, the goal of the strategic plan is to enhance the innovative the supporting infrastructure with the help of investments and financial tools along with the improvement of the digital skills of employed persons in the regional ICT sector.[124]

III.1.2. Initiatives re digital-entrepreneurship skills

Overview of specific initiatives on national, regional, sectoral and corporate levels

Projects

The Institute for Entrepreneurship, Sustainable Development and Innovation along with the Association for Social Responsibility and Development through Innovation are participating in a six-month project entitled "A New Generation of Entrepreneurs – Digital Tools for Building and Expanding Business". This project is funded by the National Youth Programme (2016-2020) of the Ministry of Youth and Sports. As part of this project, free practical trainings, organised as four courses on digital entrepreneurship, are held. They are aimed at young people aged between 15 and 29 years who have the ideas, desire and passion to create their own businesses. The four courses offered are as follows:

- Course 1: Legislation for Starting and Managing a Business. Digital instruments;
- Course 2: Entrepreneurship and Risk Management;
- Course 3: Digital Marketing;
- Course 4: Knowledge Management and ERP – Enterprise Resource Planning.

The content of the courses is developed in order to allow young people to acquire knowledge, skills and practical advice from specialists working in the sphere of entrepreneurship and business. Young people will develop their own concepts, create models of small firms and, with the support of educators, create a market product. The project envisages the involvement of 20 people, selected according to the field they want to develop, their motivation and their skills.

The Institute For Entrepreneurship, Sustainable Development and Innovation, with its experience and expertise, will provide the educational resources required for the trainings on "Legislation for Starting and Managing a Business. Digital instruments" and "Digital entrepreneurship and financial planning". Following the end of the project, the Institute will contact its grant and partner network, which will offer internships and jobs to those who have successfully completed the trainings under the project. Furthermore, upon the completion of the courses, a closing

[124] https://sofia.bg/documents/20182/7179284/Digital_Strategy_Sofia.pdf/4ec00e7a-aa1b-4eb0-9c7e-56999a0dfd4c.

meeting will be organised, and those who have finished the modules will be given award for their innovative business idea and will have the opportunity to do an internship in an ICT company[125].

Entrepreneurship Education Hub

In 2017, Junior Achievements Bulgaria launched a Bulgarian hub for the development of entrepreneurship competences and education. This is part of the European Entrepreneurship Education Hub. The aim of the hub is to unite all relevant stakeholders in the sphere of entrepreneurship by developing a platform for the establishment of policies and the implementation of measures at the national level, where the measures regard entrepreneurship competences and education as a key factor for economic and social prosperity. This initiative was supported by key foreign and Bulgarian representatives, and the ensuing activities for the creation of the Bulgarian entrepreneurship hub include the examination of the conditions of entrepreneurship in Bulgaria as well as identifying over 45 organisations which are part of the entrepreneurial eco-system[126].

Google Digital Garage

In May 2018, Google, with the support of the Ministry of Economy, introduced digital skills training for Small and Medium-sized enterprises. The programme "Grow with Google – Digital Garage Bulgaria" aims at overcoming the digital divide within Europe and targets around 1 million Europeans. The main goals of the programme are to support people in finding jobs and to trigger business growth, which are also goals of the European Commission. An earlier programme offered by Google since 2016 – "Digital Garage in Bulgaria" – offers free online trainings in digital marketing and online business for employees and entrepreneurs in the SME sector. Through this programme, 26 thousand people have been trained in the sphere of digital skills and 21% of them claim that they have experienced a positive effect on their career or business after the trainings[127].

Good practices

Many of the good practices identified in the field of digital and entrepreneurship skills in Bulgaria concern projects that target young people or students. The following good practices have been identified:

- Trainings along with consultations are the best stimulus for young people to undertake entrepreneurial activities. Additionally, knowledge sharing is a useful tool to promote entrepreneurship among the youth;

[125] Institute For Entrepreneurship, Sustainable Development and Innovation, 2019, Project: "A New Generation of Entrepreneurs – Digital Tools for Building and Expanding Business", available at: http://institute-esdi.org/novini/74-2019-10-17-08-04-55.
[126] JA Bulgaria, 2018, e-Hub for the Development of Entrepreneurial Competences and Education (EE-Hub), available at: http://www.jabulgaria.org/article/projects/centar_za_razvitie_na_predpriemacheski_kompetentnosti_i_obrazovanie_ee_hub.
[127] Ministry of Economy (2018). "Google" launches trainings for the digitalisation of SMEs in Bulgaria, available at: https://mi.government.bg/bg/news/google-startira-obucheniya-za-cifrovizaciya-na-malkite-i-sredni-predpriyatiya-v-balgariya-3449.html.

- Representatives from the business community should be engaged in the educational process because they have the necessary experience;
- Young people and students can gain knowledge, skills and experience by creating and leading their own businesses in real-life conditions;
- Students should be encouraged to participate in the educational process to realise and develop their ideas.

III. 2 Italy

III.2.1 National policies towards skills for the future

In order to comply with the Digital Agenda for Europe, Italy responded with:

- A massive financial commitment to develop ultra-fast broadband and 5G technologies that, despite positive results, has not helped Italy improve its connectivity ranking (ranked 25th of the 28 EU Member States);
- A national strategy (Agenda Digitale Italiana) to favour, assist and leverage the potential of ICT technologies for economic development and industrial competitiveness – which is consistent with the objectives and targets set by the European Agenda.

The main objective of the Digital Agenda for Italy is to tailor digital policies and strategies to the Italian context. This also includes the development of technologies, innovation and the digital economy.

The following entities are responsible for determining the contextual objectives and relevant action plans of the strategy:

- Ministry of Economic Development;
- Ministry of Public Administration;
- Ministry of Education and Research;
- Ministry of Finance;
- Department for Territory Cohesion and Department for Publishing of the Presidency of the Council;
- Nominated representatives of the Italian regions, provinces and municipalities.

In the framework of the Digital Agenda for Italy, the main interventions have been condensed within the Strategy for Digital Growth (2015): this strategy coordinates all public policies and interventions to foster digital transformation and to establish a digital culture among citizens and enterprises.

It has been promoted by the AGID (Agency for Digital Italy) that the digitalisation of the private sector might be possible exclusively through the digital alignment of the public administrations first[128].

Human capital and technology have also been a priority field for intervention. A substantial effort has been made towards to the overall digitalisation of citizens through the National Plan for Culture, Training and Digital Competences (2014), with a dedicated focus on not only low-skilled adults, but most importantly on:

- The young and workers for vocational training and transverse digital competences;
- Disadvantaged people with an aim to overcome the digital divide (gender differences, territorial differences, socio-economic differences, among others) and to promote social inclusion in order to "trigger" a virtuous cycle in the priority field of digitalisation.

Following the same scope:

- The Good School Act (2015) introduced a National Plan for more "digitally inclined" schools to strengthen digital competences among teachers and students and a modern learning environment. This is achieved through expanding access to the Internet and digital platforms;
- The objective of the 2017 Industry 4.0 National Plan 2017-2020 is to boost investment in new technologies, research and development and to revitalise the competitiveness of Italian companies.

The monitoring of the ongoing digitalisation process has been assigned to the Observatory of Digital Competences. The Observatory carries out investigations and surveys among citizens, students, enterprises and the public administration in order to provide policy makers with relevant data, statistics and guidelines for the development of the digital field. It is published every year by AGID (Agency for Digital Italy).

Regardless of the positive results in absolute terms, even the largest Italian cities, considered at the national level as "best example standards", are among the least digital-friendly urban areas in Europe – only Milan, Turin and Rome make the ranking in 38th, 52nd and 53rd position, respectively, out of the 60 cities considered[129]. Not by chance, these results are consistent with their business-friendliness appeal – Turin gains some points and occupies the 44th position, but Rome remains at the bottom of the ranking and Milan slips to 56th position[130].

[128] For instance, in 2018, the AGID published a very detailed white paper in order to promote and support uptake at the local and regional policy making levels the full embracement of AI technologies in the implementation of their services for citizens.

[129] European Digital City Index. Digital Infrastructure, available at: https://digitalcityindex.eu/theme/3 /.
[130] European Digital City Index. Business Environment, available at: https://digitalcityindex.eu/theme/2.

Other relevant policies

The most recent effort (dated to April 2020) is represented by the launch of the Italian Coalition for Digital Skills ("Repubblica Digitale") – a multidimensional initiative to foster, boost and mainstream ICT competences at any level of society[131].

The initiative has been promoted by the Minister for Technological Innovation and Digitalisation with the aim to narrow the substantial gap in digital education existing between Italian citizens and the rest of Europe.

Its two long term goals are:

- Reducing the phenomenon of digital illiteracy to levels at least similar to those detected in other European countries and promoting the development of the necessary digital skills of workers;
- Significantly increasing the percentage of ICT specialists highly experienced in avant-garde and 4.0 technologies.

Repubblica Digitale's strategy is built around five pillars[132]:

- Enhancing local and national actions for the development digital citizenship with specific actions promoted by the MiD (e.g. the initiative: "A tablet and a smile for the elderly");
- Providing citizens with adequate tools for the self-development of digital skills (self-evaluation kit, e-book, online courses, agenda of initiatives and events, among others);
- Skilling, upskilling and re-skilling initiatives to cover the specific training needs of each generation;
- Communicating the importance of digital skills and digital culture through media involvement; national events in collaboration with the national organisation of digital skills; the organisation of an annual competition or prize for the best Digital Republic initiatives, among others;
- Monitoring the evolution of the digitalisation phenomenon and the effectiveness of intervention policies, thanks also to the establishment of the observatory on skills and the digital divide.

Repubblica Digitale represents a comprehensive approach to digitalisation and ICT culture with no demographical/sectorial boundaries.

[131] https://ec.europa.eu/digital-single-market/en/news/italy-launches-its-national-coalition-digital-skills-and-jobs.
[132] https://innovazione.gov.it/it/repubblica-digitale/.

41% of Repubblica Digitale's facilitators are from the private sector (with the number of representatives from SMEs being more than double the number of those from large companies) and at the same time they benefit from 23% of the total number of initiatives. Of these, more than half are dedicated to high school students or students at higher education institutions, immediately followed by adult workers and entrepreneurs.

To date, the most successful initiatives are the "competences centres" (CC), the most important annex of the "Industria 4.0" plan.

In operation since 2018/2019, CCs are physical facilities that act as strategic innovation hubs in the intersection zone between the public and private sectors where universities, scholars, public administrators and SMEs boost tech transfer and training services. They involve large partnerships, generally headed by a university, and their mission is to exploit, mainstream and validate industrial research priorities and the digital competitiveness of the workforce.

CCs receive co-financing of several million euro from MiSE and the Ministry of Education, University and Research (MIUR) and bring together a network of hundreds of private intermediaries, big tech companies, universities and spin-offs, IT researchers and formal/non-formal VET providers to support the digitalisation strategy of the national entrepreneurial ecosystem.

The CCs are:

- Manufacturing 4.0 @ Polytechnic of Turin;
- Made in Italy 4.0 @ Polytechnic of Milan (Box X);
- Big Data Innovation & Research EXcellence (BI-REX) @ University of Bologna;
- Advanced Robotics and Enabling Digital Technologies & Systems 4.0 (ARTES 4.0) @ Scuola Superiore Sant'Anna of Pisa;
- Social Network, Mobile Platforms & Apps, Advanced Analytics and Big Data, Cloud, Internet of Things (SMACT) @ University of Padua;
- Industry 4.0 @ University of Naples "Federico II";
- Security and Optimisation of Strategic Infrastructures 4.0 (START 4.0) @ CNR;
- Cyber Security (Cyber 4.0) @ University of Rome "La Sapienza".

III.2.2 Initiatives re digital-entrepreneurship skills

Overview of specific initiatives on national, regional, sectoral and corporate levels

Thus far, digital entrepreneurship education and entrepreneurial training in general are highly fragmented across a multitude of socio-economic actors.

Each of them designs and provides their own learning programmes relying for the most part on personal experiences and very diversified theoretical frameworks which were acquired and mastered throughout their own personal training as part of a "train-the-trainers" experience.

While this broad availability of diverse knowledge is certainly beneficial, it could also be perceived as disruptive to the emergence of a shared understanding of digital entrepreneurship.

This heterogenisation of digital education programmes is due to a considerable mismatch between the policy and operational levels. In other words, how are EU frameworks actually communicated and implemented at a local or regional level after being received from ministerial authorities?

However, it is very interesting to observe how private training and educational initiatives developed at local, regional and even national levels have proven to be incredibly engaging and effective. For the most part, these initiatives target secondary schools and university students, aspiring start-uppers and entrepreneurs, and recent graduates pursuing managerial careers.

The formula exploited by these programmes relies on simple but "catchy" methods, such as business challenges, enterprise simulations and forecast planning, where students are asked to use their best critical and creative thinking skills to solve and "decode" potential real-life business scenarios.

For example, University2Business hosts an annual "Disruptor Challenge"[133] which is sponsored by Italian companies operating in wide range of markets and sectors. Students are faced with complex decision-making and strategic planning hypotheses proposed by the different companies participating in the initiative.

Other more traditional approaches can be just as effective provided they use gamification and are interactive, experience-based and student-centred. One successful example of this type of approach is H-FARM[134] – the largest Innovation Centre in Europe. Since 2005, it has proactively invested in the development, dissemination and mainstreaming of digital awareness and ICT culture among youth through its training programmes.

H-FARM provides more than 40 structured training courses on specific topics related to digitalisation and "tomorrow's competences" for employability.

These conceptual assumptions are also applicable to the digital empowerment of already established small and micro-entrepreneurs.

[133] available at: https://www.ilfuturoeoggi.it/.
[134] available at: https://www.h-farm.com/it.

External consultants, ICT operators, and both formal and non-formal VET providers are elected as the favourite interlocutors of such category but with a few important distinctions:

- Start-uppers and innovative SMEs are largely engaged in incubation and acceleration processes – a booming phenomenon since 2017, as observed by the Social Innovation Monitor[135];
- Large firms might rely on established realities with higher capital potentials as assured by the CCs (both from the financial and knowledge perspective);
- The average SME is much more inclined to outsource their digital functions to external specialised firms.

In 2017, the Digital Transformation Monitor published a series of important findings from the implementation of "Industria 4.0"[136]. What really stands out is how, throughout the years, public interventions were found to be a very disruptive factor to the efficient implementation of the national digitalisation plan.

Experience-based scenarios have shown that when businesses seem to already have a clear vision of what they need to achieve in their own digitalisation priorities, the best contribution that some can expect from a public intervention should be limited to financial support or tax relief – very basic but fundamental requirements aimed at triggering new digital awareness and innovation horizons.

Good practices

To date, only medium and large enterprises have shown a fundamental and comprehensive interest in digital technologies. There is still great difficulty in reaching small and micro-enterprises.

Therefore, it is necessary to ensure the greater involvement of small and micro-enterprises to avoid potential new divergences arising from technological and digital uptake, but only if the considered initiatives are designed to provide opportunities to all companies and take into consideration contextual factors such as size, sector and location.

As small and micro-enterprises engagement has historically been poor, there is a need to ensure the interventions are appropriately tailored to the needs to the target, which is an effort that will further complicate a national discussion that is already very complex.

[135] Impatto degli incubatori/acceleratori italiani, Report 2019, available at: https://socialinnovationmonitor.com/report-incubatori/.
[136] available at: https://ec.europa.eu/growth/tools-databases/dem/monitor/content/italy-%E2%80%9Cindustria-40%E2%80%9D .

The parallel focus on technology and digital skills is one of the main features of the framework, however, the measures boosting the investment in technology and innovative processes shows results in the short run, while measures focusing on IT capabilities development need more time to be implemented and deliver the first observable results.

There is the risk that, from the qualitative perspective, what is done today to teach and educate on ICT culture might be less impactful in the near future than how previously foreseen. This approach lack of efficiency and is incapable to measure skills alignment effectiveness as quick as the ROI from a financial investment on digital innovation.

III.3 Poland

III.3.1 National policies towards skills for the future

Background: the main policy players

The directions of digitalisation and digital education – or more broadly: skills and competences for the future – are set by the Council of Ministers and expressed through various strategies and programmes. Implementing public policy towards skills for the future is a cross-cutting issue which is of interest to numerous state departments in Poland: family, labour and social policy issues; science and higher education; economy; entrepreneurship and technology; infrastructure; and investment and development, among others. There are, however, two key sections of government administration that hold the primary responsibility for the implementation of policies on digitalisation and digital education: the Ministry of Digitisation and the Ministry of National Education.

Digitisation as a section of government administration in Poland was established in 2002. At that time, it was subordinated to the Minister of Science and was run by the Office of the Committee for Scientific Research (Urząd Komitetu Badań Naukowych). The rank of digitisation increased in 2003 when the name of the ministry was changed to the Ministry of Science and Digitisation. From 31 October 2005, digitisation was subordinated to the Ministry of the Interior and Administration.

The Ministry of Administration and Digitisation was established six years later, in November 2011. After another four years, a separate ministry was established by the Ordinance of the Council of Ministers of 7 December 2015 (effective from 16 November 2015), receiving the name of the Ministry of Digitisation. According to the information published on the Ministry's website[137], its mission is to "make people's lives better through digitisation" according to a vision in which Poland is "an innovative and friendly country where the interactions between the state, citizens and entrepreneurs are simple".

Public policy towards digitisation in Poland has been targeted at three areas: 1) infrastructure development, 2) stimulation of demand for digital competences, 3) stimulation of supply of

[137] For more information please go to: https://www.gov.pl/web/cyfryzacja/podstawowe-informacje (accessed on 27.04.2020).

digital competences. The main efforts in implementation, however, have been concentrated thus far on infrastructure development, although Poland still lags behind other EU countries in this respect.

Much of the public administration's energy has been devoted to the digitalisation of public administration and the introduction of public e-services. The need for undertaking such efforts was expressed, among others, in the Integrated State Informatisation Programme (Program Zintegrowanej Informatyzacji Państwa) – a strategic document describing the government's activities aimed at providing high quality electronic public services to Polish citizens. It was adopted by the Council of Ministers in 2014 as an implementation document for the Efficient State 2020 Strategy (Strategia Sprawne Państwo 2020) and was closely related to the Operational Programme Digital Poland (Program Operacyjny Polska Cyfrowa). Although up to 2019, the Programme was focused mostly on the digital competences of civil servants, the level of digital literacy of citizens and entrepreneurs was mentioned as one of subsidiary indicators measuring the implementation progress. For example, the target value for the percentage of citizens with basic and upper basic digital skills in 2020 was set to 43%, as compared to 40% in 2015, according to the Digital Agenda Scoreboard. The updated 2019 version of the Programme, the implementation of which has been envisaged for the years 2019-2022, includes a direct reference to the digital skills of Polish citizens. It recognises the importance of digital education in shaping digital competences and states that it should enable citizens to use digital technologies in different areas of life, to benefit from them and to improve their quality of life[138].

The Ministry of National Education is responsible for matters relating to pre-school, general, special and vocational education and training, and – according to the strategic documents adopted by the Council of Ministers (please see the following two sub-sections) – should incorporate digital education into the curricula on every level of formal education.

Development policy overarching framework up to 2030: Strategy for Responsible Development

The main strategic document on the central level addressing the general directions and paths of the development of Poland is the Strategy for Responsible Development[139] (Strategia na rzecz Odpowiedzialnego Rozwoju, SOR) for the period up to 2020, including the perspective up to 2030. The Strategy was adopted by the Council of Ministers on 14 February 2017. As many of its ambitious plans and targets will most likely have to be revisited due to the COVID-19 pandemic, the Strategy remains the key guiding document for the medium- and long-term economic policy of Poland.

Human and social capital as well as digitalisation have been included in this document among the core conditions for reaching its three specific objectives: sustainable economic growth

[138] Program Zintegrowanej Informatyzacji Państwa, p. 13.
[139] For more information about the Strategy for Responsible Development please go to (in Polish): https://www.gov.pl/web/fundusze-regiony/informacje-o-strategii-na-rzecz-odpowiedzialnego-rozwoju (accessed on 6.04.2020).

increasingly driven by knowledge, data and organisational excellence; socially sensitive and territorially sustainable development; effective state and economic institutions contributing to growth as well as social and economic inclusion.

Education is thus one of the core elements of the Strategy. According to this document, strengthening human and social capital in the national innovation system should encompass promoting entrepreneurial culture and mobility, and all changes in the education system – in particular, vocational education and higher education – should be oriented towards building the pro-innovative attitudes of students. In this context, the document announced the modernisation of vocational education and programmes addressed to adults of varied levels of digital competences in order to increase their efficiency and effectiveness, and harmonisation with the labour market[140]. The Strategy assigns a key role to three sets of skills: universal skills that allow a person to perform social and professional functions and roles in different contexts; digital skills which are necessary to function in the modern world; and professional skills needed on the labour market.

Regarding vocational education and training specifically, the Strategy underlines that special efforts should be placed on enhancing its quality and attractiveness[141]. The authors of the document have acknowledged the fact that VET – together with higher education – has the greatest impact on the supply of adequate staff for Polish industry. As the Strategy suggests, employees ready to use ICT tools and digital technologies may contribute to increasing the global competitiveness of the Polish economy. In order for employers to have access to the staff they really need, it is necessary to involve them on a large scale in the process of vocational training and examination, states the Strategy.

Taking advantage of ICT in teaching is perceived in the document as one of the ways to ensure a better-quality education[142]. Digital skills – greatly needed in daily functioning and for working in an information society – challenge schools to change their modes of work with students who now are enabled to search, process and use information themselves. In this context, the Strategy underlines that the development of digital competences should happen at every stage of life, including also informal education and self-study. Another way to increase the quality of education – including VET – is to improve its innovativeness through, among others, substantial changes in the curricula[143]. This should, according to the Strategy, be directed towards some greater emphasis on universal competences such as communication (both in the mother tongue and other languages), creativity, initiative, innovativeness, team working and, last but not least, entrepreneurship.

Among the education-related strategic projects envisaged in the Strategy, one relates specifically to vocational education. The project Modern personnel for Polish industry foresees the development of a new model of cooperation between vocational education entities and

[140][Streszczenie w EN], 8, 10, 18.
[141] Strategy for Responsible Development, *op.cit*., p. 266.
[142] *Ibidem*, p. 267.
[143] *Ibidem*, p. 276-277.

business, including, among others, providing education combined with professional training at the employer (according to the dual education model) and the active participation of industry in the preparation of curricula[144]. The project envisages the modernisation of the offer and content of VET, and the provision of vocational counselling and guidance. It recognises the need to popularise vocational education among students and their parents, as well as the need to improve the competences and qualifications of teachers in vocational schools. One of key concepts of the programme is the so-called rationalisation of the choice of educational pathway according to which the structure of vocational education should be more flexible and access to further training should be provided.

Other strategic projects are:

- *Integrated Qualification System* (Zintegrowany System Kwalifikacji, ZSK) – a project encompassing the implementation of the Integrated Qualification System, which should improve the level and quality of human capital in Poland by increasing the number of learners and increasing the effectiveness of investments in human capital;
- *The Skills Initiative* (Inicjatywa na rzecz umiejętności) – a programme to promote life-long learning in different forms based on a new model of adult education based on non-formal education, the recognition of its learning outcomes and greater accessibility to integrated services for citizens, where educational offers are combined with services from other areas (promotion of entrepreneurship and employment, family support, participation in culture and social activity);
- *School for the Innovator* (Szkoła dla innowatora), which encompasses the preparation of a comprehensive system of education for innovators covering different levels of education and strengthening the resources of this system (teacher education and training);
- *Education in the Digital Society* (Edukacja w społeczeństwie cyfrowym) – a project aiming at ensuring the provision of equipment and infrastructure to develop the competences of students and teachers to use ICT tools in the educational process. The main component of the project will be the National Educational Network (Ogólnopolska Sieć Edukacyjna, OSE);
- The reform of higher education, in particular aimed at seeking new solutions for the use of research and the teaching potential of universities;
- *Study and Work in Poland* (Studiuj i pracuj w Polsce) – a project aimed at closing the human capital gap in strategic sectors of the Polish economy by encouraging foreign students to study and work in Poland, as well as supporting the study in Poland of children of Polish repatriates.

The objectives set out in the Strategy are to be achieved through nine sectoral strategies, out of which four refer to digital competences:

[144] *Ibidem*, p. 279.

- *Efficient and Modern State 2030 Strategy* (Strategia Sprawne i Nowoczesne Państwo 2030) sets out a number of changes in the functioning of public administration aimed at improving its efficiency by using digital technologies – these changes should be accompanied by the processes of opening up the state's information resources and improving the digital competences of society and administration;
- *Human Capital Development Strategy* (Strategia Rozwoju Kapitału Ludzkiego), which will support the development of the digital competences of citizens through educational campaigns and the creation of the National Educational Network (Ogólnopolska Sieć Edukacyjna, OSE);
- *Innovation and Economy Efficiency Strategy* (Strategia Innowacyjności i Efektywności Gospodarki) sets out a number of measures for entrepreneurs from the IT sector and public administration in the area of data opening policy, including measures for Artificial Intelligence development and the adaptation of public institutions to economic challenges, as well as strengthening digital and management competences in the society;
- *Social Capital Development Strategy* (Strategia Rozwoju Kapitału Społecznego), which puts an emphasis on the broad digitalisation of cultural goods and scientific achievements.

Skills framework up to 2030: Integrated Skills Strategy

The key strategic document devoted to skills development is the Integrated Skills Strategy 2030 (general part) (Zintegrowana Strategia Umiejętności 2030 [część ogólna])[145], adopted by the Council of Ministers in January 2019. The document takes into account the assumptions of the Skills Agenda for Europe, the OECD Skills Strategy and national requirements, including those related to the strategic document on a lifelong learning perspective[146]. It also responds to the requirements included in the Partnership Agreement approved by the European Commission in October 2017, which obliged Poland to develop an integrated strategy for skills development that should cover the education and training system (including general, vocational, lifelong learning and higher education).

The Integrated Skills Strategy 2030 is in line with the Strategy for Responsible Development and develops the objectives and directions of activities designed in the Human Capital Development Strategy.

In line with the agreed assumptions, the Integrated Skills Strategy 2030 should consist of two components:

- General strategies, setting out the main priorities and directions for action;

[145] The whole text of the documents is available here: https://efs.men.gov.pl/wp-content/uploads/2019/08/Zintegrowana-Strategia-Umiejętności-2030-część-ogólna.pdf (accessed on 27.04.2020).
[146] For mor on the lifelong learning please go to: https://www.gov.pl/web/edukacja/perspektywa-uczenia-sie-przez-cale-zycie.

- Detailed strategies, containing an extended diagnosis, a catalogue of actions taken and planned, as well as an extended description of the implementation mechanisms.

Works on the detailed section of the Strategy in Poland are still ongoing.

The authors of the document have acknowledged the major role of the stock of relevant skills for social and economic development. "Today's changes resulting from globalisation, technological developments, an ageing society, increased migration, urbanisation or green economy, determine the set of skills that are essential for social life and the labour market"[147] – states the document's summary.

The Strategy provides a framework for a systematic and comprehensive approach to skills policies, ensuring appropriate investment in matching skills with anticipated and current social and market needs. More specifically, according to its authors, the document provides a framework for:

- Designing and implementing coherent policies for developing skills in line with lifelong learning;
- Ensuring equal access to information on and demand for skills, educational and career guidance, and education and training opportunities related to skills development;
- Strengthening awareness of the importance of lifelong skills development for individual, economic and social gains;
- Increasing educational, vocational and social activity in all groups of society, especially among people with low skills or who are at risk of social exclusion.

The Strategy's overall objective is to create the opportunities and conditions for the development of the skills needed to strengthen social capital, social inclusion, economic growth and quality of life. It is based on six priority areas:

- Improving the level of key skills in children, young people and adults;
- Developing and disseminating a learning culture geared towards active and continuous skills development;
- Increasing employers' participation in the development and better use of skills;
- Building an effective system for diagnosing and communicating the current state and demand for skills;
- Developing effective and sustainable mechanisms for inter-ministerial and inter-sectoral cooperation and coordination in the field of skills development;
- Equalising opportunities in access to the development and use of skills.

Basic and transversal skills, including entrepreneurial and digital skills, have been put in the centre of considerations (please see the table below). As it has been pointed out in the Strategy, the growing importance of transversal skills is related to, among other things, changes in work

[147] Zintegrowana Strategia Umiejętności 2030 (część ogólna), Ministerstwo Edukacji Narodowej, Warszawa 2019, https://efs.men.gov.pl/wp-content/uploads/2019/08/Zintegrowana-Strategia-Umiejętności-2030-część-ogólna.pdf, p. 11.

organisation and the role of employees, the rapid obsolescence of existing skills and the growing demand for new ones, as well as an increased emphasis on those skills which are more difficult to automate.

Table 3. Basic and transversal skills according to the Integrated Skills Strategy 2030.

Basic skills	Transversal skills
Understanding and creating information	**Entrepreneurial skills**
Multilingualism	Individual, social and learning skills
Math skills	**Digital skills**
Skills in life sciences, technology and engineering	Skills regarding cultural awareness and expression
	Skills related to multiculturalism
	Civic skills
	Critical thinking and creative problem solving
	Leadership skills
	Ability to adapt to new conditions
	Teamworking

Source: Zintegrowana Strategia Umiejętności 2030 (część ogólna), Ministerstwo Edukacji Narodowej, Warszawa 2019, https://efs.men.gov.pl/wp-content/uploads/2019/08/Zintegrowana-Strategia-Umiejętności-2030-część-ogólna.pdf, p. 16.

Digital skills have been defined in the Strategy as:

- Confident, critical and responsible use and interest in digital technologies for learning, working and participating in society;
- Information and data literacy;
- Communication and collaboration;
- Media literacy;
- Digital content creation (including programming);
- Security (including digital comfort and competences related to cyber security);
- Intellectual property issues;
- Problem solving and critical thinking.

Entrepreneurial skills have been defined as the ability to seize opportunities and ideas and turn them into value for others, based on creativity, critical thinking and problem solving. They also involve initiative, perseverance and the ability to work together to plan and manage projects of cultural, social or financial value.

The Strategy makes a direct reference to VET by addressing the latest reforms in the organisation of vocational education in Poland (more information on this in the next sub-chapter) aimed at enabling more flexible cooperation between schools and employers and introducing arrangements for further training for teachers directly with the employer[148]. As the Polish business sector is dominated by micro-enterprises which employ a significant part of the workforce, it is especially necessary to strengthen the links between these micro-entrepreneurs and VET. Otherwise, the growth of micro-enterprises operating in mature sectors will continue to be hampered. The issue is also important for small and medium-sized enterprises in more innovative and fast-growing sectors of the economy, for which skills shortages are a major challenge[149]. Therefore, the reform of vocational education assumes the implementation of education based on cooperation with employers and it should, along with the implementation of the Strategy, enhance the employability of graduates of vocational schools. Moreover, the reform should also address the poor preparation of graduates of basic vocational training for lifelong learning, which also remains a challenge.

The Integrated Skills Strategy 2030 refers to the education reform process which was initiated in December 2016 when the Polish Parliament passed the Education Law. The key element of the reform has been the transition from two-degree compulsory general education to one-degree education, delivered in an eight-grade primary school; further education has been extended by one year. At the same time, compulsory education has been limited to completion of an eight-grade primary school. These changes made it necessary to develop new core curriculum and a new formula for external exams. The provisions of the new curricula also relate to respect for information privacy, data protection, intellectual property rights and safe movement in cyberspace. A number of training projects in programming for teachers were launched all over Poland to enable the teaching staff to implement the new core curriculum.

As part of the reform, the former basic vocational schools were transformed as of September 2017 into first degree industry schools (szkoła branżowa I stopnia) upon the completion of which it would be possible to take up employment or continue education in a second degree industry school (szkoła branżowa II stopnia). A major amendment of the Education Law of November 2018 introduced further changes to the vocational education system (as of September 2019) including the requirement for closer cooperation between schools and employers and their organisations. In other words, the amendment made it possible to conclude agreements between schools and employers and create so-called “patronage classes”, in which students can be educated in a given profession or speciality that is needed by a particular enterprise. The amendment also included publishing official forecasts of demand on the labour market and introducing binding opinions on this issue from the voivodship labour market council (local administrative bodies are to assess the needs for educating students in vocational schools).

[148] Zintegrowana Strategia Umiejętności 2030 (część ogólna), Ministerstwo Edukacji Narodowej, Warszawa 2019, https://efs.men.gov.pl/wp-content/uploads/2019/08/Zintegrowana-Strategia-Umiejętności-2030-część-ogólna.pdf, p. 38.
[149] OECD 2018

Other relevant policies

On the regional level, the Integrated Skills Strategy serves a point of reference in the course of updating the voivodship development strategies and the work plans of various Regional Territorial Observatories (Regionalne Obserwatoria Terytorialne) and Regional Territorial Fora (Regionalne Fora Terytorialne). Dedicated regional and local digital and skills policies in Poland are, however, just emerging.

One of examples of such an emerging policy is the policy of digital transformation of the capital city of Warsaw[150]. Currently, the draft of this policy document is being publicly consulted. The project stems from the smart city concept. One of the directions for digital transformation described in the draft is named *We are constantly improving* (Stale się doskonalimy), where improvement is also understood as the development of the competences of the inhabitants of Warsaw[151]. High digital competences for the citizens of Warsaw was also recognised as one of the values of the digital transformation[152]. In the draft text, the municipality has committed itself to conduct research on the level of the digital competences of its employees and on the citizens of Warsaw and to develop these competences. Digital competences are understood as "the ability to cooperate, think creatively and be open to novelty, change and experimentation"[153]. The text makes no direct reference to the impact of digital competences on entrepreneurship.

III.3.2 Initiatives re digital-entrepreneurship skills

Overview of specific initiatives on national, regional, sectoral and corporate levels

Various projects and initiatives supporting the implementation of the above-mentioned policy strategies are carried out on different levels of governance in Poland. The most important source of funding of such endeavours is the Operational Programme Digital Poland for 2014-2020, with its Priority Axis III: Digital Competences of the Society. More specifically, in relation to digital skills, the Programme aims to fund projects related to:

- Developing the digital skills of society, mainly in rural areas and small towns, to support a more active participation in social life and more frequent involvement for the benefit of local communities and activity in non-governmental organisations;
- Creating and implementing education and information campaigns to promote the benefits of developing digital skills;
- Developing and strengthening the potential of programmers, which can be used for the digital development of the country.

[150] For more information about the strategy of the project, please go to: http://2030.um.warszawa.pl/cyfrowa-transformacja/.
[151] P-06 Dokument. Projekt Polityki Cyfrowej Transformacji m.st. Warszawy, Wersja 2, Urząd m.st. Warszawy, Biuro Cyfryzacji Miasta, http://2030.um.warszawa.pl/wp-content/uploads/2019/10/Projekt-Polityki-cyfrowej-transformacji-Warszawy-publikacja-20191029.pdf, p. 9
[152] *Ibidem*, p. 11.
[153] *Ibidem*, p. 13.

For example, with regard to digital infrastructure in schools, in June 2017, the Council of Ministers adopted a resolution on the implementation of the aforementioned National Educational Network (Ogólnopolska Sieć Edukacyjna, OSE), obliging the Minister of Digitisation to prepare an adequate law. The development of the OSE, which aims primarily at equalising educational opportunities for children by providing them with broadband Internet and digital educational resources, is financed by the Operational Programme Digital Poland for 2014-2020.

Governmental efforts at the national level, such as OSE development, are concentrated mainly on infrastructure development and have been criticised for their insufficiency. On the one hand, infrastructure is more widespread, but on the other hand, the demand and supply of digital competences are not sufficiently stimulated. In other words, people have technological means but do not know how to use them or why they should do so.

Non-governmental organisations try to fill in this gap by proposing concrete projects addressed to both students and teachers. For example, the association Miasta w Sieci (Cities Online) based in Tarnów, in 2014 created the Centre for Education and Digital Creation "Factory of the Future", which is now a hub for research, experimentation and daily practice in the field of digital education. The Centre is equipped with all of the required technologies and allows for the implementation of comprehensive projects dedicated to skills development addressed both to teachers and students and is funded from various sources, including the Operational Programme Digital Poland for 2014-2020. The territorial scope of projects implemented by non-governmental organisations varies from nationwide (e.g. Lekcja:Enter) to regional (e.g. Latarnicy2020.pl) and local.

Good practices

The analysis of the projects dedicated to skills development in VET results in the formulation of the following good practices:

- Communication and enhanced cooperation between relevant stakeholders in implementing specific projects is crucial – e.g. VET institutions and training providers and business;
- Working on real-life cases and scenarios to solve real-life problems and obtain skills which might be actively used in practice enhances the chances of the project's long-term impact;
- Engaging students in the teaching process is pivotal. Taking into account the specificity of Polish vocational education and the needs of the labour market, methods using the involvement of students in various types of in-class activities, such as group work or problem solving may prove particularly effective. Cooperative and collaborative learning might be used both among students and between a student and an entrepreneur.

III.4 Portugal

III.4.1 National policies towards skills for the future

As mentioned, during the last ten years, Portugal initiated several political instruments to foster both digital and entrepreneurship skills. This section addresses the political measures launched in Portugal to that end, aiming to overcome the effects of the severe economic and financial crisis, as well as to promote the development, modernisation and competitiveness of the country in the international arena.

Policy responses to foster digital skills in Portugal

In November 2010, the Portuguese government issued a resolution that approved the Digital Agenda 2015.[154] Two years later, in 2012, now involving the private sector and to a greater extent in line with the priorities defined by the EU, the Agenda Portugal Digital was launched. The development of the Portuguese population's digital inclusion, specifically in terms of digital literacy skills and qualifications in ICT, was declared as strategic, along with the expansion of digital entrepreneurship and the internationalisation of the Portuguese ICT sector[155]. Less than three years later, the Agenda Portugal Digital was subject to minor revisions and extended until 2020[156].

From 2013 to 2015, the Portuguese Coalition for Digital Employability (CPED) studied mechanisms to facilitate the training of young people in ICT as well as the reskilling of unemployed individuals[157]. As a result, in 2015, the Strategy and Action Plan for Digital Employability 2015-2020 was issued. This instrument set out three strategic goals: reduce the shortage of ICT professionals; improve access to ICT skills in the public and private sectors, as well as among citizens in general; and increase the number of companies using digital technologies and digital-based enterprises to develop the digital economy. The plan's measures were structured around four axes: qualification and reskilling for employment in the ICT sector; growth of digital entrepreneurship and ICT job offers; raising social awareness on the digital and its potential; and internationalisation of the ICT sector and attraction of foreign direct investment[158]. Also, in 2015, the Portuguese Agency for Science and Technology (FCT) launched the National Strategy for Inclusion and Digital Literacy 2015-2020. According to Brites and Jorge (2017), this

[154] Resolução do Conselho de Ministros no. 91/2010 – Aprova a Agenda Digital 2015, iniciativa inserida no âmbito do Plano Tecnológico. Diário da República, I Series, no. 225, 19-11-2020, available at: https://dre.pt/application/conteudo/308714.

[155] Resolução do Conselho de Ministros no. 112/2012 - Aprova a Agenda Portugal Digital. Diário da República no. 252/2012, I Series, 2012-12-31, available at: https://dre.pt/application/conteudo/189514.

[156] Resolução do Conselho de Ministros no. 22/2015 - Procede à primeira alteração à Resolução do Conselho de Ministros n.º 112/2012, de 31 de dezembro, que aprovou a Agenda Portugal Digital. Diário da República no. 74/2015, I Serie, 16-04-2015, available at:https://dre.pt/application/conteudo/66997036.

[157] Information on the CPED and its activity is available at: https://www.fct.pt/dsi/competenciasdigitais/cped/index.phtml.pt [accessed on 7 May 2020]

[158] CPED, FCT. Estratégia e Plano de Ação para a Empregabilidade Digital 2015-2020, (Lisbon: CPED and FCT, 2015), 4-6, available at: https://www.fct.pt/dsi/docs/EstrategiaPlanoAcaoEmpregabilidadeDigital_v0.1.pdf, [accessed on 7 May 2020]

was "the first public consistent document on digital literacy" in Portugal[159]. It highlighted how age, schooling and socioeconomic profile were relevant structural factors to understand the digital divide in the country and set forth political measures to overcome generational, educational and socioeconomic gaps, having the elderly, as well as low-educated and/or low-qualified adults as target groups[160].

In 2017, the IN.CoDe.2030 programme was established. This ambitious initiative was devised as an integrated national public policy aimed at fostering the digital skills of the Portuguese[161]. Built upon five axes – inclusion, education, qualification, specialisation and research – the IN.CoDe.2030 programme, among other objectives, envisioned not only the generalisation of basic digital literacy skills in the country, but also to foster the employability, professional training and specialisation in ICT and digital applications of young people and the working population[162].

Finally, in April 2020, as the Agenda Portugal Digital reached its close, the Action Plan for Digital Transition was issued. This policy instrument is structured around three pillars: 1) the digital capacity building and digital inclusion of the Portuguese population, focusing on the development of digital education, professional training and reskilling, and digital inclusion and literacy; 2) the digital transformation of Portuguese companies aimed at fostering digital entrepreneurship and attracting foreign investment, digitising SMEs, and promoting scientific and technical knowledge transfers to the Portuguese economy; and 3) the development of e-government services in both central and regional administrations to enhance its agility, openness and connectivity to citizens.

Policy responses to foster digital entrepreneurship in Portugal

Policy responses to foster digital entrepreneurship in Portugal are not disentangled from those that aim to promote entrepreneurship at large and to enhance the digital skills of the workforce. Hence, this section addresses the national programmes Industry 4.0 and StartUp Portugal.

In 2017, the first phase of the programme Industry 4.0 was launched. Aiming to foster the digital economy in Portugal, this programme's three goals included: 1) hastening Portuguese companies' adoption of the fourth industrial revolution's concepts and technologies; 2) promoting the creation and international visibility of Portuguese technology-based companies; and 3) making the country an attractive destination for foreign investment in the 4.0 context. These objectives corresponded to seven strategic axes: 1) human capacity building through training and reskilling; 2) technological cooperation; 3) Industry 4.0 start-up creation; 4) Industry 4.0 start-up funding; 5) Industry 4.0 start-up support to investment; 6) Industry 4.0 start-up

[159] Brites, M. And Jorge, A. (2017). Digital literacy and education: Report by country: Portugal, Centro de Estudos de Comunicação e Sociedade, Instituto de Ciências Sociais, Universidade do Minho, available at: http://hdl.handle.net/1822/47125, [accessed on 22 November 2019]

[160] FCT (2015). Estratégia Nacional para a Inclusão e Literacia Digitais (2015-2020), Lisbon: FCT, available at: https://www.ticsociedade.pt/enild, [accessed on 22 November 2019]

[161] Resolução do Conselho de Ministros n.º 30/2020 - Aprova o Plano de Ação para a Transição Digital. Diário da República, I Series, no. 78, 21-04-2020, available at: https://dre.pt/application/conteudo/132133788, [accessed on 8 May 2020]

[162] Information on the IN.CoDe.2030 programme is available at: https://www.incode2030.gov.pt/incode2030 [accessed on 7 May 2020]

internationalisation; and 7) legal and normative adjustments. Therefore, along with initiatives targeting the development of digital competencies, the first phase of Industry 4.0 aimed at the adaptation of VET training programmes to match labour market demand regarding the competencies required by the digital transition of the economy and the reskilling of the workforce, especially for young people, by providing them with training in ICT.

The second phase of Industry 4.0 started in 2019 and had three main axes: 1) Generalise 4.0 – to encourage the sharing of knowledge, experiences and benefits to promote a massive transition to the fourth industrial revolution; 2) Capacity Building 4.0 – to equalize the workforce's knowledge, expertise and training to facilitate the transition to Industry 4.0, ensuring that this process is inclusive and based upon skilled employment; 3) Assimilation 4.0 – to promote, facilitate and fund Portuguese companies' access to and contact with Technology 4.0, as well as to provide financial assistance in scale-up and 4.0 transition processes, especially among SMEs[163].

Closely related to with the Industry 4.0 initiative, the Portuguese national strategy for entrepreneurship, known as StartUp Portugal, was announced in 2016. Having three fundamental action axes – ecosystem, funding and internationalisation – StartUp Portugal aimed to promote innovation and the modernisation of the country's economic fabric by supporting and strengthening the role of technological start-ups. Its goals are to reinforce the entrepreneurship ecosystem and the funding capacity of technology-based companies, to promote the competitiveness and international visibility of the Portuguese economy, to attract national and foreign investment to the technological sector, to renew the economic fabric and to create qualified employment positions[164]. In 2018, the programme StartUp Portugal + was established. The strategy set out in its first edition was then updated with 20 new measures aimed to enhance entrepreneurship, which included training for entrepreneurs[165].

III.4.2 Initiatives re digital-entrepreneurship skills

Overview of specific initiatives on national, regional, sectoral and corporate levels

In Portugal, initiatives to foster digital skills and digital entrepreneurship are varied and highly interconnected. Hence, in this section it is feasible to mention only a few initiatives, which were selected bearing in mind the DEEP project goals and target groups.

The Campaign eSkills for Jobs (2014-2016)

[163] For information on the Indústria 4.0 programme see: https://www.iapmei.pt/Paginas/Industria-4-0.aspx [accessed on 8 May 2020]

[164] Information on the programme StartUp Portugal is available at: https://www.iapmei.pt/PRODUTOS-E-SERVICOS/Empreendedorismo-Inovacao/Empreendedorismo-(1)/Startup-Portugal.aspx and https://startupportugal.com/ [both accessed on 8 May 2020].

[165] July 2018, Ministério da Economia, Estratégia Nacional para o Empreendedorismo - 2 anos de StartUP Portugal [retrieved from: https://www.iapmei.pt/getattachment/PRODUTOS-E-SERVICOS/Empreendedorismo-Inovacao/Empreendedorismo-(1)/Startup-Portugal/Startup-Portugal.PDF.aspx, 5 May 2020].

Despite being an initiative of the European Commission, it is worth mentioning Portugal's participation in the Campaign eSkills for Jobs 2014-2016. Targeting the youth and young adults as well as unemployed adults, the campaign aimed to raise awareness on the potential of ICT for employability. This initiative included several training events aimed to improve digital skills[166].

Norte Digital

Ongoing since 2017, the project Norte Digital is sponsored by ACEPI[167] and co-financed by NORTH 2020. Norte Digital aims to help the SMEs based in the north of the country to benefit from the potential of the digital economy. It supports SMEs in the process of building a digital strategy, assisting them to facilitate the creation of the necessary conditions to strive in the global market[168]. Its action axes are as follows: to increase the number of SMEs in the digital economy; to enhance access to new markets and the creation of new products and services; to qualify and prepare up to 50 SMEs to enter the international market; to create three cabinets to support SMEs in the digital transition process; to harmonise the promotion and improvement of intersectoral synergies; to empower new companies that think "outside the box"; to facilitate and promote synergies between SMEs in accordance with digital trends; to contribute to reinforcing the achievement indicators of SMEs; and, finally, to strengthen skilled employment by promoting the interconnection between the training offer and market needs, namely in terms of digital skills and ICT expertise[169].

IEFP

In 2014, the Portuguese national agency for employment and VET (IEFP) signed a cooperation agreement with CESAE (Business Services and Support Centre) to enact a programme to boost digital employment through the implementation of training actions in emerging areas of ICT. It targeted the short- and long-term unemployed with qualification levels 4, 5 and 6 or with lower employability potential. The following training courses were developed: Web Developer & Mobile; Management Systems and Management IT Apps; Digital Marketing; and Visual Arts and Computer Graphics. To date, more than 200 professional certificates have been awarded. Since 2016, to meet the objectives set out in INCoDe.2030, the IEFP has defined minimum percentages of ICT training actions for its VET centres. Thus, for audio-visual and media production, computer sciences and electronics, and automation, the following percentages were established for reference: learning courses 20%; adult education and training courses 20%; active life (level 4) 30%. Moreover, aiming to reskill graduates by providing them with training in ICT, in 2018, the

[166] More information on the Campaign eSkills for jobs 2014-2016 is available at: http://eskills.fct.pt/category/formacao/ [accessed on May 8, 2020]

[167] ACEPI is the acronym for Associação da Economia Digital (Digital Economy Association), a non-profit organisation, created in 2000, to debate, enhance, promote and generalise the digital economy in Portugal. For more information see the official website of ACEPI: https://www.acepi.pt/

[168] The official website of this project is available at: https://www.nortedigital.pt/ [accessed on 8 May 2020]

[169] Zertive Consulting, Estudo de análise de requisitos, levantamento de necessidades de qualificação, visão e enquadramento sectorial de PME na região Norte, (ACEPI, 2019), 11-19. [retrieved from: https://www.nortedigital.pt/media/1285/estudo-an%C3%A1lise-de-requisitos-e-levantamento-de-necessidades-das-pme-regi%C3%A3o-norte.pdf, 8 May 2020]

IEFP signed a cooperation agreement with CCISP (Coordinating Committee of Polytechnic Institutes) to establish a training programme. This training, provided by polytechnic institutes to unemployed graduates and long-term unemployed adults, aims to provide them with digital skills to boost their entry into the job market or support the resumption of their professional activity. The programme, funded by the IEFP, at its inception was expected to cover about 1,500 trainees from across the country; however, no data is currently available to assess its implementation[170].

APDSI

The Association for the Promotion and Development of the Information Society (Associação para a Promoção e Desenvolvimento da Sociedade da Informação [APDSI]) was founded in 2001 and became a non-governmental organisation in 2009. Being a civil society initiative, the APDSI is a think tank whose mission is twofold: to create an independent platform to reflect on and discuss the development of the information society in Portugal and to foster the progress of an inclusive and safe information society to leverage the country's socioeconomic development. In the last decade, the APDSI has contributed to policy making through its studies and recommendations and has created space for collaboration and debate among its associates, partners, experts and policy makers. The APDSI is structured around ten key areas: citizenship and social innovation; the future of information society; digital intelligence; health; digital public services; skills, qualification and employability; ICT governance; digital policy and governance; safety; and territory. Alongside numerous conferences and other public events, several initiatives have been established by APDSI, and it is important to highlight the following here: the National Computer Olympics, a programming competition that targets students from basic and secondary schools; the Programme Ideation, which aims to foster knowledge transfer processes from the academic world to the business sector with the view to solve tangible problems; and the digital transformation award, which acknowledges the best initiatives of digital transformation. Finally, among its several working groups are the Digital Business and Entrepreneurship Group and the Digital Skills, Qualification and Employability Group, which deal with the complexities of and potential surrounding the digital revolution in the business and education sectors[171].

AdC

The AdC (Academia de Código/Coding Academy) was established in January 2015. The IEFP, being the public sector partner for this initiative, signed a protocol with the AdC to implement coding Bootcamps, which consist of an intensive 14-week programme aimed at reskilling unemployed young people, giving them technical training in computer programming. This vocational training programme on ICT is built upon the study of labour market needs and targets the NEET (Not in Education, Employment, or Training), aiming to overcome two pressing problems in Portugal – youth unemployment and the scarcity of ICT expertise in the labour market. Testifying to the

[170] 12 December 2018, Governo de Portugal. Relatório de progresso. Resumo das atividades em curso e programadas no âmbito da iniciativa INCODE.2030 [retrieved from: https://www.incode2030.gov.pt/sites/default/files/incode.2030_relatorio_de_progresso_12122018.pdf, 8 May 2020]

[171] More information on APDSI is available at: http://apdsi.pt/ [accessed on 8 May 2020].

AdC's success, this organisation has already reached the 44th edition of its coding Bootcamp, and 90% of its participants were recruited by companies within two months after completion of the programme[172]. Also in 2015, AdC began offering computer science classes for elementary school students via a pilot project in three Portuguese schools. By 2016, in the Municipality of Fundão, all children from the first to sixth year of schooling had attended classes in computer science, which had been made compulsory. From that year onwards, there were multiple requests from around the world, which led to the creation of the well-recognised ubbu – code literacy platform. Ubbu offers a turnkey curriculum for schools and a 25-hour online training programme for teachers. Once experienced, any teacher of any discipline can teach programming. The platform offers already prepared lessons, including tips and exercises. In order to access the platform and be able to teach the discipline of computer science to students from the first to the sixth year of schooling, the school has to be registered in ubbu. In mid-2019, João Costa, the CEO of the start-up, revealed that because of the ubbu platform, more than 60 thousand elementary school students had computer science classes in Portugal, and that ubbu was expecting to reach to reach at least 1 million children worldwide by the end of 2019 thanks to agreements already in place which made the platform available in other countries such as South Africa, Brazil, Cape Verde, Colombia, the United States, Spain, the Netherlands and Norway.[173]

Startup Lisboa

Startup Lisboa is private non-profit association whose mission is to support entrepreneurs and companies in their first years of activity. Being a business incubator established in 2012, Startup Lisboa equally aims to promote job creation and encourage development of the urban, social and economic visibility of Lisbon. Acting as facilitator, Startup Lisboa enables contact between entrepreneurs and investors, mentors and strategic partners, as well as potential customers. Since 2012, Startup Lisboa has analysed 4,500 applications and offered support to 400 projects and entrepreneurs from more than 40 countries. It also includes to the creation of 3,500 jobs and to the investment of EUR 150 million. To foster the ecosystem, Startup Lisboa created two workspaces and one residence for entrepreneurs – Casa Startup Lisboa (House Startup Lisbon). Furthermore, Startup Lisboa has launched its soft-landing programme, a three-day event for foreign entrepreneurs, investors or companies that want to set up their business in Lisbon, offering workshops and contact both with key partners and the cosmopolitan entrepreneurship ecosystem of the country. It is worth mentioning that Startup Lisboa has already been distinguished with several awards: the European Enterprise Promotion Award 2013 by the European Commission; the People's Choice Award for Best Accelerator or Incubators in Europe

[172] For more information on the AdC see: https://www.academiadecodigo.org/. Further details on AdC are presented and discussed in the following academic work: Pereira, E. (2017). "Social Impact Bond Feasibility Study. Youth Employability: Academia de Código", MA Diss., NOVA – School of Business and Economics [retrieved from: https://run.unl.pt/bitstream/10362/22191/1/Pereira_2017.pdf, on 8 May 2020].

[173] "Ubbu reaches the 60 thousand primary students in Portugal," Educação Internacional, no. 10, 14 June 2019, 6 [retrieved from: https://leitor.jornaleconomico.pt/download?token=eb99aa6a8a5ea8fb8365ea7493df7770&file=Especial_14062019.PDF, on 12 May 2020]

by the London Web Summit; and the prize of Partner of the year 2013, granted by Portugal Ventures[174].

III.5 Spain

III.5.1 National policies towards skills for the future

In 2015, the Ministry of Education approved an Order[175] transposing into the country's legal system the classification of competencies described in the EU's Recommendation on key competences for lifelong learning.

The regulatory framework of the education system has been modified to meet the training objectives of the European Digital Agenda. To accompany this process, the National Institute of Educational Technologies and Teacher Training (INTEF) was created with the aim of integrating ICT and teacher training into non-university educational stages. The Institute's main functions are teacher training and the development of educational resources for the application of ICT in the classroom.

The Spanish education law LOMCE[176] includes EU guidelines that insist on the need for citizens to acquire key competences as an indispensable condition to achieve full personal, social and professional development, following the demands of a globalised world and to make economic development linked to knowledge possible.

Given that competency-based learning is characterised by its transversality, its dynamism and its comprehensive nature, a competency-based teaching-learning process must be approached from all areas of knowledge and by the various bodies that make up the educational community, in both formal and informal settings. Its dynamism is reflected in the fact that competencies are not acquired at one time and then remain unaltered, but rather imply a process of development through which individuals acquire higher levels of performance in their use.

Moreover, this learning includes an integral formation of the people who, at the end of the academic stage, must be capable of transferring the knowledge acquired to the new instances that appear in the life option they choose. Thus, they will be able to reorganise their thinking and acquire new knowledge, improve their actions and discover new forms of action and new skills that allow them to efficiently execute tasks, facilitating lifelong learning.

[174] For more information on *Startup Lisboa,* see: https://www.startuplisboa.com/ [accessed on 8 May 2020]
[175] Spanish Government, "Order ECD/65/2015 describing the relationship between competencies, content and evaluation criteria for primary education, compulsory secondary education and the baccalaureate". 29 January 2015 https://www.boe.es/buscar/doc.php?id=BOE-A-2015-738
[176] https://www.boe.es/buscar/pdf/2013/BOE-A-2013-12886-consolidado.pdf.

Figure 22. Key competencies in the Spanish educational system.

Digital competence:

- Knowledge: Rights and risks in the digital world, main computer applications, specific language: textual, numeric, iconic, visual, graphic and sound, information sources.

- Know-how: Using technological resources for communication and problem solving, searching, obtaining and processing information, using and processing information critically and systematically, and creating content.

- Know how to be: To have an active, critical and realistic attitude towards technologies and technological means, to value the strengths and weaknesses of technological means, to have curiosity and motivation for learning and improving the use of technologies, and to respect ethical principles in their use.

Sense of initiative and entrepreneurial spirit:

- Knowledge: Understanding of the functioning of societies, trade unions and business organisations. Design and implementation of a plan. Knowledge of existing opportunities for personal, professional and commercial activities.

- Know-how: Capacity for analysis, planning, organisation and management. Ability to adapt to change and problem-solving. Knowing how to communicate, present and negotiate.

- Knowing how to be: Acting in a creative and imaginative way. Have self-knowledge and self-esteem. To have initiative, proactive interest and innovation in private, social and professional life.

The post-LOMCE curriculum is structured around the key competences established by the EU, which include digital competences. ICT content is dealt with at all stages and is compulsory in primary education and optional from the first year of secondary education and high school.

Regarding vocational training, the curriculum is different. It focuses on the specific knowledge of the chosen professional branch and incorporates core blocks. It also deals with entrepreneurship and certain business skills but leaves digital competences aside.

Vocational training in the Spanish educational system

To analyse professional training in Spain, we conducted an analysis of the curricula of nine training cycles (three basic vocational trainings, three intermediate and three advanced), where we look for content that coincides with or can be assimilated to the digital competences collected in DigComp, as well as content related to entrepreneurial skills.

First, it is necessary to indicate that, as the regulations state: "Vocational training centres shall have the necessary pedagogical, organisational and economic management autonomy for the development of teaching and its adaptation to the specific characteristics of the socio-economic, cultural and professional environment."[177] Vocational training centres have some autonomy to adapt the curriculum or to introduce non-reflected teaching, so efforts are being made in some centres to introduce digital competencies into the framework of academic training.

In conclusion, we can say that training in digital skills has been scarce and uneven, and in most cases related to the specific tasks of the profession to be developed in the future and not considered in a global or integrated way. The areas of digital content creation, security and technical problem-solving are barely present.

Professional training in Spain is dedicated to notion of self-employment and entrepreneurship as a highly valued employment alternative, as can be seen in the contents of the module training and labour guidance "Valuation of self-employment as an alternative for professional insertion". However, the module "Company and Entrepreneurship", seems to forget, or only timidly approach, the digital competencies that have proved to be an essential complement for professional and business success in any sector.

[177] Royal Decree 1147/2011, of July 29, which establishes the general organization of professional training in the educational system, available at: https://www.boe.es/buscar/pdf/2011/BOE-A-2011-13118-consolidado.pdf.

At present, it seems that the trend is beginning to change.

In 2018, the Ministry of Education and Vocational Training proposed the inclusion of a set of specific modules in all VET programmes at all levels (basic, intermediate and high). The modules were set to support the acquisition of skills and competencies in Industry 4.0, big data, communication networks 5.0, and other ICT-related areas. The Ministry's aim was to create new VET programmes or modify existing ones that will satisfy the needs of the new digital sectors.
Spain also implemented a new project called the School of Computational Thinking[178]. Its aim was to help teachers throughout Spain to incorporate computational thinking into their daily practice through programming and robotics. Around 800 teachers and 20 thousand students from primary, middle and high school participated during 2018-2019.

Other relevant policies

In October 2018, Spain also created and published the conclusions of the working group on programming, robotics and computational thinking in the classroom[179]. This group consisted of 14 Autonomous Communities, which collaborated with universities, pioneering companies and civil society entities to develop an idea on the teaching of these skills.

The Regional Government of Extremadura pays special attention to training in new technologies and digital skills, offering grants for e-commerce projects to companies in the region, carrying out important online training programmes in digital tools and with other measures such as the awarding of the Good ICT Practice seal.

III.4.2 Initiatives re digital-entrepreneurship skills

Overview of specific initiatives on national, regional, sectoral and corporate levels

Innovation, digitalisation and competitiveness[180]

Through this initiative, the Spanish Chamber of Commerce aims to support companies that want to innovate and improve their competitive position in the market.
To this end, they provide entrepreneurs with a series of value-added services.

An online platform allows the assessment of the digital competences of citizens

[178] Ministry of Education and Vocational Training (2018). "School of Computational Thinking and Artificial Intelligence" https://intef.es/tecnologia-educativa/pensamiento-computacional/
[179] Ministry of Education and Vocational Training (2018). "Report on Programming, Robotics and Computer Thinking in the Classroom. Situation in Spain" http://educalab.es/-/informe-sobre-programacion-robotica-y-pensamiento-computacional-en-el-aula-situacion-en-espana
[180] Spanish Chamber of Commerce (2019). "Innovation, digitization and competitiveness" https://www.camara.es/innovacion-y-competitividad

The Ministry of Economy, Knowledge, Business and University of the Andalusian government allows entrepreneurs to self-diagnose their digital competences through an online tool[181].

Free digital skills training for entrepreneurs

The State Foundation for Training in Employment FUNDAE has a programme of free courses in digital skills[182] with training plans and training resources developed by large technology companies.

These companies have free training resources in digital competences on their web pages and the Foundation is aware of the usefulness of making these courses accessible to all workers, so it has reached an agreement for access to and dissemination of these training resources in digital competences.

Go for it: Boost programme for entrepreneurs[183]

This programme was created, as a promotional with the aim to support entrepreneurs and SMEs, carried out by senior managers and business leaders in the field of ICT. If one's business project was successful, the company was receiving business advice from three advisors belonging to prestigious companies (e.g. Facebook, BQ, Atresmedia, HP, Microsoft and IBM, among others). Thanks to the connections that the programme was able to make between advisors and entrepreneurs/SMEs, its beneficiaries were able to identify opportunities for their business and expand their network of contacts, partners and potential customers to ensure the development of their activity.

Digital Skills Awards Spain 2020

The Digital Skills Awards Spain 2020[184] identify, value and recognise the best projects and experiences in the field of developing digital skills enabling talent for society, professionals, education, women and girls, in inclusion and professional training.

The Connected Industry 4.0 of IVECO [185]

The first edition of this award recognises the merits of companies that stand out for their digitalisation projects.

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[181] Junta de Andalucia (2019). "Self-diagnosis platform for digital skills" http://www.digcomp.andaluciaesdigital.es/
[182] State Foundation for Employment Training "Free digital skills training" 2019 https://www.fundae.es/digitalizate.
[183] School of Industrial Organization – Orange "Go for it: Boost program for entrepreneurs" 2020 https://sedigitalylanzate.es/lanzate/.
[184] Ametic (2020). "Digital Skills Awards Spain 2020" http://ametic.es/es/evento/alianza-talento3/digitalskillsawards2020
[185] Iveco "IVECO wins the Connected Industry 4.0 award from the Ministry of Industry, Trade and Tourism" 14 November 2019 https://www.iveco.com/spain/sala-de-prensa/noticias/pages/iveco-se-alza-con-el-galard%C3%B3n-de-industria-conectada-4-0_ministerio-de-industria-comercio-y-turismo.aspx

IVECO receives the National Connected Industry 4.0 Award for Large Industrial Companies, granted by the Ministry of Industry, Trade and Tourism, which recognises those production plants that stand out for their commitment to an innovative and connected transformation of industry, such as the IVECO plant in Valladolid.

IV. Conclusions and policy recommendations

While the EU's tools lead in establishing an inclusive and comprehensive framework for skills development, Member States are at the forefront of the conceptualisation and implementation of the relevant policy initiatives. At the same time, the EU is accountable for a large number of EU-wide initiatives which provide direct support to digital and entrepreneurial skills acquisition. Further, national initiatives were assumed to benefit significantly from the established EU-wide network of stakeholders from both the demand and supply side of skills formation and use, as well as the available structural and tailored financial support provided for by the EU funds in place. Despite this, some obstacles to the effective implementation of the policies are observed.

In *Bulgaria* in general, the policy response of the Bulgarian state in relation to digital and entrepreneurial skills is adequate because the national legislation concerns both competences. The country has implemented different policy tools such as strategies, action plans and concepts to successfully embed the innovative competences. The initiatives and good practices prove that both Bulgarian society and the state are not indifferent when digital and entrepreneurial skills are concerned. Nevertheless, educational systems are not adapted in a way to meet the demands of the market by supplying it with a qualified workforce. The conservative educational system in Bulgaria still treats digital and entrepreneurial skills separately, leaving room for improvement.

In *Italy*, on the other hand, the biggest threats the digitalised renewal of Italian SMEs face are the low interest of SMEs to invest in ICT, despite what is shown by global statistics, and the insufficient reach of micro-enterprises and small companies. In addition, the cultural attachment to traditional models is so deep-rooted that the digital transformation of the country might take much longer and require more "social" efforts than expected considering that more than a quarter of Italian SMEs are based in the southern part of the country[186], which is a rural territory that severely lacks primary and "basic" infrastructure and services. In addition, the resilience of the Italian economic and entrepreneurial ecosystem depends on reliable, smart and inclusive education and a training plan centred on digital entrepreneurship widespread across all formal/non-formal VET settings.

In *Poland*, digitisation and the development of digital skills – in various areas of human life, not only in relation to entrepreneurship – are still understood quite narrowly by Polish policy makers. Investments in digitisation and digital skills are often reduced to the development of infrastructure and the provision of the necessary hardware and software. Skills and competence building are often an end in itself – the functional, relational approach that would show what a given competence is useful for, how it may make life and work easier and lead to greater self-fulfilment, is still too rare. As a result, people do not feel that it is beneficial to build their digital competences and use digital tools.

[186] Number of small and medium-sized enterprises SMEs in Italy in 2017, by macro-region, available at: https://www.statista.com/statistics/892319/distribution-of-smes-in-italy/.

This also applies to entrepreneurs, who are still not willing to use even simple software to facilitate the circulation of documents or issue invoices, among others. The specificity of the Polish enterprise sector is also of importance here as it is dominated by micro-enterprises which employ a significant part of the workforce and which relatively rarely invest in the development of employees' skills. Most of the companies such as this do not have departments responsible for the development of human resources and training and it is difficult for them to spend time during working hours on training outside the company.

The governmental policies in *Portugal* have been rightly directed to both digital competences and entrepreneurship, aiming to anchor the modernisation of the economy and to enhance its ability to compete on a global scale, having as an outcome the development of an ecosystem that has proven beneficial to digital entrepreneurship. Thanks to this, Portugal has become a key technological start-up centre in Europe. Despite unfavourable conditions and the country's several structural blockages, digital and entrepreneurial skills are strongly interconnected in the country's policies and initiatives. Nevertheless, secondary education and vocational training curricula scarcely address entrepreneurship and there is a room to develop methodologies and programmes with positive effects in terms of the development of entrepreneurial competences.

In *Spain* the regulatory framework of the educational system was modified in 2015 in line with the EU's recommendations on key competences for lifelong learning. Furthermore, many projects and initiatives supporting digital entrepreneurship skills have been implemented at the national and regional level. Spain has good telecommunications and technology infrastructure, but there is ample room for improvement in the digitalisation process of companies that have the means but still lack trained professionals and a digital culture.

A high degree of skills mismatches in companies limits their capacity to innovate and capitalise from innovation. The current situation regarding digital competences in Spain is seen as not only the responsibility and consequence of the educational system, but also of the companies, which should adapt their business models and introduce the upskilling of their employees.

Another indicator that shows the need for Spain to make more progress in its degree of digitalisation, and specifically in its business fabric, is the percentage of companies that employ ICT specialists, which is lower than the EU average. However, this average figure masks important differences between regions, with a range of variation from a maximum of around 23% in Madrid and Catalonia to a minimum of 10% in Castile-La Mancha. It is precisely the regions with companies that employ the most ICT specialists (which have the highest proportion of companies providing ICT training to their employees) that lead the productivity and well-being ranking (GDP per inhabitant).

Policy responses to the challenges related to digital entrepreneurship should be undertaken on multiple levels and addressed to a number of different stakeholders. On the basis of the lessons learned from all five countries, and by taking into considerations the various constraints of the

countries studied, we present a list of broad recommendations, the implementation of which should support the process becoming more inclusive:

From the implementation perspective:

- Operate in an environment of technological neutrality;
- Implement horizontal actions rather than those that are vertical or sectorial;
- Focus on enabling factors (investments in innovation, broadband infrastructure, skills);
- Steer existing instruments to promote technological leaps and productivity;
- Coordinate key stakeholders without acting as a controller or intervening in the decision-making process;
- Incentivise universities to include knowledge exchange and collaboration in their long-term vision, both for teaching and for research activities. Non-academic stakeholders, national public authorities, regional and local governments, and research entities, among others, should all contribute to the definition of this long-term vision concerning the role of formal and non-formal VET facilities for digital entrepreneurship;
- Support and value cultural discussion, knowledge exchange and collaboration activities as something greatly enriching for faculty members and students;
- Mainstream a student-centred teaching paradigm. Involve students, at all levels, in collaborations with external stakeholders;
- Improve connections between the public and private sectors;
- Improve the relationships between businesses and schools.

From the communication perspective:

- Disseminate the knowledge and expertise related to the benefits emerging from I4.0 investments;
- Identify and capture technology needs and challenges;
- Support the financial empowerment of technology transfer centres;
- Provide financial assistance for the implementation of industrial research projects;
- Stimulate external engagement in the governance, management and monitoring of digital entrepreneurship initiatives;
- Support cooperative paths and knowledge exchange initiatives between higher education institutions and the entrepreneurial ecosystem – something that, to date, has been possible only thanks to the private will of individuals;
- Policy makers on different levels of governance should better communicate the benefits of using ICT in business and daily life.

From the policy perspective:

- Support the full availability and efficiency of ICT infrastructure;
- Allocate national funds and economic resources to encourage and incentivise the digital renovation of companies;
- Strengthen entrepreneurship education throughout the educational system, including in VET and higher education, and ensure it is linked with digital empowerment and the development of ICT skills.