DIGITAL ENTREPRENEURSHIP DYNAMICS IN THE IDEA COUNTRIES

Common trends, good practices and tools in digital entrepreneurship skills development

Prepared by: IDEA consortium

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Executive summary

About the IDEA project

The IDEA – Inspiring Digital Entrepreneurship and Awareness in HE is an Erasmus+ Strategic Partnership project. It is being delivered by nine partners from seven European countries. The IDEA consortium brings together partners with different backgrounds such as business/ICT field, higher education institutions and NGOs and social partners. By pooling their knowledge and talent these partners have designed a project that addresses the gaps and mismatches in the areas of digital and entrepreneurial skills of European students. The project boosts the effectiveness of higher education (HE) curricula and magnifies HE students' chances of success by combining training targeted to above two sets of skills.

The IDEA provides response to the specific needs of European youth in the age of digital economy. Through its activities and outputs IDEA develops an innovative approach of one of the most important factors behind the entrepreneurial success: the use of digital skills applied to entrepreneurship. One of the first crucial traits of successful entrepreneurs is the ability to keep up with the latest social, technological and economic trends. By developing tailored training programme and deploying a full scale multilingual open education resource (OER) platform IDEA will widen its results across the entire European Union's educational space. In this way, IDEA contributes to the ability of European member states to exploit the transformative power of the digital economy in combat against socio-economic lagging and youth unemployment.

This composite report is based on results from a comprehensive mapping and stock taking of digital entrepreneurship dynamics in the countries involved (Croatia, Italy, Romania, Slovakia, Poland, Spain and Belgium), identification of common trends in digital skills application to entrepreneurship, issues, best practices and tools, and consequent extrapolation of "what works" and "what does not work" elements in digital entrepreneurship in HE environment. The mapping and stock taking had been executed by IDEA project partners in their respective countries, as well as at an EU level. Based on this effort, IDEA partners proposed a set of success and failure factors together with recommendations targeted at digital entrepreneurship dynamics in higher education (HE) context and beyond.

The results of mapping and stock taking of digital entrepreneurship dynamics serve not only as guidelines for formulation of European educational policies in the field of digital skills. Their practical value reflects itself also in their role of pillars for development of IDEA training programmes. These results will be deployed throughout the Europe via its OER platform destined to become a knowledge hub and an open education focal point. IDEA will rise awareness among HE institutions and education authorities about the potential of digital and entrepreneurship skills and their role as business success factors. Through all these activities IDEA will improve professional success chances of HE students with different backgrounds.

Digital entrepreneurship in the European Union

Digital entrepreneurship has been viewed as a critical pillar for economic growth, job creation, and innovation by many countries including the Member States of the European Union. European Commission (2015) defines digital entrepreneurship as creating new ventures or transforming existing businesses by developing novel digital technologies and/or novel usage of such technologies. Digitalization is a very up to date topic and only very traditional businesses have not been affected yet. While it presents enormous opportunities, it is a source of major risks at the same time, therefore researchers and academics pay it increased attention.

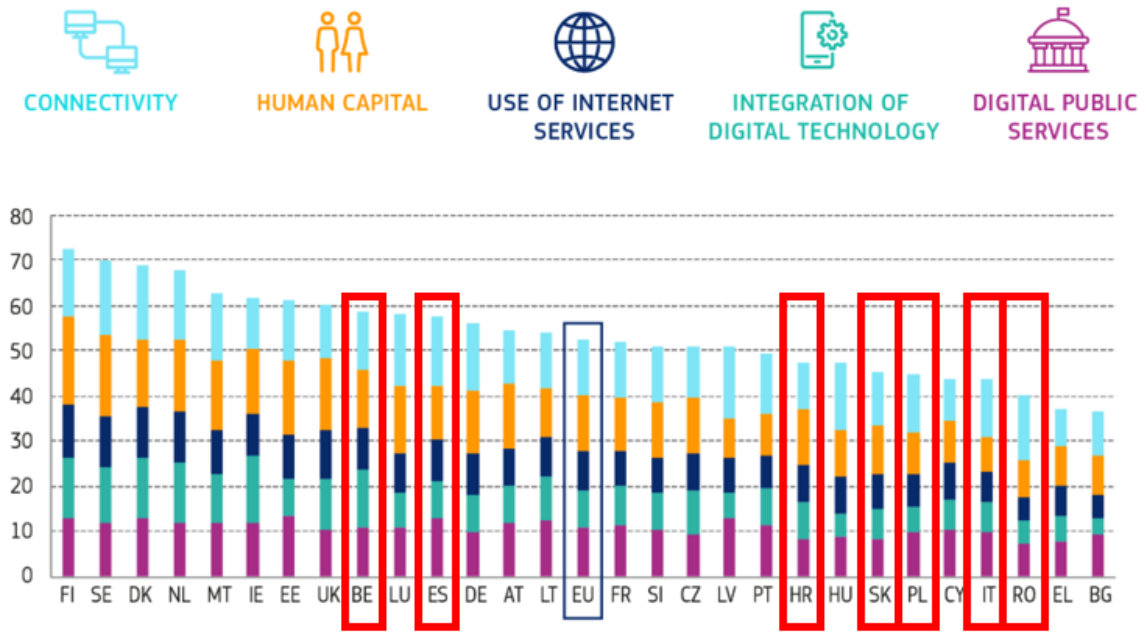
The literature on digital entrepreneurship has grown significantly in the last decade, however minimal research has addressed this topic which can be even more applied to digital entrepreneurship education. Research in the area of digital entrepreneurship has been mainly focused on digital business models as digitalization presents many opportunities to modify them, digital entrepreneurship process as necessary steps to be taken to succeed, platform strategies which are important tools enabling businesses to grow, a digital ecosystem which represents enabling environment and processes involving stakeholders, social digital entrepreneurship as a tool to engage low-income people into entrepreneurship, and digital education.

Digital entrepreneurship education has been underdeveloped and there are significant research gaps. While research in entrepreneurship education is quite abundant, describing different methodologies, tools, and concepts, that still has to be done in the specific field of digital entrepreneurship education. So far, most studies focus on boosting digital entrepreneurship intentions among university and secondary education students and their attitudes towards digital entrepreneurship, identifying key digital entrepreneurship competencies and skill-sets to start a digital venture among students or existing digital

entrepreneurs, and enhancing students´ knowledge whether it is about starting a digital venture or ICT such as using digital content, software, digital teaching, learning tools, etc.

Today in Europe, there is a shortage of more than 500,000 digital jobs and the demand for digital jobs is overtaking supply. Furthermore, new digital jobs are increasing at an average of around 4% a year. Unemployment rates are at an all-time high, yet industries are unable to find the appropriately skilled people to fill their digital needs. A huge gap between the demand for digital skills and the actual skills of European citizens exists primarily due to low competences levels, since connectivity and access to basic ICT infrastructure is widely available in Europe. The 2020 DESI Ranking[1] in Figure 1 shows substantial differences in human capital across EU member states which consists of basic and advanced digital skills. Eurostat, for example, notes that the share of people with at least basic digital skills ranges from 29 % in Bulgaria and Romania to 85 % in Luxembourg and 79 % in the Netherlands.

Figure 1. DESI 2020 Ranking



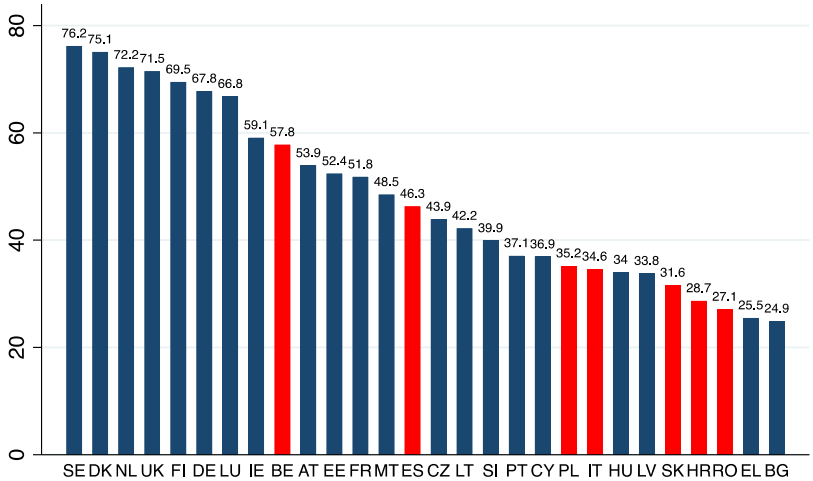
The European Commission's work programme for 2020 "A Union that strives for more"[2], states that investment in digital skills will be essential to address a widening skills gap and changing work patterns, as well as to regain European mastery and ownership of key technologies. Coupled with improving digital literacy, this will be the driver of the updated Digital Education

[1] https://publications.jrc.ec.europa.eu/repository/bitstream/JRC112439/jrc112439_eides_report.pdf
[2] https://ec.europa.eu/info/sites/info/files/cwp-2020-publication_en.pdf

Action Plan[3]. Since 2018 the action aims to foster digital competences and open science skills in higher education with the objective to engage, inform and train higher education students, teachers, researchers and staff.[4] Furthermore, the EU scenario underlines how important are the openness and interactivity of the Internet that enable businesses to harness the co-creative potential of large, uncoordinated audiences for novel forms of value creation, which, combined with novel revenue models, enable businesses to fundamentally re-think how they deliver products and services.

Digital entrepreneurship has potential of reviving remote regions, advance gender equality on labour market and boost the overall socio-economic development. Yet, businesses - and SMEs in particular - often struggle with digital developments. Barriers to cross-border trade, regulatory and administrative burdens, insufficient access to finance and digital skills in the workforce. Removing intermediaries, matching employers with their future employees, providing online education, adapting the educational material, giving people their first physical address and their first bank account are just a few of the areas that digital entrepreneurs have to address. In European Union, the growth of digital enterprises takes uneven pace across countries as 2019 EIDES ranking shows (Figure 2)[5].

Figure 2: EIDES index ranking 2019



EIDES - European Index of Digital Entrepreneurship Systems
Note: IDEA consortium countries in red

[3] https://ec.europa.eu/education/education-in-the-eu/digital-education-action-plan_en
[4] https://ec.europa.eu/education/education-in-the-eu/european-education-area/digital-education-action-plan-action-5-open-science-skills_en
[5] https://publications.jrc.ec.europa.eu/repository/bitstream/JRC117495/jrc117495_eides_2019_final_with_identifiers.pdf

The report states that Sweden, Denmark, Netherlands, United Kingdom, Finland, Germany and Luxembourg lead as for their digitalised General and Systemic Framework Conditions for entrepreneurship. Behind at a notable distance according to the EIDES are the followers made of seven countries: Ireland, **Belgium**, Austria, Estonia, France, Malta and **Spain**. A third cluster is made of catchers-up: Czech Republic, Lithuania, Slovenia, Portugal, Cyprus and **Poland**. Finally, the laggards are the remaining eight countries: **Italy**, Hungary, Latvia, **Slovakia**, **Croatia**, **Romania**, Greece and Bulgaria[6]. It is striking that Italy, in spite being one of the G7 countries, ranks in this group together with former centrally planned economies and Greece.

In order to build digital entrepreneurship ecosystems, a number of measures are necessary. A common framework will require harmonisation at European level in terms of e-government. This will help to define a common platform that will enhance business and interconnection opportunities. This vision should also be replicated at the educational level, especially in universities. The new EU skills agenda[7] recognises the need to support cooperation among education, employment and industry stakeholders to improve the digital skills of the wider population, not just IT professionals. To achieve such objectives, lifelong and non-formal learning play a key role in teaching skills, including digital skills. The European Commission recognises that formal education is not the only player in teaching digital skills and that non-formal education providers can offer efficient and fast ways to acquire and upgrade digital skills.

To explore the drivers behind these processes the IDEA researchers focused their efforts in three interrelated areas: the mapping of state and digital entrepreneurship dynamics and policy initiatives at the EU level, the country level developments and the trends in higher education with respect to the digital entrepreneurship.

Policy, third sector and industry review at EU level

The phenomenon of digital transformation in Europe has fully affected all the Member States which over the past decade have defined a significant infrastructure and systemic adjustment for the reduction of the digital divide and the spread of digital literacy. Nevertheless, the level of development of digital skills and specific training courses on digital

[6] In bold, countries represented in the IDEA Project
[7] http://ec.europa.eu/social/main.jsp?catId=1223

entrepreneurship at Higher Education level still follows a worrying trend in EU. Currently there is no common framework of skills that can encourage the proliferation of courses of study geared to digital enterprise. To foster a digital-friendly culture, the EU should encourage its member states to integrate digital skills such as data science and computer science courses into their primary, secondary, and university curricula. The new European Commission's work programme for 2020, "A Union that strives for more" states that investment in digital skills will be essential to address a widening skills gap and changing work patterns, showing renewed interest in increasing digital skills as a basic condition for economic growth.

The reasons why these educational objectives have not yet been achieved in Europe are attributable to: lack of training in synergistic methods; keeping the freshness alive; finding suitable entrepreneurs to take part in HE programmes; finding the right space in academic timetable and curriculum. We have analysed EU sources as the European Index of Digital Entrepreneurship Systems (EIDES), the Digital Economy and Society Index (DESI) and others, with a specific focus on the Countries represented in the IDEA project starting from Digital Entrepreneurship and landing in the context of Higher Education. The snapshot that comes out in EU underlines a general fragmentation in the context of Digital Entrepreneurship and digital skills with high performances by the northern and Baltic countries (size of country doesn't matter) while the states of south-eastern Europe still remain below the European average.

It is universally accepted that digital transformation is happening. What remains uncertain is the way in which it will unfold and whit what effects. Digitalisation in education will continue to grow the coming years. The demand for digital and personalised content, tools and environments will only grow. Schools must adopt digitisation as part of their overall strategy in order to transform existing structures and processes, enforce digital change, and enable innovation and entrepreneurship. Nevertheless, only a few European member states have been able to cope with digital transformation and this is reflected in the lack at Higher Education level of shared initiatives which allow to educate, stimulate and incubate future digital enterprises. To foster a digital-friendly culture, the EU should encourage its member states to integrate digital skills such as data science and computer science courses into their primary, secondary, and university curricula.

Country-level contexts

The emergence of new trends in digital technologies and innovations has been accelerating at a record pace in recent years. The transition from an industrial society to an information society

and industry 4.0 is a revolutionary global change. This implies a whole set of challenges, together with many opportunities. While some IDEA countries already have a digital strategy in place, some other countries still report lack of a comprehensive and systemic strategic architecture promoted at national policy level.

If digital government strategies (whether comprehensive or fragmented) are in place, the priority focuses most often include: providing appropriate technical infrastructure and digital connectivity, digital transformation of businesses, equalizing the digital opportunities, developing and upgrading digital skills, building social infrastructure, implementation of e-government services for both citizens and business entities, sustainable and green investments. Most of IDEA partners report good digital connectivity with fixed broadband and 4G mobile coverage, while the ultrafast broadband coverage is not yet completely developed.

As for the e-government, IDEA partners report that governments in their countries initiated several digital services and portals that make public agenda easy and more efficient. However, still those online services provide mostly online information and to some extent offer interactive feedback. The arrival of technology has brought important changes to the market place, revolutionized the society and with it, the world of work. Practically in all IDEA countries, companies are looking for upper skilled digital profiles. In fact, upgrading digital skills and their application in businesses is a further important pillar in the development of digital entrepreneurship.

However, at the same time, all IDEA partners indicate that in their countries, the business sector is currently suffering from a major imbalance between supply and demand for digital professionals with sufficient digital skills. Despite the efforts in improving digital skills being present in all IDEA countries, the supply of ICT specialists and IT literacy lag behind the market needs. Further, IDEA partners often report gap between women and men in ICT engagement in their countries. Then, engagement in digital activities often varies considerably across age groups, which naturally corresponds to different levels of digital advancement and representation of computer skills.

One of the main reasons of the digital skills mismatch even in case of fresh graduates is that students do not receive specific practical training on digital skills during their educational career. Also, interest in STEM disciplines is often not sufficient to reflect the market needs. Some IDEA countries still report rather outdated educational systems that need transformation into solution-oriented ones, with a special focus on the development of analytical thinking.

Multiple voices across IDEA countries call for development of training programs oriented to the digital industry. High-level digital skills for ICT professionals are needed in all industry sectors, as they represent the key to boost the digital transformation of companies.

IDEA partners often indicate, that majority of R&D investments in ICT in their countries is done by large and medium-sized enterprises, whereas small and micro enterprises comprise only a small proportion of total R&D investment. Evidences from most of the IDEA countries show that various above-mentioned gaps are often addressed by initiatives of third sector and private sector representatives. Moreover, these are often more efficiently suited to the concept of digital entrepreneurship development within different target groups. However, they are often isolated and ineffectively supported by public policies.

Finally, IDEA partners did not come across a wide range of reports describing the situation of digital entrepreneurship in their countries. Thus, this finding justifies that the IDEA project as a whole, and this intellectual output in particular, fills this information gap and provides valuable results, which in turn can stimulate specific actions aimed at promoting digital entrepreneurship in IDEA countries and beyond.

Higher education context

All IDEA partners indicate that in their countries, HE institutions (HEIs) play an important role as academic centers in education, stimulation and incubation of digital entrepreneurship, as well as shaping entrepreneurial attitudes among the key part of society – students. All IDEA partners also argue that cooperation between the academic and research community and private sector is one of the priorities for development of digital entrepreneurship.

However, still, IDEA partners found evidence that not all HEIs are adequately equipped to educate and train on digital skills and IT competences, and that responsiveness of HEIs to the new business paradigms (among them also being the digitalization) is limited. IDEA partners identified a couple of study programs that are specifically designed for digital entrepreneurship, with an aim to develop relevant skills of future digital entrepreneurs. However, despite a couple of such good examples, access to digital skills and knowledge in most HEIs is offered through rather fragmented programs that focus only on certain elements of digital entrepreneurship. Interdisciplinary programs in digital entrepreneurship are generally lacking. Entrepreneurship and digitalization are often still treated separately, rather than being integrated. IDEA partners

also report that several HEIs developed student start-up incubators, either general or specifically focused on digital businesses.

As students studying IT and related fields are more likely to engage in digital entrepreneurial activity, universities and educators should include more entrepreneurship-related subjects and courses into their curricula. Role models play a significant role as far as entrepreneurship in general, as well as digital entrepreneurship intentions, go. Therefore, it is important to promote these role models in different contexts. Another interesting finding suggests that role models mediate women´s participation in digital entrepreneurship, while it can help to increasingly involve them in studying ICT related subjects as women representation is comparatively lower than men.

Digital technology and ICT knowledge are important for digital entrepreneurship involvement, but entrepreneurial knowledge is equally important. Therefore, it is recommended to apply experiential and active learning, for example using simulations and training enterprises as well as putting theory in practice. Reportedly, students are mostly taught theory and minority is to apply it or to put it in practice. That should be reversed.In order to have more digitally entrepreneurial students, universities and other educational institutions should transform as well. Hence, use more digital technologies not only for teaching but to be more effective, be more commercial and competitive. Irreplaceable is the role of an educator or teacher who should adopt an encouraging and active role in the educational process.

Key lessons

The mapping and stock taking of digital entrepreneurship dynamics enabled IDEA consortium to extract the success and failure factors. These served to develop recommendations for fostering of digital entrepreneurship dynamics in HE context and beyond.

Success factors

<u>Country context</u>

- Connectivity and high coverage with high-speed internet (combination of fixed line and mobile)
- Comprehensive digital strategies and coordinated implementation efforts
- Cooperation of actors from both public and private sectors (so-called digital coalitions)
- Supportive legislation measure for digital entrepreneurs and IT professionals (e.g. tax reliefs)

- Development of IT capabilities – general, but also specific in order to bridge the skills gap where necessary
- Fostering technological and digital uptake in broad population of SMEs, adoption and implementation of advanced technologies
- Private sector innovation potential and the presence of global ICT companies
- Tailoring of the interventions on the basis of the target population's nature
- Boosting the investment in technology and innovative processes
- Usage of e-government services in interaction with public authorities, obtaining information, downloading and submitting forms, etc.
- High usage of e-commerce in all types of markets
- Development of specialized digital innovation hubs or clusters in different sectors of digital entrepreneurship, such as gaming etc.
- Success stories and role models in digital uptake (e.g. e-commerce adoption in SMEs, adoption of digital solutions in SMEs,

HE context

- Specialized study programmes linked to digital entrepreneurship or, in broader terms, aimed at digital business context in relevant fields (economics, law, IT), as well as interdisciplinary programmes linked to digital entrepreneurship
- Digital entrepreneurship stimulation and incubation initiatives and offerings at universities (startup incubators & accelerators, support services, mentoring, cooperation with business sector, etc.)
- Extra-curricular training programs in specialized fields (e.g. gaming) in connection with local ecosystem and digital business actors
- Networking and community-building with stakeholders from digital entrepreneurship ecosystem (IT sector, technological firms, startups, etc.) and their involvement in common initiatives and partnerships
- Involvement of actors from business and private sector to facilitate access to their practical expertise and experience from business
- Strong cooperation between academia, IT sector and authorities that increases responsiveness to the market needs

Failure factors

Country context

- Lack of a clear digital strategy and flexibility in adapting regulation related to digitalization, problematic and insufficient implementation of strategic documents
- Uncoordinated work of the relevant stakeholders (e.g. institutions, associations, advisory bodies)
- Digital entrepreneurship interventions (from any subjects) are rather isolated actions without a coordinated global scenario, measurable outcome indicators and tracking of long-term and sustainability indicators are often missing
- Barriers for developing infrastructure (high costs, administrative burdens, high charges), especially in rural areas

- Low level of economic digitization and inefficient e-government, procedures that are digitalized only partially and can't be completed 100% online
- Lack of skilled IT specialists and workforce with advanced digital skills
- Outdated educational systems, emphasizing theoretical knowledge instead of their practical adoption,
- Low interest of SMEs to invest into technological and digital uptake, low investment into R&D
- Insufficient outreach of government initiatives to SMEs
- Unnecessary public interventions that disrupt efficient implementation of digitalization
- Lack of continuous support and follow-up activities in training and support programmes
- Various barriers that decrease customers' interest and uptake of digitalized products and services

HE context

- Access to digital skills and knowledge through rather fragmented programs that cover only partial elements of digital entrepreneurship. Lack of holistic approach.
- Few interdisciplinary programmes in digital entrepreneurship, lack of initiatives that would support interdisciplinary teams and synergies between deeply skilled IT students and other students with latent inclination to IT
- Dominant focus of DE initiatives on students with ICT background and low attention to non-IT business related fields of study
- Rather theoretical focus of study programmes and lack of practical orientation
- Low proportion of students and graduates of Science, Information Technology, Engineering and Mathematics (STEM) fields

Strategic and policy level recommendations

- Adopt a strategy for development of digital entrepreneurship and coordinate and align incentives of various government bodies, public entities and business sector towards its implementation;
- Set a straightforward regulative framework for the development of the digital entrepreneurship;
- Establish active partnership and coordinative activities between all relevant government bodies and authorities, institutions and advisory bodies;
- Involve the private sector and the third sector representatives in development of digital entrepreneurship at national levels. Coordinate key stakeholders beyond the government sector without acting as a controller or intervene into the decision making;
- Government facilitation and indirect support of investments in infrastructure (e.g. by simplifying administrative procedures, lowering related fees and charges);

- Support innovation ecosystem by promoting the tighter cooperation between the academic and research community and private sector;
- Target EU funds to promote digital transformation, and foster learning from digital frontrunners in the EU;
- Steer existing instruments to promote technological leap and productivity;
- Prepare education, healthcare, arts and entertainment sectors for evolution, as these sectors exhibit low digitization and low automation potential;
- Develop, implement, and promote e-government solutions in the public sector.

Operational and practitioner level recommendations

- Provide support to digital entrepreneurship start-ups by providing training, access to funding, and facilitating teleworking. Provide shared workspaces with high-speed broadband, business incubators and accelerators;
- Provide support to the small and micro enterprises to increase their investment in R&D; boost digital transformation, and to adopt key enabling infrastructure (e.g. specialised software and hardware, digital tools etc.) in early stages of their businesses;
- Provide free customizable digitalization strategies models/templates to start-ups and SMEs as a highly effective solution to boost their switch towards digitalization;
- Create open-access training programmes for existing business owners (and other people, such as employees, self-employed or liberal professions) without IT background in user-friendly mode (e.g. online, self-paced learning) to increase their uptake of digital entrepreneurship;
- Strengthen entrepreneurship education in combination with digital skills development and ICT literacy throughout the entire school system;
- Promote and increase take-up of internet services by the general population;
- Capture and develop talents, stimulate lifelong learning among employees and grow the pool of ICT specialist population;
- Re-skill the workforce especially in sectors with low current digitization rates and high future automation potential;
- Train employees in SMEs to equip them with the specialized skills needed for implementing digitalization within the company;

- Increase public and private support enabling the population to improve their digital skills and gain work experience – by creating different platforms to get skills by young people or unemployed people who want to get a higher qualification;

HE context recommendations

- Incentivise universities to include knowledge exchange and collaboration in their long-term vision, both for teaching and for research activities. Involve non-academic stakeholders, public and regional authorities in defining this long-term vision;
- Encourage universities to adopt digitisation as part of their overall strategy in order to transform existing structures and processes, enforce digital change, and enable innovation and entrepreneurship;
- Stimulate external engagement in the governance of HEIs;
- Support cooperative paths and knowledge exchange initiatives between HEIs and entrepreneurial ecosystem;
- Establish interdisciplinary programs in digital entrepreneurship on graduate and post-graduate level;
- Increase offerings of ICT-related subjects and courses in HE curricula;
- Establishing strategic and cross-cutting syllabus in digital entrepreneurship, including the review of curricula and the inclusion a significant percentage of practical disciplines on technological and digital innovation from the early years of study;
- Introduce a broad range of digital initiatives, not just online courses. These include for example: digitized pedagogy and supporting learning, monitoring and assessment systems; scalable online education; dynamic accreditation and examination; and developed research using digital tools, digital data access and digital communications;
- Motivate students to increase their enrolment into the STEM areas;
- Mainstream a student-centred teaching paradigm. Involve students, at all levels, in collaboration with external stakeholders;
- Promote digital entrepreneurship role models in different HE contexts, including female role models (to attract women who are currently underrepresented in STEM and/or ICT fields);

- Practice-oriented entrepreneurship education using experiential and active methods;
- Digitization must be built into the physical assets of the university. The expected new features include user-friendly, flexible and integrated work-study environments; digital labs; WiFi everywhere; wireless charging stations; outsourced data centers; and smart and green buildings;
- Support establishment and development of start-up incubators at universities and facilitate the cooperation between universities and the private sector;
- Use university high technology facilities to support digital start-ups;
- Increase digital and technology uptake together with commercial and competitive orientation by educators and HE institutions as well.

IDEA Country report: Croatia

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SVEUČILIŠTE U DUBROVNIKU
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I POSLOVNU EKONOMIJU
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Summary of findings

In order to analyse the scope and potential for digital entrepreneurship in Croatia special focus is put on the institutional and digital landscape and high education environment. In terms of the infrastructure, Croatia is covered pretty well with fixed broadband (99% of households); it has improved 4G mobile coverage of up to 94% and fast broadband coverage to 83%. However, in terms of ultrafast broadband coverage, Croatia is behind the EU average (39% vs 60% of households) (European Commission, 2019a). The development of infrastructure includes engagement of the large infrastructure companies. During the period of 2010-2018, the leading local telecom HT invested more than 12 billion HRK in electronic communication infrastructure (EIZ, 2019). Upgrading digital skills and their application in businesses is a further important pillar in the development of digital entrepreneurship in Croatia, that is pursued by both, public (ProMikro, The Digital Citizen) and private (Generation next, Idea Knockout, and Hack it! Hackathon) sector. Despite the efforts in improving digital skills and the increased demand for advanced digital skills, the supply of ICT specialists and IT literacy is still below the EU average (European Commission, 2019a). In addition, the gap between women and men in ICT engagement is higher in Croatia than in the EU as female ICT specialists represent a very small proportion of total female employment - only 0.9% of employed women.

Croatian government initiated several digital services and portals that make it easy and more efficient to start and run the business (Hitro.hr, e-Citizen, The Central Salary System, The Digital Chamber). Still, those online services provide mostly online information and to some extent offer interactive feedback through a friendly interface. Although Croatia has a high percentage of business users of e-services (i.e. fiscalisation, e-submission of receipts, and e-

registration), it still lags behind the EU averages. In addition, the value from e-commerce is 12% as compared to 18% in the EU-28 (Eurostat).

Croatia invests in digital technologies through EU-coordinated programs, but also through public Croatian agency for SMEs, Innovations and Investments (HAMAG-BICRO), and Croatian Bank for Reconstruction and Development (HBOR). The majority of R&D investments in Croatia generally, and ICT specifically, is done by large and medium-sized enterprises, whereas small and micro enterprises comprise only 7.7% of total R&D investment in the business sector (MINGO, 2016). Although cooperation between the academic and research community and private sector is stated as one of the priorities in Croatian digital strategy, the innovation ecosystem could be improved. At the moment, the collaboration is promoted through the clustering platform in the form of Croatian Competitiveness Cluster for ICT Industry and industrial clusters, technology parks, and business incubators with firms from the ICT sector. Private companies, like HT, also cooperate with the academic community in providing digital solutions for businesses (HT, 2017).

Analysis of the role of the HE institutions in the promotion of digital entrepreneurship in Croatia, pointed out to a couple of study programs that aim to develop relevant skills of future digital entrepreneurs e.g. a program provided by HE institution in technical science that complements engineers' knowledge and skills with business knowledge and skills required for the digital economy, an MBA program on e-leadership, as well as a couple of digital marketing programs on both undergraduate and graduate levels. In May 2019, the University of Dubrovnik announced the first doctoral program Business Economics in Digital Environment. This will be the joint program of the University of Dubrovnik and the University of Zagreb. Despite a couple of good examples, access to digital skills and knowledge in most Croatian HE institutions is offered through rather fragmented programs that focus on certain elements of digital entrepreneurship. Interdisciplinary programs in digital entrepreneurship are generally lacking. In addition to formal programs, several HE institutions developed student start-up incubators. The most prominent ones are developed by the Faculty of Electrical Engineering and Computing at the University of Zagreb (FER) and Faculty of Economics, University of Split.

Overview of country context in Croatia

Digital infrastructure and fundamentals

In terms of digital infrastructure Croatia performs relatively well. European Commission (2019a) notes that fixed broadband reached about 99% of households and 4G coverage is provided at 94% of territory. Fast broadband coverage take-up improved from 7% in 2017 to 19% in 2019 (as compared to 41% of households in the EU). However, in terms of ultrafast broadband coverage (100 Mbps and above), Croatia is behind the EU average (39% vs 60% of households). Large infrastructure companies (like HT d.d. and Ericson Nikola Tesla) are engaged in the development of 5G network (EIZ, 2019). Limited trials of 5G network were initiated in 2017. Although with some delay in implementation, two EU co-financed programmes are underway with focus on providing access to digital infrastructure in areas where high-speed connectivity is neither available nor planned due to the lack of commercial interest: The Framework national programme for the development of broadband access infrastructure (ONP) and the National programme for backhaul broadband infrastructure development (NP-BBI). The budget of these projects exceeds 220 million EUR. However, a comprehensive strategy for 5G deployment is still missing.

Digital skills

According to the 2019 data from Eurostat's Digital Economy and Society Index (DESI), Croatia ranks 13th among EU member states by digital skills of its human capital and falls within EU average. While level of digital skills among end users is higher than EU average, about 57% of Croatian SMEs are unable to fill their vacancies of ICT specialists due to the lack of such human capital profile on the labour market (DESI, 2019). As one survey containing 300 companies in Croatia indicates that managers are aware that they lack digital skills which are very important (Apsolon, 2019). The respondents on average spent up to 25% of total expenditures on education on digital skills (22.2% of respondents did not invest in this type of education). 71% of respondents reported that their employees are just partly qualified for digital transformation (Apsolon, 2019).

The need for upbringing of individuals with digital skills is being recognized by HEIs and several programmes are underway in the field. Public schools reform introduced pilot project e-Schools and the ICT classes are made compulsory in primary schools. Eurostat figures show continuous annual rise in the share of ICT graduates. *ProMikro* project is designed to educate

teachers in new ways of using computers in teaching, while *The Digital Citizen* is designed to bring digital skills to local communities through public libraries.

There are also private initiatives. HT d.d. encourages the development of STEM skills for young people and contribute to enhancing digital literacy with several donation programs, such as *Generation next, Idea Knockout, and Hack it! Hackathon,* and provides also education for senior citizens on the use of Internet (HT, 2017). The Croatian Employers' Association - HUP ICT is active in organizing educational programs, seminars and conferences, in order to promote good practice in ICT, while Croatian Chamber of Economy organizes conferences on e-commerce and training courses in the usage of online services. A National Digital Skills and Jobs Coalition also exists as a partnership between different stakeholders (firms, educational institutions, public and private sector) in development of initiatives for improving digital skills.

Openness of regulatory framework

Croatian government introduced the Open Data Policy with the aim to make public administration open and transparent, and make public bodies' websites more readily accessible to public in a single place (European Commission, 2019a). Such data include available statistics on economy but also on digital society and e-government. In order to boost the development of digital infrastructure, Croatia reduced the fees for the use of radio frequency spectrum (European commission, 2019a). However, complicated administrative procedures, high taxes, high fees on radio frequency spectrum, payments of parafiscal charges in general raise the cost of digitalisation (HT, 2017).

Equal opportunity

The gender gap in ICT is higher in Croatia than in the EU (European Commission, 2019a). Women use Internet, online banking, and e-Government less than men. Only 30% of females have basic digital skills and female ICT specialists represent only 0.9% of total female employment. Females in ICT are less paid than men, and they are especially weakly represented in leadership positions (Markotić, 2015). Several initiatives promote greater inclusion of women in digital business. *The ICT Supergirls initiative* that encourages young women and girls to pursue careers in ICT through annual events and a mentoring program, *Women Techmakers, Google's brand and global program for women in technology* that promotes and celebrates women who play leading roles in the industry through various events and panels, *DigiGirlz -Microsoft's 'community' program* designed to improve understanding among high-

school girls of career opportunities available in the high-tech industry. *Women STEM Awards project* of HT d.d. motivates young women to start career in STEM digital field (HT, 2017).

Policy support

E-government

E-government plays an important role in Croatian digital development strategy. Main goal is to connect all information systems and data in public administration, and provide high quality e-services in order to make their interaction with public administration more efficient (Ministry of Public Administration, 2017). In practice, Croatian e-government online services provide mostly online information and to some extent offer interactive feedback through friendly interface. Croatia has high percentage of business users of e-services (i.e. fiscalisation, e-submission of receipts, and e-registration). Croatia is, however, still behind the EU average in several indicators (European Commission, 2018). As such, in 2019 Croatia was below the EU average in terms of the online interaction with public authorities (33% vs 53%), obtaining information from public authorities' websites (29% vs 44%), downloading official forms (24% vs 32%), and submitting completed forms (19% vs 36%) (Eurostat, n.d.a).

Over past years there has been an increase in availability of e-government services. Some of main digital services introduced include:

- *Hitro.hr* – an e-government service aimed to ensure easy and fast starting-up of business venture.
- *E-citizen* – the one-stop-shop service for straightforward and transparent communication between citizens and the public administration providing services in areas of taxation, pension and health insurance as well as obtain various certificates from government. Within *E-citizen*, a person can also start business online through *START* or *e-Craft* services.
- *The Central Salary System (COP)* is a web-based application covering salary calculations for the all institutions whose salaries are financed from the State budget.
- *Digital chamber* is the initiative of the Croatian Chamber of Economy that provides at one place all relevant information to companies related to starting business, legislation, fairs and promotions, public office, and financing (HGK, n.d.).
- Business have access to *e-Filing* – an electronic service for registration of industrial property rights

- *FINA eCard* – service by Croatian Financial Agency – FINA provides faster, simpler and more secure access to services such as *eTax*, *eVAT*, *ePension* and *ePayment.* Through FINA citizens and businesses also have option of electronical signing and authentication of documents.
- From 2019, electronic invoicing in affairs with public sector is made mandatory.
- There are also e-services as *eTax portal*, *eCustoms, and eExcise*. Croatian businesses have option of issuing *eInvoice*, accessing and submitting electronically annual financial statements through *Web Annual Financial Statements Registry* (RGFI), electronically obtaining creditworthiness information through *Web-BON.*

Finance

Croatia invests in digital technologies through EU-coordinated programmes, but also through public Croatian agency for SMEs, Innovations and Investments (HAMAG-BICRO) and Croatian Bank for Reconstruction and Development (HBOR), and a number of ICT firms obtained grants for their ICT projects. The majority of R&D investments in Croatia generally, and ICT specifically, is done by large and medium-sized enterprises (such as APIS IT, Combis, Ericsson Nikola Tesla, Končar Group, IN2 Group), whereas small and micro enterprises comprise only 7.7% of total R&D investment in the business sector (MINGO, 2016). During the period of 2010-2018, HT - leading telecommunication company invested more than 12 billion HRK in electronic communication infrastructure (1,35 billion HRK a year on average) (EIZ, 2019).

Innovation ecosystem

The cooperation between academic and research community and private sector is one of high priority in Croatian digital strategy (Ernst and Young, 2019). The collaboration is promoted through clustering platform in the form of *Croatian Competitiveness Cluster for ICT Industry* (which brings together public and 37 members from the business sector, universities and research institutes in a formal structure in order to develop synergies and cooperative efforts and increase ICT sector competitiveness – MINGO, 2016) and industrial clusters, such as Međimurski ICT cluster that is an alliance of 11 local small ICT companies. There are also several initiatives to provide solutions to private companies in ICT, such as Algebra LAB (provides support to companies and young entrepreneurs in the development of – information systems, software, security, the development of games, big data usage, or CroTechHub provides multiple level of support for SMEs to enable them to transform their business and to create new

products that are “digitalized”. Private companies like HT also cooperate with academic community, such as the Faculty of Electrical Engineering and computing in Zagreb or University of Dubrovnik, and provides digital solutions for businesses (HT, 2017).

Growing through e-Commerce

E-commerce

Eurostat statistics shows that e-commerce is still weak in Croatia, as only 13% of companies are purchasing online (26% in the EU). Although 98% of companies have Internet connection, only 22% of them are selling online (21% of SMEs, of which 8% selling cross-border). The value from e-commerce ranges around 12%, considerably below EU-28 average of 18%. At the same time, demand is growing, as 81% of households have Internet connection and 45% of consumer are doing online purchases (90% and 60% respectively in the EU-28) (Eurostat, n.d.b).

Online payments

In Croatia, online payment can be carried out using all major credit cards. Global *e-Payment* services such as *Google Pay* or *Apple Pay* are only limitedly available to users of selected commercial banks. Standard banking services of fintech companies such as *Revolut* or *Monese* are available to Croatian users as well. Citizens and businesses in Croatia perform their financial transactions using online payment services provided by major banks in the country, such as m- and e-zaba (provided by Zagrebačka banka), RBA mBIZ mobile banking application for business users, and online banking Privredna banka Zagreb that offers also credit solutions for SMEs. One study shows that 82% of individuals use credit cards in online shopping (MINGO, 2016b), and 46% of individuals use Internet banking (55% in the EU). (Eurostat, n.d.b).

Cross-border delivery

Cross border mobility statistics show that EU citizens can use only information online provided by e-government services, and interactive feedback is provided to a lesser degree. Electronic identification service is not available in other countries for citizens and e-documents cannot be transmitted to other countries (European Commission, 2018). On the other hand, privacy and data protection in line with GDPR is applied to citizens of other EU member states. In relation to business-to-customer transactions, foreign undertakings are obliged to register in Croatia for VAT purposes and calculate VAT in accordance with Croatian law, whereas the foreign

company will be obliged to pay tax in Croatia. According to DESI index (2019) only 8% of Croatian SMEs sell their products across borders.

Governing digital markets

Establishing participative governance

Croatian government established National Digital Economy Council as an advisory body including the representatives of entrepreneurs, educational institutions, professional associations, non-governmental organisations and public authorities, with the aim to establish an active partnership of all relevant stakeholders in the development of the digital economy, through defining the objectives and priorities for the creation of a single digital market (MINGO, 2016a).

Further examples of participative governance are *Clusters for ICT Industry* which bring together public, private and scientific-research representatives in a formal structure in order to develop synergies and cooperative efforts and increase ICT sector competitiveness (MINGO, 2016a). Through clusters firms seek to lobby for public support and influence changes of national and EU legislation, co-operate with the public sector and academic community. There are also technology parks and business incubators with firms from ICT sector.

Regional markets

Croatian legislation on digital business is harmonized with the EU standards and norms. The Croatian Constitution allows the free profit repatriation, the free transfer of invested capital, and a foreign company is recognized as a local company. Foreign companies are protected with intellectual property rights (patents, copyrights and design). In addition, these companies profit from tax incentives. There are also the Bilateral Agreements to avoid double taxing.

ICT in aid

Investment in the development of digital technologies and support to SMEs is high priority of the Croatian digital strategy (Ernst and Young 2019). Funding includes EU and national sources. For the 2014-2020 period, total EU budget for Croatia from the European Regional Development Fund (ERDF) for information and communication technologies was 307 million euro, while at the national level from this fund was available for ICT (digital infrastructure, developing ICT products and services and e-commerce, strengthening ICT applications for e-government, e-learning, e-inclusion, e-culture and e-health) 54 million euro. Euro 33 million

was provided to digitise public administration (Croatian government, n.d.). Croatia spent only 45% of total ERDF funds (European Commission, n.d.).

HAMAG-BICRO within the Science and Technology Projects (STP II) with the help of World Bank provided funding for R&D, innovative projects, for start-ups, micro, SMEs in the field of ICT within the programs RAZUM, IRCRO, Proof of Concept. As such, IRCRO program in 2015 call provided 6,6 million HRK grants for nine companies, whereas RAZUM program provided 14,3 million HRK funding for three companies (HAMAG-BICRO, n.d.). Croatian Bank for Reconstruction and Development (HBOR) provided loans at lower interest rates for companies and crafts businesses also for the purpose of business start-up, business modernisation, and introduction of new technologies. For funding R&D projects in the ICT sector, along with public funding (Croatian Science Foundation, HAMAG-BICRO) and IPA programmes (Instrument for Pre-Accession Assistance), participation in FP7 and Horizon2020 projects have also been very important sources (MINGO, 2016).

Monitoring

Central State Office for the Development of the Digital Society is in charge of monitoring of e-service development, while National Information Infrastructure Council is in charge of monitoring the development of the national information infrastructure and the quality of e-government. Other public bodies included in monitoring, evaluation and advising are Ministry of Economy, Entrepreneurship and Crafts, Ministry of Regional Development and EU Funds, Ministry of Maritime Affairs, Transport and Infrastructure. Croatian Bureau of Statistics (CBS) collects and publish the data on information society yearly, including the data on the internet access, Internet usages, e-commerce, cloud computing services, security measures in companies and households. Additional comparable statistics on Croatia on digital economy and society is available in Eurostat database (Eurostat, n.d.a).

Overview of HE context in Croatia

Digital entrepreneurship, as defined by Giones and Brem (2017), refers to the introduction of new products and services based on the Internet, cloud technologies, big data and artificial intelligence whose mayor funding strategies include business angels, crowdfunding, seed and venture capital. In line with this definition, students – future and potential digital entrepreneurs should be provided with knowledge and skills on relevant digital technologies (Internet, cloud technologies, big data and artificial intelligence), marketing and management as well as finances. Higher education institutions are essential in inspiring digital entrepreneurship and digital entrepreneurship education usually comes with low start-up and running costs. Thus, teaching of digital entrepreneurship is achievable in many educational environments and directly addresses student's real life (Kraus et al., 2019).

This chapter provides a brief overview of programs, courses, training activities and other efforts of higher education in Croatia to educate, stimulate and incubate digital entrepreneurship.

Currently, there are 2566 accredited study programs in the Republic of Croatia (MZO, 2020). This includes both university and professional programs in all fields of study provided by 91 **public higher education institutions (8 public universities with 68 faculties and art academies and 1 university centre at public universities, 11 public polytechnics, and 3 public colleges) and 28 private higher education institutions (2 private universities, 4 private polytechnics and 22 private colleges) (AZVO, 2020).** It was necessary to focus the analysis on study programs and activities of HE institutions in the most relevant fields from the perspective of digital entrepreneurship. These are business and economics, computer science and information and communication technology. This, however, does not suggest that courses, training and other activities relevant for fostering digital entrepreneurship are not provided to students in other study programs not included in this analysis.

Educate

The first step was to analyze the availability of study programs that aim to develop relevant skills of future digital entrepreneurs, i.e. to educate them. Programs designed specifically for the purpose of educating skills of digital entrepreneurship are rare in Croatia and we were able to identify only three existing and one emerging initiative in this direction. Specialist Professional Graduate Study in Digital Economy at Zagreb University of Applied Sciences is a two-year program, which covers subjects and courses in the field of both social and technical

sciences. The curriculum includes compulsory courses on the digital economy and new models, quantitative methods in economics, financial analysis, HRM, operation research, business law, and project management. The second year of this program includes three elective modules: Digital transformation, Entrepreneurship in the Digital Economy and Digital Marketing. These modules consist of courses on innovation, intellectual capital, entrepreneurship, family entrepreneurship, digital marketing, marketing communication, brand management, and business infrastructure. This program provided by HE institution in technical science complements engineers' knowledge and skills with entrepreneurship, marketing, business and economics knowledge and skills required for the digital economy.

Algebra MBA has designed an MBA program on e-leadership. This MBA program is analyzed in more detail in the IDEA Tools and good practices section. Algebra University College also developed digital marketing programs on both undergraduate and graduate levels. Undergraduate study of Digital marketing, among other subjects, includes courses on digital advertising, computer tools in visual communications, e-commerce, e-business, digital agencies, standards in internet technology application, social networks and social media. Graduate professional program in Digital marketing[8] builds and develops digital marketing skills further by, among others, courses on design thinking, disruptive technologies, security and privacy in the digital economy, digital transformation, future technologies in marketing, innovation development. Mission of ALGEBRA e-leadership MBA is also to serve as a national reference and competence centre for e-Leadership, strategic management, business transformation and innovation in digital economy, as well as reliable business partner to local and international entrepreneurs and companies.

Faculty of Economics and Business, University of Zagreb developed a two-year professional graduate program in Digital marketing. This program is designed to educate professionals interested to pursue their careers in marketing agencies and firms that rely on digital business. The curriculum includes courses on digital advertising, marketing activities on social media and search engines, digital media and digital content, privacy in the digital economy, mobile applications, digital agencies, etc.

Study programs focused primarily on digital entrepreneurship in Croatia are provided to the student at the graduate level. In May 2019, the University of Dubrovnik announced the first

[8] https://www.algebra.hr/visoko-uciliste/en/studij/graduate-professional-program/digital-marketing/ (accessed 26 March 2020)

doctoral program Business Economics in Digital Environment. This will be the joint program of the University of Dubrovnik and the University of Zagreb. Doctoral study Business Economics in the Digital Environment prepares students for careers in the public and private sector both in Croatia and abroad through the knowledge and skills acquired that can be applied in many research activities qualifying individuals to bring decisions when making economic policies, reaching new scientific goals in the research community as well as analysis and understanding of business processes, thus providing better employment possibilities for the students.

The launching of postgraduate (doctoral) study Business Economics in Digital Environment is in the final stage at the Department of Economics and Business, University of Dubrovnik. In launching and implementation of the study several partnering institutions are engaged, among which the most important is the Faculty of Economics and Business of the University of Zagreb as the joint provider. The aim of the study program is to provide the students with the knowledge and skills that would make them competitive in the world of digital economy. The study program comprises several thematically similar modules covering key topics in business economics. Nevertheless, unlike the existing study program with the same title, they emphasize digital transformation as the main stream in the area of business economics in the future. The study program comprises five modules: Tourism, Marketing, Management, International Business and Digital Economy. Significance of the study has been recognised in the market, and it is supported by renowned international companies doing business in Croatia, representatives of the local and regional community as well as relevant business institutions.

Ongoing initiative, that is also described as good practice example in accompanying of this report is Gaming industry center Novska. Building on foundations of Digital Innovation Hub and entrepreneurship incubator Pismo already in place, activities are underway of developing regional entrepreneurial system for gaming industry that involves high school and university education of skills required for doing business in gamin sector, provision of finance to entrepreneurs and professional support. These activities will supplement already ongoing education that was attended by over 100 participants over last three years.

In further analysis, we identified numerous programs and courses that provide partially knowledge and skills in this area although their main focus is not digital entrepreneurship. This includes programs of business schools that cover topics on entrepreneurship, marketing, digital advertising, e-commerce, etc. that indirectly contribute to fostering digital entrepreneurship. This is the case of more or less all study programs for future managers. It is also encouraging

to see business, innovation and technology management and other management courses included in study programs in computing on both obligatory and compulsory bases.

Department of Economics and Business (University of Dubrovnik) has founded the Centre for Research on Digital Transformation (CREDO) in 2019. Similar centres do not exist at public universities in the Republic of Croatia. The aim of the centre is to gather scientist and researchers with rich experiences in the field of digital transformation. This group of individuals will investigate economic effects of digital transformation in the field of entrepreneurship, industrialization, innovations, tourism, trade, environmental protection, local and regional development, international trade, labour market and education. The Centre has task to produce and spread the knowledge in local community, but also at national and international level. It is aimed to offer inputs for policy implications and professional help for business sector in the process of digital transformation but also to create educational content for building of digital skills among students and adults.

The main goals of CREDO are:

- Exploring macroeconomic, sectoral and organizational forms and outcomes of digital transformation
- Offering evidence-based inputs for formulating economic policies in the era of digital transformation
- Offering professional support to business sector in adjustment processes to digital environment
- Strengthening digital skills for the groups that are threatened by digital transformation
- Applying acquired knowledges in teaching processes.

Examples in this overview testify that HE institutions recognized the importance of digital skills development through special programs in digital entrepreneurship as well as through other programs that partially cover relevant topics. However, it can be improved to meet the requirements of the digital economy by educating future digital entrepreneurs. The main issue is that access to digital skills and knowledge is enabled through rather fragmented programs that focus on certain elements of digital entrepreneurship. Interdisciplinary programs in digital entrepreneurship are generally lacking.

Stimulate

A cursory overview of publicly available documents containing study programs syllabus reveals significant efforts to stimulate creation, critical thinking and business planning through study projects. These projects in many courses are part of the final grade or even obligatory task of the study program. However, it is beyond the scope of this analysis to assess if such programs are adequately applied, are there any benefits, and what are the effects of stimulating digital entrepreneurship.

The Faculty of Electrical Engineering and Computing at the University of Zagreb (FER) offers support to students to take their idea to the next stage within the program called Startup@FOI. The one-year program is performed in cooperation with the Technology Park Varaždin and offers usage of offices, accounting and legal support, consulting, and networking with successful IT companies.

The Faculty of Electrical Engineering and Computing at the University of Zagreb (FER) also offers an educational program named Startup Academy, which includes five workshops free of charge for students – entrepreneurs.

Algebra University College also developed a four-month program of stimulating selected students' ideas, during which students participate in workshops and work with the mentor. Algebra helps students to develop a business strategy and prototype services or products and connects them with the business world.

In 2019, the Faculty of Economics, the University of Split organized together with Middlesex University London and Universidad de Malaga international competition of student startups called STup!. Competition was supported by World Business Angels Investment Forum. The competition gives students an opportunity to pitch in front of an international community of like-minded entrepreneurs as well as to connect with potential clients, investors and trainers. More information on http://spi.efst.hr/ .

The student association eSTUDENT organizes several competitions which stimulate digital entrepreneurship. This student association designed a new platform of student competition called LUMEN that incorporates four areas:

- LUMEN Business (previously Case Study Competition),
- LUMEN Data science (previously Mozgalo),
- LUMEN Development (previously App Start Contest) and

- LUMEN Engineering (previously Elektroboj).

Although these contests are not directly organized by higher education institutions in Croatia, the academic staff of the University of Zagreb engages in their activities by providing training activities in their area of expertise as well as promoting associations' activities and connecting them to the business community. They also contribute to student competitions as judges or they create tasks that are part of the competition.[9]

Incubate

The higher education institutions, namely Faculty of Electrical Engineering and Computing at the University of Zagreb (FER), Faculty of Economics, University of Split, Faculty of Economics & Business, University of Zagreb, Business school PAR and Polytechnic of Bjelovar, developed student startup incubators. Similar initiatives exist in In January 2020, Department of Economics and Business at University of Dubrovnik founded its student incubator of digital entrepreneurship as well.

Student startup incubator of Faculty of Electrical Engineering and Computing at the University of Zagreb - SPOC is opened to their students and those who graduated in the last two years. Students are provided with mentoring, knowledge and skills required for developing their startup. SPOC also offers opportunities for networking with investors, business partners and experts. They invite a student to apply their ideas in teams or individually. Those with needed knowledge and skills interested to join a startup can apply for a brainstorming workshop and participate in project development. Students and teams from other faculties are also eligible to apply. They can later team up with FER students to develop a prototype. Best projects enter a six months program from ideation to the Minimum Viable Product phase. All teams must participate regularly in workshops with mentors who have experience in building startups. In January 2020 SPOC started with the fourth generation of student startups. More information on the program and current as well as past project is available on the SPOC website: https://spock.fer.hr/#!/program.

At the Faculty of Economics, the University of Split operates a student incubator open for all the student – entrepreneurs for the University of Split. Project is financed by European Social Fund and it offers mentoring, business consulting, workshops and education, networking events and the use of fully equipped co-working space to their members. Student Entrepreneurship

[9] https://arhiva.estudent.hr/partneri/#academic_tab (accessed 2 March 2020)

Incubator organized three years in a row Global Entrepreneurship Week – initiative for networking and cooperation of start-ups around the world. Together with the Faculty of Economics, Split and City of Split, the Student Entrepreneurship Incubator organizes Get in the Ring competition. The competition is opened to start-up not older than five years, operating in Split or willing to move their operations to Split. Applications are assessed by entrepreneurs with experience and experts from investment funds. In addition to money prize, the winner gets the honor to represent Croatia at the Get in the Ring Global Competition.

Faculty of Electrotechnics and Computing, University of Osijek developed virtual incubator STUP, as a meeting point between entrepreneurs and students where concrete business problems in sphere of digital economy are offered by enterprises. Students have an opportunity to develop their entrepreneurial skills under supervision of both academics and business sector mentors. Over 400 companies form STUP's network and more than 1800 students have used some of its services. Detailed information is available at https://stup.ferit.hr/.

The University of Pula launched Student Entrepreneurial Incubator - SPIN in 2013. The mission of the Student Entrepreneurial Incubator is to create and foster an entrepreneurial culture, innovation and awareness of the need for interdisciplinary integration of all components of the University, business and public administration. The main goal of SPIN is to enable the students of the University of Pula to use the infrastructure, space, computers and telecommunication equipment, as well as to provide the necessary information and knowledge through mentoring. SPIN helps students shape business ideas and present them to potential investors and/or partners; develop business plans and define business strategies; start entrepreneurial ventures; establish and maintain cooperation with representatives of entrepreneurs, businessmen, bankers, business angels and other parties interested in developing and commercializing students' entrepreneurial ideas. Detailed information is available at https://fet.unipu.hr/fet/za_studente/spin#.

VERN' University of Applied Sciences established VERN's Startup Incubator/Accelerator in 2013. It enables students to develop entrepreneurial projects more efficiently, both in terms of outsourcing business development infrastructure, and mentoring and consulting support. The program is primarily intended for projects in pre-incubation and incubation phases, but it also anticipates further development phases. The pre-incubation phase implies that the project is in the form of a business idea in the initial stages of development, with the aim of testing market potential. The incubation phase implies that the project is ready to go or is already on the market, and is looking for effective channels of market positioning. Support for projects and their

authors includes work space, technical infrastructure (projector, laptops, printer, internet access, etc.), mentoring (business planning, marketing, sales, IT, accounting, legal issues, business registration, etc.), an opportunity for business networking, etc. More information can be found at https://vern.hr/educationmeetsbusiness/startup/inkubator-akcelerator/.

The network of student entrepreneurship incubators (MSPI) is virtual platform through which students develop their entrepreneurial ideas. It consists of open and closed platform. Open part of platform serves as hub for networking, knowledge sharing and business counselling. In closed part of platform students have the opportunity to develop and test their entrepreneurial ideas under supervision of business community mentors. MSPI is established with support of HAMAG-BICRO who also provides co-financing in setting up of business venture as well as mentorship in first year of doing business. The programme encourages entrepreneurial activities of students and finances implementation of developed solutions. MSPI provides services such as mentoring, networking with business and academia members, development of business plan, access to financial support, setting up of business venture and opportunities for apprenticeship. Details can be found at: https://www.mspi.hr/

Detailed information on current activities of remaining student incubators were rather limited. The goal of the Student Entrepreneurship Incubator[10] established at the Faculty of Economics & Business, University of Zagreb, is to provide their student with key concept, strategies and methods important for establishing business venture through series of workshops and seminars with experienced entrepreneurs. Business school PAR established an incubator for their students in order to help them to develop their ideas, found startups and provide access to equipment and co-working space[11]. Student Entrepreneurship-Technology Incubator[12] at the Polytechnics of Bjelovar organized workshops and seminars as well as supported their students to participate at innovation fairs and innovation competitions. Student incubator of digital entrepreneurship at University of Dubrovnik, Step2digit was founded only recently. Its foreseen activities include workshops and seminars in fields of digital marketing and market research, student digital entrepreneurship idea competitions and activities aimed at development of transversal student skills relevant for work in digital economy.

[10] https://www.efzg.unizg.hr/for-students-11750/career-opportunities/student-entrepreneurship-incubator/38556 (accessed 25 March 2020)
[11] https://par.hr/studentski-inkubator/ (accessed 25 March 2020)
[12] https://vub.hr/studentski-inkubator/ (accessed 26 March 2020)

Success and failure factors and recommendations

Success factors

- Croatia is covered pretty well with fixed broadband (99% of households); it has improved 4G mobile coverage of up to 94% and fast broadband coverage to 83%.
- Croatia has a high percentage of business users of e-services (i.e. fiscalisation, e-submission of receipts, and e-registration). Croatia is, however, still behind the EU average in terms of the online interaction with public authorities (33% vs 53%), obtaining information from public authorities' websites (29% vs 44%), downloading official forms (24% vs 32%), and submitting completed forms (19% vs 36%) (Eurostat, n.d.a).
- In May 2019, the University of Dubrovnik announced the first doctoral program Business Economics in Digital Environment. This will be the joint program of the University of Dubrovnik and the University of Zagreb.
- In addition to formal programs, several higher education institutions developed successful student start-up incubators that provide students-entrepreneurs with mentoring, and knowledge and skills required for developing their start-up. Incubators also offer opportunities for networking with investors, business partners, and experts.
- There is ongoing initiative for developing national gaming industry center that would provide all services and educate individuals for doing business in gaming industry.
- A virtual network bringing together student entrepreneurs was established from student incubators with support of HAMAG-BICRO and involving stakeholders from different aspects of student entrepreneurial ecosystem.

Failure factors

- Based on the institutional framework analysis, one can argue that Croatia lacks a clear digital strategy and flexibility in adapting regulation related to digitalization. Although there were some changes in the regulation, there is still a lack of application and practice (e.g. public procurement for innovation, digital signature, etc.)
- Uncoordinated work of the relevant institutions, associations, and advisory bodies.

- Infrastructure is another factor that drags down the success of the digital entrepreneurship down, especially in the area of the ultrafast broadband coverage, Croatia is behind the EU average (39% vs 60% of households) (European Commission, 2019a). The other issue is that the development of infrastructure depends on the engagement of large infrastructure companies. Although the government reduced the fees for the use of radiofrequency spectrum to facilitate the investment in the digital infrastructure, complicated administrative procedures, high taxes, payments of parafiscal charges in general still raise the cost of digitalisation (HT, 2017).
- E-commerce is still low in Croatia, as e the value from e-commerce is 12% as compared to 18% in the EU-28.
- Croatia lacks highly skilled ICT specialists. The gap between women and men in ICT engagement is higher in Croatia than in the EU as female ICT specialists represent a very small proportion of total female employment - only 0.9% of employed women.
- The majority of R&D investments in Croatia generally, and ICT specifically, is done by large and medium-sized enterprises (such as APIS IT, Combis, Ericsson Nikola Tesla, Končar Group, IN2 Group), whereas small and micro enterprises comprise only 7.7% of total R&D investment in the business sector (MINGO, 2016).
- Despite a couple of good examples, access to digital skills and knowledge in most Croatian HE institutions is offered through rather fragmented programs that focus on certain elements of digital entrepreneurship.
- Interdisciplinary programs in digital entrepreneurship are generally lacking.

Recommendations

- Set a straightforward regulative framework for the development of the digital entrepreneurship;
- Establish active partnership and coordinative activities between Central State Office for the Development of the Digital Society, National Information Infrastructure Council, Ministry of Economy, Entrepreneurship and Crafts, Ministry of Regional Development and EU Funds, Ministry of Maritime Affairs, Transport and Infrastructure, National Digital Economy Council and other relevant institutions and advisory bodies;
- The government should facilitate the investment in infrastructure by simplifying administrative procedures and cutting the taxes and parafiscal charges as well as the use of the public land.

- Set strategic objective of building resources for development of digital entrepreneurship and align incentives of various public entities (ministries, HEIs etc.) and business sector towards achievement of such midterm objective.
- Support innovation ecosystem by promoting the tighter cooperation between the academic and research community and private sector;
- Provide support to the small and micro enterprises to increase their investment in R&D.
- Targeting EU funding to promote digital transformation and learning from digital frontrunners in EU, as well as develop solutions and business models based on digital technologies;
- Establishment of the Interdisciplinary programs in digital entrepreneurship on graduate and post-graduate level;
- Support digital entrepreneurs in overcoming entry costs through setting up of access to key enabling infrastructure such as specialised software and hardware.
- Directing students to enroll more into the STEM areas at higher education level and preventing the brain drain of ICT specialist in Croatia;
- Support development and establishment of the start-up incubators in universities and facilitate the cooperation between universities and the private sector.
- Providing support to start-ups by providing training, access to funding, supporting technology acquisition, and facilitating teleworking. Provide shared workspaces with high-speed broadband and other incubators.

IDEA Country report: Italy

Prepared by:

Summary of findings

The brief report here discussed showcases and mainstreams the main trends and dynamics on digital entrepreneurship and awareness in HE for the Italian national context.

The research relied on: official report developed by international organisations (World Economic Forum, World Bank, Global Entrepreneurship Monitor and Organization for Economic Co-operation and Development), European Commission's documents, National Surveys and Assessments (mainly by MISE – Ministry of Economic Development and ISTAT – National Institute of Statistic), Industry Reports and the independent contribution of individual researchers.

Firstly, we explored the general entrepreneurial framework in Italy compared to the most industrialised occidental economies; then we proceeded to focus on digital entrepreneurship dynamics only, from the perspective of:

- the national agenda designed to promote and uptake the digitalisation of the territorial economy
- the participation of Italian SMEs to Digital Markets and e-commerce.

We moved to the analyses of the contributions and responsibilities of HE ecosystems in Italy as digital entrepreneurship education providers and the responsiveness of HEIs to the new challenges faced by tomorrow-entrepreneurs.

Finally, on the basis of the learned lesson, the report concludes with the exploitation, mainstreaming and valorisations of the most valuable recommendations from a policy, communication and implementation perspective.

All main highlights suggest that the Italian entrepreneurial ecosystem is one of the most digitally underdeveloped compared to other occidental economies.

The severe lack of a comprehensive and systemic strategic architecture promoted at national policy level deeply affects the overall entrepreneurial and cultural approach to IT knowledge and digital education, emphasizing e-commerce and digital markets as not-exploited opportunities:

- 40% of Italian entrepreneurs do not believe/ignore/are afraid of “the digital machine” and only 5% of the firms are fully committed in e-commerce.
- 80% of the Italian enterprises never invested in new digital solutions for their business.

Our findings suggest that the future economic sustainability and competitiveness of the Italian industry in the digital markets, highly relies on a bottom-up approach encouraged specifically by education and training solutions sustained at any school and HE dimension.

The analysed data suggest that Universities and formal HEIs have yet to develop adequate training solutions on digital skills and IT competences – what numerous authors and reports formally recognise as the hard skills of tomorrow.

For the most, digital entrepreneurship education is still linked and related to necessity-lead approaches rather than opportunity-driven models and the responsiveness of the digital training paths to the new business paradigms is reduced to a mere transmission of theoretical knowledge without any real, practical and operational input.

The current entrepreneurial generations (mainly represented by males between 50-55 y/o) perceives the World Wide Web as a 0-value-added tool for their business and the ones who should equip the entrepreneurs of tomorrow with resilient digital knowledge are not fully prepared for their responsibilities. If no actions are taken, Italian aspiring entrepreneurs are likely to face much bigger challenges than their international peers.

Overview of country context in Italy

Digital Infrastructures and Fundamentals

The picture portrayed by the annual Global Entrepreneurship Monitor (GEM) displays the Italian entrepreneurial context as one of the less developed among, not only the European countries, but even western industrialized economies.

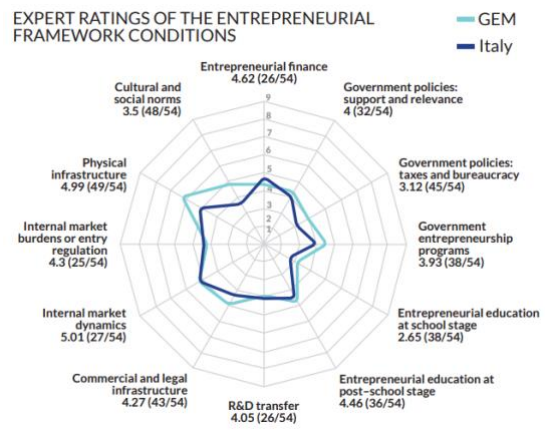
According to data, out of the 48 global economies surveyed, the Italian entrepreneurial environment ranks at the very bottom of numerous charts that highlights as comparison parameters:

- Early stage entrepreneurial activities (TEA index – Total early-stage Entrepreneurial Activity)
- TEA Index and Gender distribution
- Necessity versus Opportunity as drivers of entrepreneurship
- Growth Expectations
- Innovation
- internationalization

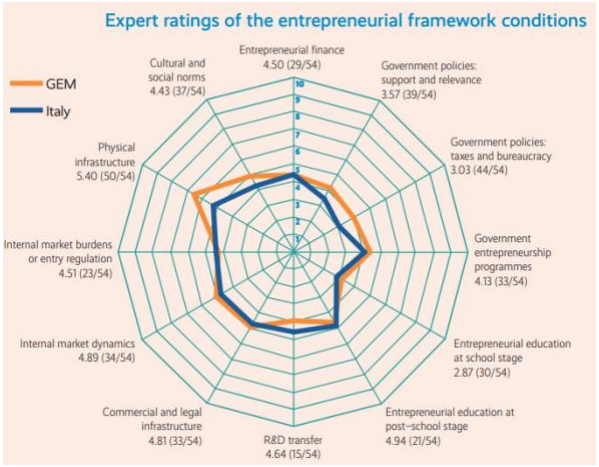
Taking into account the Europe and North America sample, Italy continues to fluctuate between the last and penultimate ranks (21st or 22nd out of the 22 Economies considered)[13] and it is positioned below the average of all GEM' standards. Apart from the launch of the "Startup Act" in 2012, the Italian Government has not been an active protagonist of substantial policies aimed at the exploitation and valorisation of entrepreneurial and business opportunities – and to date, the Act has not assured and guaranteed the results in terms of efficacy and efficiency as foreseen at proposal[14]. Very few actions have been recorded only at local/regional policy level and for the most, they resulted in failure attempts or in a very short-term narrowing measure that cannot keep-up with the structural needs perceived on the long-run[15].

[13] GEM, Global Entrepreneurship Monitor:
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);
[14] Italy and Startups: 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
[15] Youth Entrepreneurship in Italy. An Overview from Isfol – Paper for OECD Study Visit in Rome. Scialdone; Di Saverio; Villante.

GEM, Global Entrepreneurship Monitor: Italy Snapshot (2018/2019)



GEM, Global Entrepreneurship Monitor: Italy Snapshot (2019/2020)



In particular, the main critical factors that discourage young aspiring entrepreneurship are:

- Severe funding and bureaucracy obstacles – on a worldwide scale, the World Bank ranks Italy 119th in "easy access to finance and credit"[16], a data that is unfortunately consistent with the findings mainstreamed by the "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 industrialized countries[17].
- Labour and antitrust regulation – Italy shares with the poorest economies of the world the same Corruption Index[18] making extremely difficult for Italian regulators to assure fair competitive conditions for all market's agents.
- The historic and longstanding wealth gap between northern and southern regions, with the consequent impossibility to implement a systemic policy strategy equally perceived and impactful on a national scale.

(http://isfoloa.isfol.it/bitstream/handle/123456789/966/Di%20Saverio_Scialdone_Villante_Youth%20Entrepreneurship%20in%20Italy.pdf?sequence)

[16] The World Bank – "Doing Business 2020": Ease of doing business in ITALY, (https://www.doingbusiness.org/en/data/exploreeconomies/italy#DB_gc)

[17] World Economic Forum – "The Global Competitiveness Report 2019" p.298-302, Klaus Schwab, World Economic Forum (http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf)

[18] Transparency International, Corruption Perception Index 2019 (https://www.transparency.org/cpi2019)

- A persistent and structural lack of a strong, consolidated, robust and resilient entrepreneurial culture that misses from the very first stages of compulsory school to even Higher Education settings[19].

Assuming these data as the backbone of the analysis, it is not difficult to perceive how highly fragmented, weak and marginalised is the digital entrepreneurship phenomena in Italy.

The following results are a pure reflection of the overall entrepreneurial ecosystem and for the most they testify the incapability of the Italian productivity system to keep-up with the digital revolutions perpetrated by worldwide industries.

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

1) A Massive financial commitment to Ultrabroadband and 5Gs technologies that, despite the positive results, does not help Italy to scale up its Connectivity score (25th out of the 28 Member States)
2) A national strategy (Agenda Digitale Italiana) to favour, assist and leverage on ICT technologies potentials for economic development and industrial competitiveness – consistently with the objectives and targets as foreseen and indicated by the European Agenda.

The main objective of the Digital Agenda for Italy is to profile digital policies and strategies in the Italian national context, including actions and roles for the development of technologies, innovation and digital economy.

The Digital Agenda is under the responsibilities of six ministries on the basis of the contextual objective and action plan 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
- The nominated representatives of the Italian Regions, Provinces and Municipalities

[19] ENTREPRENEURIAL ACTIVITY AND EDUCATION IN ITALY; Nicola Curci (Bank of Italy), Alessandra Micozzi (Polytechnic University of Marche)

Policy Support

In the big frame of the Digital Agenda for Italy, the main interventions have been condensate 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 was promoted by AGID[20] (Agency for Digital Italy) in the key belief that the digitalisation of the private sectors might be possible exclusively through the digital alignment of the Public Administrations first.

For instance, in 2018 the AGID published a very detailed white paper[21] in order to promote and uptake at local and regional policy making level the full embracement of AI technologies in the implementation of their services for citizens.

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

- young and workers for vocational training and transverse digital competences.
- disadvantaged people to overcome the digital divide (gender differences, territorial differences, socio-economic differences, etc.) and to promote social inclusion in order to "trigger" a virtuous cycle in the priority field of digitalisation.

Following the same scope:

– 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 2017 Industry 4.0 National Plan 2017 -2020. The Industry 4.0 National Plan's objective is to boost the investment in new technologies, research and development, and revitalise the competitiveness of Italian companies.

The monitoring of the on-going digitalisation process has been assigned to the Observatory of the Digital Competences: the Observatory carries out investigations and surveys among citizens, students, enterprises and the public administration in order to provide public policies with relevant data, statistics and guidelines for the development of the digital field. It is published every year by AGID.

[20] AGID is the top public institution in the Digital Field, it is under the Prime Minister´s Office

[21] L'Intelligenza Artificiale a Servizio del Cittadino, AGID, 2018 (https://ia.italia.it/assets/librobianco.pdf)

From 2018, key features are represented by the "Competences Centres" supposed to stand as strategic innovation hub in the intersection zone between public and private sectors where universities, scholars, public administrators and SMEs boost tech transfer and training services to sustain industrial research priorities and workforce's competitiveness.

Regardless of the positive results in absolute terms, even the biggest Italian cities, considered at national level as "best example standards", are among the less digital friendly urban areas in Europe[22] – only Milan, Turin and Rome figure in the chart respectively in 38th, 52nd and 53rd position out of the 60 cities considered.

Not by chance, these results are perfectly consistent with their business-friendliness appeal – Turin gains some points and occupies the 44th result, Rome remain at the bottom of the chart and Milan slips way back in 56th position.

Growing through e-commerce

The Italian e-commerce market turnover grew by 17% to in 2017, reaching EUR 23.6 billion: the number of e-shoppers reached 22 million in 2017 (+ 10% from 2016) and in the same year products 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[23].

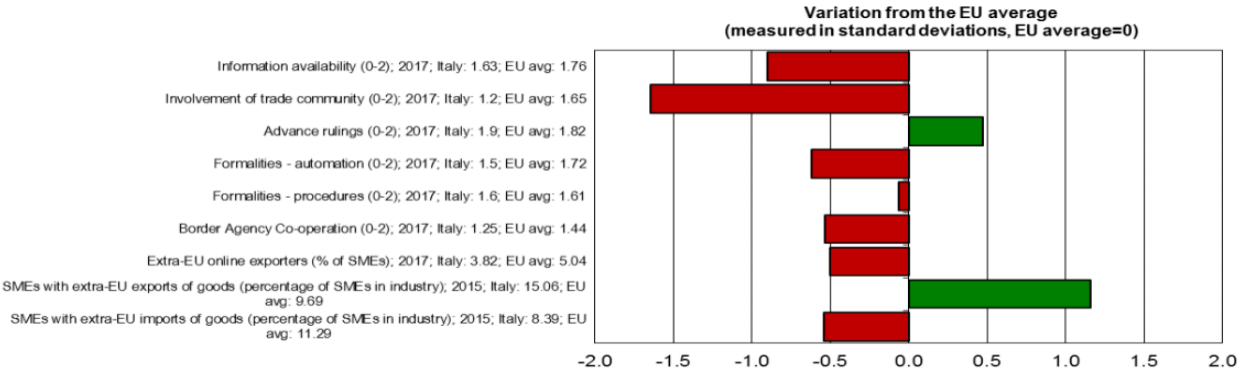
In 2018, the Italian e-commerce accounted for the 15% of the total extra-EU exports[24] and an official report published by the Communication Office of Amazon estimated that in the same year Italian Small and Medium Enterprises Selling on Amazon were more than 12,000 and Delivered Export Sales Over €500 Million[25].

Italy is the 13th largest market for e-commerce with a revenue of US$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[26]. However, Italian SMEs are still challenged by severe barriers to e-commerce exploitation[27], mainly:

[22] EDCi – European Digital City Index (https://digitalcityindex.eu/)
[23] ITALIAN MARKET : E-COMMERCE (https://import-export.societegenerale.fr/en/country/italy/ecommerce)
[24] 2018 SBA Fact Sheet – Italy, European Commission (https://ec.europa.eu/docsroom/documents/32581/attachments/16/translations/en/renditions/native)
[25] 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)
[26] E-COMMERCE MARKET ANALYSIS: The eCommerce market in Italy (https://ecommercedb.com/en/markets/it/all)
[27] Does e-commerce facilitate or complicate SMEs' internationalisation?; Multinacionales en un Cambiante Contexto Internacional; Elia, Giuffrida e Piscitello, n.909, 2019

- 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 language barriers
- The legal aspects concerning e-commerce
- An overall ignorance about the appropriate digital channels for online payment systems
- The mentioned services are all easily accessible on the market, but they do not come free: the lack of financial resources to be committed in a professional translation or in export consultancy excludes the digital and international competitiveness of a large sample of Italian entrepreneurs.

Italian SMEs: Internationalisation



Source: 2018 SBA Fact Sheet

As a result, the share of Italian SMEs selling online is the third lowest in EU and the positive trends just listed are observable thanks to the effort of just a few samples of entrepreneurs. For the most, Italian SMEs are highly underrepresented in the digital markets: an untapped potential that testifies a missing opportunity not only for the entrepreneurial network but for the national Economy overall[28].

Governing Digital Markets

As stated by the Ministry of Economic Development[29], 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, according to shared rules and regardless of where they are.

The implementing approach evolved around seven pivotal points:

[28] ENHANCING THE CONTRIBUTIONS OF SMEs IN A GLOBAL AND DIGITALISED ECONOMY, OECD 2017 (https://www.oecd.org/industry/C-MIN-2017-8-EN.pdf)

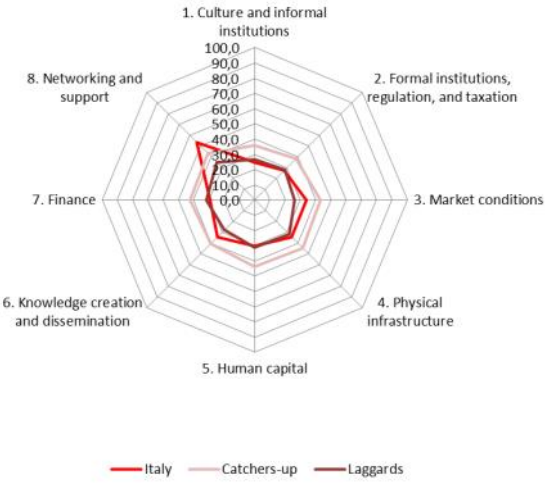
[29] THE DIGITAL SINGLE MARKET: THE ITALIAN POSITION. MISE (https://www.sviluppoeconomico.gov.it/images/stories/pubblicazioni/Position_paper_on_DSM_ITALY_EN.pdf)

1. Digital market and investments: improving interoperability, fostering e-commerce, harmonizing fiscal policies
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 ICTs: 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 on multiple educational and public awareness dimensions, after eight years from the public announcement of the "digital revolution", the Italian enterprises are still in the queue of the digitalisation process mainly because of:

- Lack of a consistent institutional back-up for digital entrepreneurship[30]

The European Index of Digital Entrepreneurship Systems : Italian Country Snapshot



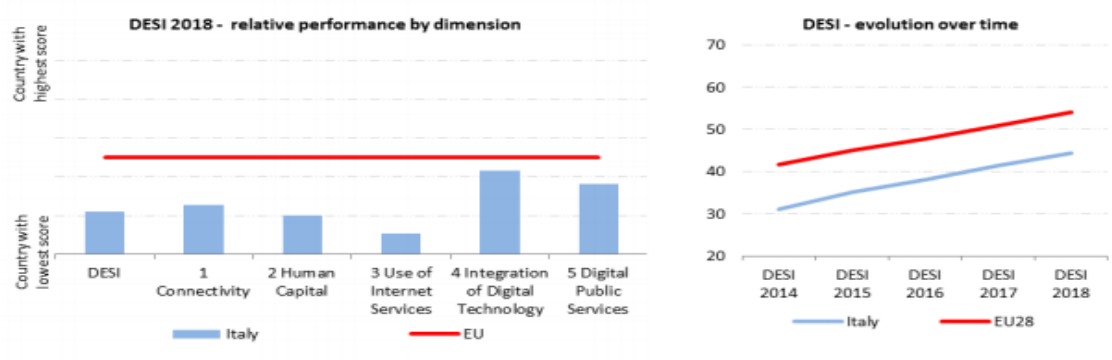
Source: The European Index of Digital Entrepreneurship Systems, 2018

- Lack of a consistent cultural embracement of ICT and Digital solutions for entrepreneurial competitiveness[31]

[30] The European Index of Digital Entrepreneurship Systems, EU Commission, 2018 (https://publications.jrc.ec.europa.eu/repository/bitstream/JRC112439/jrc112439_eides_report.pdf)
[31] EIDES 2019, The European Index of Digital Entrepreneurship Systems, EU Commission, 2019 (https://publications.jrc.ec.europa.eu/repository/bitstream/JRC117495/jrc117495_eides_2019_final_with_identifiers.pdf)

- Digitally low-skilled employees and low attraction to high skilled foreign personnel – a strong gap that persist for 2018 and 2019[32]
- A missing cohesive and reliable "digital skills strategy" – so much that Italy is ranked 25th out of the 28 Member States[33]

Italian index of performance



Source: Digital Economy and Society Index (DESI) 2018 Country Report Italy

- The digitalisation strategy has been translated on the operational level following a delegation-criteria. The transfer of responsibility from State to Region has proven to be not efficient at all, mainly because it resulted more in a list of single and independent actions rather than a systemic network of interventions[34]

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

– 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 and only 5% of the firms are fully committed in e-commerce[35]

– 80% of the Italian enterprises never perceived the need to invest in new digital solutions for their business[36]

[32] IMD WORLD DIGITAL COMPETITIVENESS RANKING 2018 & IMD WORLD DIGITAL COMPETITIVENESS RANKING 2019

[33] Digital Economy and Society Index (DESI) 2018, Country Report Italy (https://ec.europa.eu/information_society/newsroom/image/document/2018-20/it-desi_2018-country-profile_eng_B4406C8B-C962-EEA8-CCB24C81736A4C77_52226.pdf)

[34] SUPPORTING YOUTH ENTREPRENEURSHIP IN ITALY. A REVIEW OF POLICIES AND PROGRAMMES, OECD 2016 (https://www.oecd.org/employment/leed/Italy-Youth-Entrepreneurship-Report-FINAL.pdf)

[35] Strategia per la crescita digitale 2014-2020, Presidenza del Consiglio dei Ministri, 2015

[36] Level of digital innovation in companies in Italy 2017, by investment size, Statista Research Department, 2020

Such dangerous trend is even more significant among SMEs and microenterprises, which stand for the real Economic "muscle" of the country: 66% of the Italian SMEs show cultural indifference to whatever relates to digital and ICT empowerment[37] and the level of digitalization appears largely different between large and small enterprises.

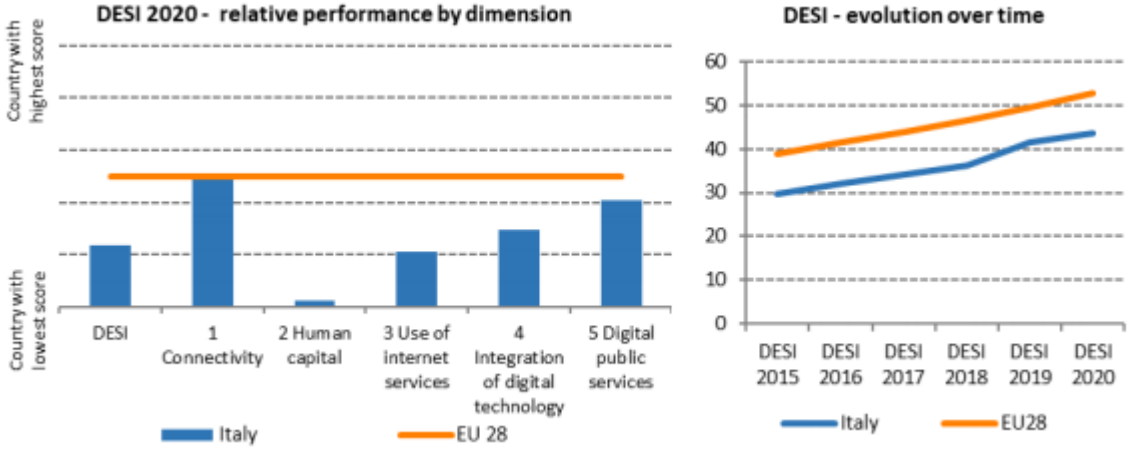
Despite the investment and the efforts of the Government, Italians are for the most highly digitally unskilled. Not surprisingly one of the demographic categories who struggle the most with digital technologies (male, 50 – 55 y/o) match the traits of the average Italian entrepreneur (male, above 50 y/o)[38].

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 44.0% of companies with at least 250 employees and by 12.2% of companies with 10 to 49 employees[39]. Of those who proactively engaged in-dept IT exploitation processes, 30% analysed big data; 13% used 3D printers / 3D and virtual modelling and 26% robotic engineering and automatization. A sample of the firms with at least ten employees (22.4%) considered the development of digital awareness and tech-competences one of the three main competitive factors for 2018-2019, along with public facilities (48.5%) and access to ultra-broadband infrastructures and connections (30.8%).

Despite all the investment and efforts of the Government, Italians remains for the most digitally unskilled and unaware of IT culture[40]. The latest DESI results[41] provide a snapshot even more significant: while there are some very consistent results from the "Connectivity" perspective, Italy still ranks at the bottom of the chart with no sign of substantial performance under all the other considered parameters.

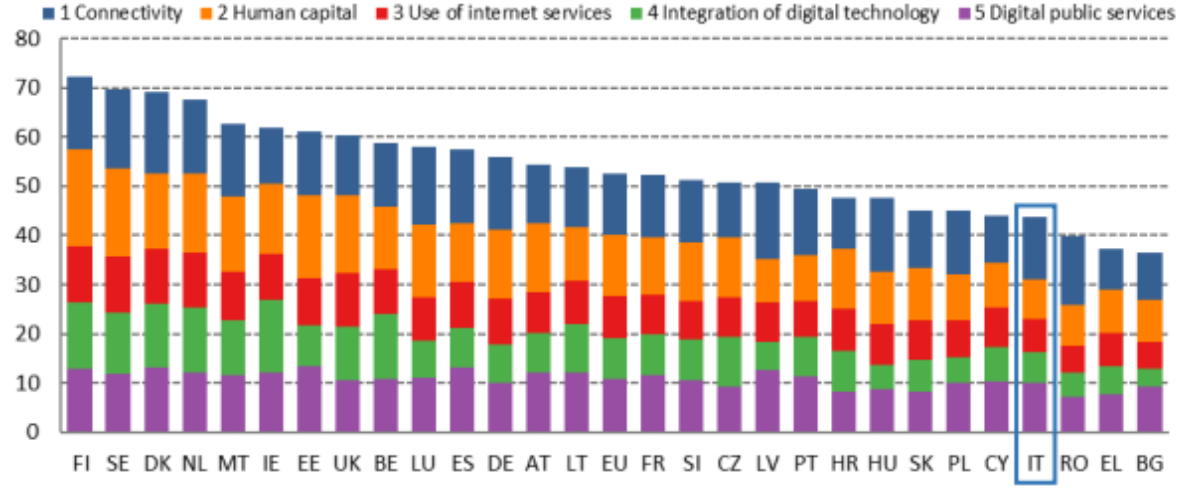
[37] il grado di innovazione e digitalizzazione delle imprese Italiane alla luce dell'edizione 2018 del rapporto istat sulla Competitività dei settori produttivi; Ministero dello Sviluppo Economico – 2018
[38] ISTAT, Entrepreneurship in Italy, 2015
[39] ISTAT, ENTERPRISES AND ICT IN ITALY, 2018
[40] ISTAT, Citizens, Enterprises and new technologies, 2015 (http://www4.istat.it/en/archive/citizens+and+new+technologies)
[41] DESI 2020 – ITALY snapshot (https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=66918)

Italian Index of Performance



Source: Digital Economy and Society Index (DESI) 2020 Country Report Italy

Digital Economy and Society Index (DESI) 2020 Ranking



Source: Digital Economy and Society Index (DESI) 2020 – General EU snapshot

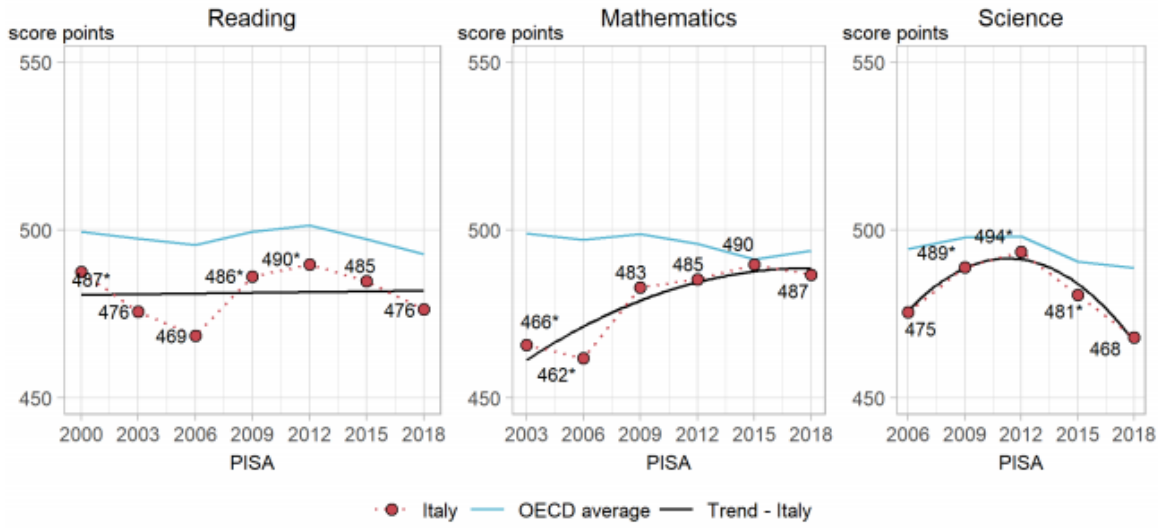
Overview of HE CONTEXT in Italy

According to an EY's report[42], among all G20 countries the Italian digital ecosystem is listed as the less favourable to promote, reinforce, straighten and enhance youth digital entrepreneurship. With such a strong resistance opposed to digital economy by the largest representation of the Italian entrepreneurial population, the future well-being and competitiveness of the Italian industries depends on how digital entrepreneurship is taught and "communicated" to aspiring entrepreneurs.

Educate:

Digital Entrepreneurship education is highlighted as a core and distinctive element for business success, regardless of the specific market. The HE and school system in Italy needs to enhance the "digital entrepreneurs" mindset providing knowledge, contacts, training and consistent institutional support. Not surprisingly, according to the latest PISA' s census[43], Italian young adults are among the worst performers in scientific subjects scoring results way below the average in Science, Mathematics and Reading – three subjects that are profoundly preparatory to the development of advanced digital and IT skills.

Trends in performance in reading, mathematics and science



Source: Programme for International Students Assessment (PISA) – Results from PISA 2018

[42] Disrupting the disruptors. Disrupting youth entrepreneurship with digital and data: the digital opportunity to empower young entrepreneurs for growth (https://www.ey.com/Publication/vwLUAssets/EY-disrupting-the-disruptors/$FILE/EY-disrupting-the-disruptors.pdf)

[43] Programme for International Students Assessment (PISA) – Results from PISA 2018 (https://www.oecd.org/pisa/publications/PISA2018_CN_ITA.pdf)

With a view to institutional and policy priorities, fresh graduates and young aspiring entrepreneurs cannot leave behind their university education without strong and reliable digital and ICT competences. The most recent effort (April 2020) is represented by the launch of the Italian Coalition for Digital Skills – a multidimensional initiative to foster, boost and mainstream ICT competences at any level of society[44].

According to the National Observatory of the Digital Competences, the new categories of IT Skills[45] follow under the following taxonomy:

- Software management, which appears fundamental in both operative and decisional 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: search for information online, managing data, understanding the web potential for information gathering, basics of search engines, storing data and information
- Online customers engagement (social media, analytics, search engine marketing, e-mail marketing and mobile advertising, social selling)

To date, actors from the private sector are at the forefront of the digital entrepreneurship education horizons, proactively designing, implementing an organising by their own sustainable initiatives to empower ICT awareness among young aspiring entrepreneurs.

These projects bring together multiple groups of interest and leveraging on student-centred learning experiences resulted to be highly effective. For the most, they rely on business simulations and entrepreneurial challenges where students are called to invest their best critical and creative thinking skills.

Just for example, in University2Business – a best-practices exchange platform promoted by NetworkDigital 360, the biggest Italian network of practitioners to sustain the digital transformation of the country – students engage real-life management scenarios that asks for disruptive solutions.

[44] https://ec.europa.eu/digital-single-market/en/news/italy-launches-its-national-coalition-digital-skills-and-jobs

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

In the previous editions, students had to measure their competences against complex forecast challenges trying to define the future of mobility, energy, Human and Machine interaction, etc. That way students are adequately equipped to better understand the changes taking place in the labour market, and to develop the most consistent skills / background for themselves.

Similar initiatives are also implemented by H-FARM, the largest innovation center in Europe dedicated to the creation of new business models and the education of young people and companies in a digital perspective.

Through its eLearning platform, H-FARM shares with the general public a very wide set of webinars, courses with self-assessment tools, interviews, open days, streaming events, online lessons, training and entertainment resources for digital education and ICT awareness. To date, the headquarters of the organisation regularly host more than 40 training programs on ICT and digital literacy for all ages and cultural backgrounds. These courses track professional specialisation in Digital management, Dynamic branding, Digital Entrepreneurship, Business Communication, Business strategy, Digital Marketing and Experience Design, Information technology and Law, Storytelling and Executive Communication, 3D design and concept art, Project Management, Blockchain, SEO & SEM and many more.

Talking about education and digital technologies, It is extremely important to combine the traditional leadership paradigms to the emerging business models that stand on profoundly different decision-making frameworks. In other words, it is necessary to remodel how digital-friendly leaders think and act in the digital era where information is now a key strategic asset as much as more canonical ones.

The narrowing of the perceived mismatch starts from some radical paradigm shift that invest the primary actors of the entrepreneurial education. The new digital curricula developed by Universities and formal entrepreneurial support systems might result is a very sterile and "empty" intervention if not coherently addressed from a cultural perspective too.

Stimulate:

According to a PWC Italy's research[46], the real "trigger" and stimulating effect of a reliable and tangible digital entrepreneurship culture comes with:

[46] Digital Skills : Come ripensare l'istruzione e la formazione nell'era digitale: competenze digitali e nuovi modelli per l'apprendimento (https://www.pwc.com/it/it/publications/assets/docs/PwC_Ufficio_Studi_Digital_Skills.pdf)

- 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 common and basic knowledge
- The recognition from teachers, trainers and mentors of their role not as much as theoretical-knowledge transmitters but as pure, creative and concrete catalysts of experienced-based and know-how source
- The digital upgrade of those who are called to these responsibilities

While the education dimension mainstreams the core content of the Italian HE's digitalization, the stimulating channels canalize the necessities and action plans related to the digitalization of the national economy.

The digital transformation process becomes an element actively supporting innovation in all HEI missions from two perspectives:

- INTERNAL to HEIs; with a new mindset taking into account the challenges and opportunities brought by digitalisation and new digital processes supporting students, staff and researchers
- EXTERNAL to HEIs; with the enabling role that HEIs must play to foster digital innovation and support a wider ecosystem formed by firms[47].

The third element that completes the equation is represented by the actors invested in the leverage dimensions. Their responsibility is to exploit and valorise digital entrepreneurship opportunities for the new generation of Italian entrepreneurs.

the success of this very complex process undeniably requires the proactive engagement of several actors in their role of primary entrepreneurship facilitators[48]:

- Chamber of Commerce and Business Associations;
  Interview findings with the senior staff of Business Support Associations reveal that their role is more important in small cities than in major cities. In the smaller cities ICT aspiring entrepreneurs are more open in accessing the services offered by the

[47] OECD Skills Studies: Supporting Entrepreneurship and Innovation in Higher Education in Italy (https://www.oecd-ilibrary.org/docserver/43e88f48-en.pdf?expires=1587930360&id=id&accname=guest&checksum=477FFAACBB4961C6436B4E4F2C7E8AE7)

[48] "ENTREPRENEURSHIP & NEW VENTURE CREATION" - Key Elements of The Entrepreneurial Ecosystem Facilitating the Growth of ICT Entrepreneurs in Italy. Lal, Colombo, Corno

associations (consultants, legal advisors, etc.) and their close relationship is also mutually rewarding.

- Incubators/accelerators;

  Findings suggest that:

  - Most of the times, especially for ICT enterprise, Incubators have the role to provide only the workspace and logistic support.

  - Incubators are able to provide limited support for access to funding that most of the time is not enough to scale-up the business.

  - Regional incubators have a strong appeal on their territory because they tend to focus their efforts mainly on local businesses in order to better monitor and evaluate their development plan.

  - very often, incubators and accelerators need to replace themselves to HEIs providing the knowledge that their clients didn't get from Universities.

- Venture Capitalists/Angels;

  The scenario of venture capital in Italy is one of the least developed in Europe. This does not mean that there are no interesting opportunities in Italy. There are a large number of VC firms investing in early stage entrepreneur ventures with a fairly good success rate but lots of them prefer to invest in other countries more digitally responsive and with higher potential returns.

- Banks and financial intermediaries;

  For the most, banks remain outside of the digital entrepreneurship's coordinates. Banks offer a range of standard products and are able to tailor to the real needs of companies very minimally – let alone very small incubated digital businesses. Often, Italian Banks have branch operating in other countries that do not serve Italian clients residing in Italy. Their operations abroad offer only networking services with professionals, consultants, lawyers without any effective support mechanisms fine-tuned to business scaling.

- Professors and academics;

  Scholars represent the group of interest more attached to the topics of digital entrepreneurship. They represent the category who press the most to shift from an entrepreneurship paradigm driven by profit and short-term revenue necessities to one lead by innovation and opportunity recognition. ICT acts as a strategic and critical tool to successfully implement such translation and when they have the opportunities,

scholars are at the forefront of a renewed policy discussion to fully embrace ICT and digital exploitation.

Incubate:

Startups, Spin-offs and Incubation phenomena gained great interest among researchers and experts since the beginning of the last decade in parallel to the definition of a specifically dedicated policy act – the so called "innovative Startup act" (2012).

Few research dated back to the same years, while highly positive about the short run results assured by the growth in number of spin-offs an incubators [49], highlighted few scepticisms that addressed two main aspects:

- the long-term sustainability and competitiveness of the programme
- the geographical heterogenization of the phenomenon – so that all local socio-economic networks might easily benefit from the emerging of these realities within their territories

In other words, the main concerns were related to the prevail of quantitative priorities (the growth in number of spin-offs realities) over qualitative ones (their effective potential to survive the market's dynamics)[50].

Since 2012, the Startup act has been further regulated with numerous ministerial decrees mainly focused on the perspectives of tax and financial incentives[51]. The partial lack of a unified strategic horizon allowed for an evolution of the Strartup phenomenon in a highly diversified way that soon rewarded north and north-west regions – which historically represent the industrial bulk off the country.

One of the most comprehensive census of Italian incubators has been published by The Central Bank of Italy in 2014 and reviews services, offers and general status of 61 facilities recognised as formal incubators. The analysis is integrated with few interviews submitted to early start-uppers who before others decided to exploit the incubation opportunity.

[49] Colombo M., Delmastro M.; How Effective are Technology Incubators? Evidence from Italy; Research Policy, 2012.
[50] Rolfo S., Salvador E.; Are incubators and science parks effective for research spin-offs? Evidence from Italy, Science and Public Policy 38 (3); 2011
[51] A systemic timeline of the Startup Act's regulatition is available at the following link: https://www.mise.gov.it/index.php/it/impresa/competitivita-e-nuove-imprese/start-up-innovative/start-up-act-normativa

Here we provide few highlights from the snapshot[52]:

Incubators' distribution among private and public sector (%)

Area	Public	Private
North-West	50	50
North-Est	58,8	41,2
Centre	58,8	41,2
South	90,9	9,1

Incubators' distribution among profit and non-profit sector (%)

Area	Non-profit	Profit
North-West	71,4	28,6
North-Est	66,7	33,3
Centre	73,3	26,7
South	100	/

Focus and institutional objectives of the incubator on a scale from 1 to 5 (%)
1: "little importance"; 5: "extremely relevant"

Objectives	1-2	3	4-5
Local employment	7,1	5,5	87,3
Industrial and economic empowerment	10,9	5,5	87,3
International networking and transnational partnerships	37,1	24,1	38,9
Technology transfer	29,7	24,1	46,3
Sustain complementary benefits for partners (i.e. Academic spin offs)	27,8	20,4	51,8
Sustain income and profit priorities for partners	22,5	15,9	61,6

Services and offers on the basis of incubators' nature (%)

Services	Public	Private	Non profit	Profit	Linked to/in collaboration with HEIs		
					Strongly	Fairly	Not at all
Workspaces	52,8	31,6	37,9	38,5	29,2	46,2	53,8
General facilities	27,8	10,5	13,8	15,4	16,7	7,7	23,1
Tutoring and Mentorship	58,3	42,1	51,7	69,2	45,8	69,2	53,8
Networking w/ research institutions	33,3	15,8	20,7	30,8	37,5	38,5	7,7
Networking w/ clients and suppliers	8,3	5,3	3,4	15,4	8,3	15,4	/
Networking w/ consultants and experts	2.8	5,3	3,4	/	8,3	/	/
Marketing	13,9	5,3	6,9	15,4	8,3	15,4	15,4
HR and recruitment	/	5,3	/	7,7	/	/	7.7
Finance, credit and taxes	8,3	15,8	10,3	15,4	12,5	7,7	15,4
Administration	2,8	26,3	6,9	23,1	12,5	15,4	7,7
Intellectual property	13,9	5,3	24,1	/	20,8	7,7	7,7
Legal	/	/	/	/	/	/	/

[52] All tables are extrapolated form: Auricchio M, Cantamessa M., Colombelli A., Cullino R., Orame A., Paolucci E.; Gli Incubatori d'impresa in Italia; Banca d'Italia, 2014.

Firms' lifecycle and Incubators' involvement (%)

	Participation of the incubator		
Life Cycle	**High**	**Medium**	**Low**
Inception	41,4	16,6	42
Start of the business	28,2	25,6	46,2
Execution (i.e. product testing)	12	8,7	79,3
Commercial development	12,8	12,8	74,3
Capital fundraising	17,3	9,3	73,3

Common perception of Incubators' relevancy for strategic competitiveness and success (%)

Common perception and general evaluation	Firm that just got out of the incubation process	Firms that are still thorough incubation
Crucial and essential for business success	17,8	27,4
Important but neither essential nor crucial	57,5	58,3
Not very important	24,7	14,3

Incubation phase and relevancy of the services offered by the incubator (%)

Services	Deemed as essential	Deemed as useful but not provided	Total of services exploited by the firm
Workspaces	72,7	33,5	1,2
General facilities	67,1	24,8	3,7
Tutoring and Mentorship	53,4	22,4	8,1
Networking w/ research institutions	36	6,8	11,8
Marketing	27,3	9,9	27,3
Administration	25,5	20,5	14,3
Networking w/ clients and suppliers	25,5	10,6	29,2
Finance, credit and taxes	22,4	11,8	12,4
Intellectual property	15,5	12,4	13,7
Networking w/ consultants	15,5	0,6	8,7
Legal	13,7	8,7	14,9
HR and recruitment	11,8	3,1	10,6

To date, the most significant integration to the Startup Act came in 2016 when the Italian Government recognised few formal requirement that certifies the recognition of Incubator (listed here). In 2017, the number of Italian Incubators "officially" recognised by MISE and the Italian Network of Chambers of Commerce was 38[53]:

[53] startup.registroimprese.it: (http://startup.registroimprese.it/isin/report?fileId=incubatori.pdf)

1) FVB S.R.L.	14) ALMACUBE S.R.L.	28) BP CUBE S.R.L.
2) JCUBE SRL	15) NOI S.P.A.	29) SEREA S.R.L.
3) INCUBATORE DI IMPRESA DEL PIEMONTE ORIENTALE S.C.A.R.L. SIGLABILE ENNE3	16) THE NET VALUE S.R.L.	30) INNOVA S.R.L.
4) INLAB S.R.L.	18) 012FACTORY S.R.L.	31) LAZIO INNOVA - SOCIETA' PER AZIONI
5) INCUBATORE DEL POLITECNICO - S.C.P.A. OPPURE I3P - S.C.P.A.	19) SVILUPPO COMO - COMONEXT S.P.A.	32) LVENTURE GROUP - SOCIETA' PER AZIONI
6) SOCIETA' PER LA GESTIONE DELL'INCUBATORE DI IMPRESE E IL TRASFERIMENTO TECNOLOGICO DELL'UNIVERSITA' DEGLI STUDI DI TORINO SOC. CONS. A R.L. SIGLABILE 2I3T SOC. CONS. A R.L.	20) NANA BIANCA S.R.L.	33) MARZOTTO VENTURE ACCELERATOR S.R.L.
7) SOCIALFARE IMPRESA SOCIALE S.R.L.	21) TIGULLIO DIGITAL SOCIETA' A RESPONSABILITA' LIMITATA	34) PI CAMPUS S.R.L.
8) BIC INCUBATORI FVG S.R.L.	22) DIGITAL MAGICS S.P.A.	35) ABINSULA S.R.L.
9) INNOVATION FACTORY S.R.L	23) IMPACT HUB SRL	36) TRENTINO SVILUPPO S.P.A.
10) H-FARM S.P.A.	24) MAKE A CUBE S.R.L.	37) VEGA - PARCO SCIENTIFICO - TECNOLOGICO DI VENEZIA S.C.A.R.L.
11) T2I - TRASFERIMENTO TECNOLOGICO E INNOVAZIONE S.C. A R.L.	25) POLIHUB SERVIZI S.R.L.	38) CAMPANIA NEWSTEEL S.R.L.
12) FRIULI INNOVAZIONE, CENTRO DI RICERCA E DI TRASFERIMENTO TECNOLOGICO - SOCIETA' CONSORTILE A RESPONSABILITA' LIMITATA	26) SUPERNOVA S.R.L.	39) POLO TECNOLOGICO DI PORDENONE SOCIETA' CONSORTILE PER AZIONI
13) TECHINNOVA S.R.L.	27) BIO4DREAMS S.P.A.	

However, from 2018 to 2019 the Social Innovation Monitor observed a significant expansion[54] of the phenomenon: the number of organisations formally recognised as incubator remained the same, but the overall number of institutions that operates as an incubator / accelerator is very close to 200 units.

[54] Impatto degli incubatori/acceleratori italiani, report 2019 (https://socialinnovationmonitor.com/report-incubatori/)

Geographical distribution of Italian incubators / accelerators

Source: Social Innovation Monitor – Politecnico di Torino, 2019

As expected, there is a still a clear geographical concentration of incubators / accelerators among North-west regions. The incubator / accelerators population is distributed as follows:

Legal Ownership

Public	30 (15,2 %)
Public-Private	44 (22.4 %)
Private	123 (62,4 %)

Type of incubators

Business Incubators	39 (48,1 %)
Mixed Incubators	29 (35,8 %)
Social Incubators	13 (16,1 %)

Out of all 200 units, 39 incubators are direct spin-offs of HEIs:

1) FVB S.R.L.	14) ALMACUBE S.R.L.	28) BP CUBE S.R.L.
2) JCUBE SRL	15) NOI S.P.A.	29) SEREA S.R.L.
3) INCUBATORE DI IMPRESA DEL PIEMONTE ORIENTALE S.C.A.R.L. SIGLABILE ENNE3	16) THE NET VALUE S.R.L.	30) INNOVA S.R.L.
4) INLAB S.R.L.	18) 012FACTORY S.R.L.	31) LAZIO INNOVA - SOCIETA' PER AZIONI
5) INCUBATORE DEL POLITECNICO - S.C.P.A. OPPURE I3P - S.C.P.A.	19) SVILUPPO COMO - COMONEXT S.P.A.	32) LVENTURE GROUP - SOCIETA' PER AZIONI
6) SOCIETA' PER LA GESTIONE DELL'INCUBATORE DI IMPRESE E IL TRASFERIMENTO TECNOLOGICO DELL'UNIVERSITA' DEGLI STUDI DI TORINO SOC. CONS. A R.L. SIGLABILE 2I3T SOC. CONS. A R.L.	20) NANA BIANCA S.R.L.	33) MARZOTTO VENTURE ACCELERATOR S.R.L.
7) SOCIALFARE IMPRESA SOCIALE S.R.L.	21) TIGULLIO DIGITAL SOCIETA' A RESPONSABILITA' LIMITATA	34) PI CAMPUS S.R.L.
8) BIC INCUBATORI FVG S.R.L.	22) DIGITAL MAGICS S.P.A.	35) ABINSULA S.R.L.
9) INNOVATION FACTORY S.R.L	23) IMPACT HUB SRL	36) TRENTINO SVILUPPO S.P.A.
10) H-FARM S.P.A.	24) MAKE A CUBE S.R.L.	37) VEGA - PARCO SCIENTIFICO - TECNOLOGICO DI VENEZIA S.C.A.R.L.
11) T2I - TRASFERIMENTO TECNOLOGICO E INNOVAZIONE S.C. A R.L.	25) POLIHUB SERVIZI S.R.L.	38) CAMPANIA NEWSTEEL S.R.L.
12) FRIULI INNOVAZIONE, CENTRO DI RICERCA E DI TRASFERIMENTO TECNOLOGICO - SOCIETA' CONSORTILE A RESPONSABILITA' LIMITATA	26) SUPERNOVA S.R.L.	39) POLO TECNOLOGICO DI PORDENONE SOCIETA' CONSORTILE PER AZIONI
13) TECHINNOVA S.R.L.	27) BIO4DREAMS S.P.A.	

Overall speaking, the report clearly highlights how the incubator / accelerator ecosystem enhance and boost two distinctive economic priorities

National Growth and GDP

Estimated turnover of Italian incubators in 2017	**€222 Millions**
Estimated turnover of Italian incubators in 2018	**€391 Millions**

Employability

People employed by Italian Incubators in 2017	**927**
People employed by Italian Incubators in 2018	**1,094**

Success/Failure factors and Recommendations

The last comments[55] provided on the "Industria 4.0" plan highlighted few lessons and recommendations for further discussion that emerged as very critical factors in terms of policy design.

Success factor

- Financial aid – The Italian experience proved the fact that, when aimed to sustain concrete, credible and tangible initiatives, financial contributions can immediately trigger the effective exploitation of the opportunities envisioned by the action / project beneficiary of the founding.
- An "invisible hand" in action – Public interventions resulted to be a very disruptive factor to an efficient implementation of the digitalisation plan and experience-based scenarios have shown that it is much better to avoid any unnecessary public interference when businesses seem to have already a clear vision of what they need to achieve their target.
- The relational dimension – The few successful experiences observed at national level share all a very distinctive portfolio of stakeholders proactively engaged from the very inception of the initiative. In those cases highlighted as "best practices scenarios", all the different ecosystems revolving around ICT culture and digital entrepreneurship come together to share their unique perspectives and expertise in order to enrich and empower the theoretical and operational assumptions at the fundamentals of the specific project.
- Knowledge transfer – From an organisational perspective, these operators coordinated each other relying on mutual trust and in-dept cooperation mechanisms. The formal overcoming of a "traditional" hierarchy and the equal distribution of roles and responsibilities among the participating parties allowed the effective and efficient transfer of the knowledge and ultimate results, both inside and outside of the partnerships.

[55] Digital Transformation Monitor. Italy: "Industria 4.0", 2017 (https://ec.europa.eu/growth/toolsdatabases/dem/monitor/sites/default/files/DTM_Industria4.0_IT%20v2wm.pdf)

- Training specialisation – Interestingly, these highly successful initiatives emerging from the dialogue among HEIs, digital and ICT practitioners and VET are always specifically fine-tuned to well-defined needs and targets. In other words, these projects / actions do not address general training needs related to understanding of digital technologies, but they all targeted a niche of the market (i.e. digital technologies for 3D modelling in manufacturing industries; ICT solutions for logistics and value chain in engineering industry; marketing and digital communication for Fashion and Luxury goods; etc.).

Failure factors

- ICT skills measurement – The parallel focus on tech infrastructures and digital skills is one of the main features of the framework, however, the means that planned to boost the investment in technology and innovative processes shows results in the short run, while measures focusing on IT capabilities development require much more time to be implemented and even greater time to show first signs of positive impact.
- Short term benefits over long term return – From a quali-quantitative perspective, the main risk concerns an overall underperformance of the training programmes and public awareness on digital competences if not duty aligned and coordinated with all the other efforts.

  Not surprisingly, the results from DESI 2020 show that, despite the very interesting "Connectivity" performance, the "Human Capital" rank is getting even worst if compared to the data from 2018 and 2019.
- Focus dispersion – So far, medium and large companies are the only ones leading a new digital paradigm while SMEs appear still as disinterested spectators. Such trend risk to further widen the competitive gap already existing between the two entrepreneurial realities to the complete disadvantage of the latter. The existing policy plans made very few distinctions between the different businesses in terms of sizes, sectors, and most importantly, financial capacity; such "one-fit-for-all" approach resulted in a formal detachment between theoretical and operative dimension.
- A missing cultural engagement to ICT and digital environments – The biggest threats are represented by two main features that needs adequate consideration: low interest of SMEs to invest in ICT despite of what show by global statistics; Insufficient reaching of microenterprises and small companies. The cultural attachment to traditional models is so deep-rooted that the digital transformation of the country might require much longer and much more "social" efforts that expected considering that more than 1/4 of

the Italian SMEs are established in the south side of the country[56], a rural territory that severely lacks of primary and "basic" infrastructures and services.

Recommendations:

On the basis of the lessons learned, here below a brief list of recommendations and best practices in order to make the process more inclusive as possible are:

From the implementation perspective:

- Operate in a technological neutrality logic
- Implement horizontal actions rather than vertical or sectorial ones
- Operate on enabling factors (investments in innovation, broadband infrastructure, skills)
- Steer existing instruments to promote technological leap and productivity
- Coordinate key stakeholders without acting as a controller or intervene into the decision making
- Incentivising 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, research entities, etc. should all contribute to the definition of this long-term vision concerning the role of HEIs for digital entrepreneurship in Italy – especially in the South
- Supporting and valorising cultural discussion, knowledge exchange and collaboration activities as something greatly enriching for faculty members and students
- Mainstreaming a student-centred teaching paradigm. Involving students, at all levels, in collaboration with external stakeholders

From the Communication perspective:

- Disseminating the knowledge and expertise related to the benefits emerging from I4.0 investments
- Identifying and capturing technology needs and challenges
- Financial empowerment of Technology transfer Centres
- Providing financial assistance in the implementation of industrial research projects
- Stimulating external engagement in the governance of HEIs

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

- Supporting cooperative paths and knowledge exchange initiatives between HEIs and entrepreneurial ecosystem – something that to date has been possible only thanks to the private will of individuals.

From the policy perspective: a national agenda specifically dedicated to SMEs digital competitiveness:

- Full availability and efficiency of IT infrastructures
- National funds and economic resources to encourage and incentive the digital renovation of Italian entrepreneurship
- Strengthening entrepreneurship education throughout the school system, VET and HE combined with digital empowerment and ICT literacy
- Promote role models for youth entrepreneurs

IDEA Country report: Poland

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IBAF INSTITUTE FOR FINANCIAL RESEARCH AND ANALYSES

Summary of findings

Polish society is noticeably divided into age groups, which naturally correspond to different levels of digital advancement and representation of computer skills. This has its justification in the history of Poland, as well as political and economic conditions that have existed in the country for decades.

The Polish government's response to the current state of digital advancement in society is represented by several initiatives that focus mainly on equalizing the digital opportunities of Poles and providing them with appropriate technical infrastructure that will enable them to develop digital skills. Parliament's priority was to create a high-speed internet connection in schools that would contribute to the proper education of children and create for them a digital environment. Another important initiative from the government's point of view, in particular the Ministry of Digitization, was to create an internet platform for every governmental institution that would meet the e-government's assumptions and allow citizens to settle matters without leaving their homes.

Initiatives represented by foundations and private companies are much more efficiently suited to the concept of 'digital entrepreneurship development'. Among such projects, the Digital Poland foundation, Sky-shop.pl, Booksy, as well as the Academic Entrepreneurship Incubators deserve recognition. Each of the above-mentioned initiatives represent distinct, characteristic properties and are addressed to a different group of recipients. What definitely connects four of these projects is the fact that they are trying to reach entrepreneurs who would like to emerge directly on the Internet market and develop their ventures in this environment.

The promising point of our report is definitely the part devoted to the presence of academic centers in education, stimulation and incubation of digital entrepreneurship, as well as shaping entrepreneurial attitudes among the key part of society - students. A relatively wide offer of studies, courses and trainings allows to state that the popularization of the subject of digital entrepreneurship among students is actively implemented.

While conducting research on the subject being the main topic of this report, we were unable to find a wide range of reports describing the situation of digital entrepreneurship in Poland. One source that we were able to distinguish was cited in the part devoted to the Warsaw Startup Ecosystem. This confirms our belief that the report prepared by the Institute for Financial Research and Analyses at the University of Information Technology and Management in Rzeszow will effectively fill this information gap and provide valuable results, which in turn will stimulate specific actions aimed at promoting digital entrepreneurship in Poland.

Overview of country context in Poland

Digital infrastructure and fundamentals

The concept of supporting the construction of digital infrastructure is a part of the assumptions of projects implemented by the Polish government, which has set the priority of creating equal digital opportunities for all citizens. In order to be able to focus on the analysis of digital enterprises and initiatives introduced in this topic, it is crucial to have a proper understanding of the situation of Polish society from which entrepreneurs are originating from.

According to the report of Polish Ministry of Entrepreneurship and Technology on entrepreneurship in Poland, the concept of 'digitization' is the basis for the fourth industrial revolution, which naturally becomes present in every area of business activity. The changes coming to the labor market along with the industrial revolution introduce the need for specialized digital competences[57].

Chances of running a successful business without the access to the Internet are very limited. The confirmation of the above-mentioned statement are statistics presented by governmental institutions. According to the Central Statistical Office, in 2018 at least 95% of enterprises and nearly 83% of households located in Poland are provided with an access to the Internet[58]. The basic statistics presented do not, however, reveal the essence of the activities of the Polish parliament, which through its support programs is trying to reach digitally excluded citizens, who largely represent the 45+ age group.

Integrated State Computerization Program

One of the programs founded and implemented by the Polish government is the Integrated State Computerization Program (ISCP). Despite the fact that the main assumption of the initiative is the development of Polish public administration with the use of modern technologies and, as a result, improving the functioning of the state performance for the benefit of the citizens, the document presenting the program of activity also honors the raising of digital awareness and development of digital competences, enabling safe and effective reaping of benefits coming from the development of technology and communication tools. In order to enable citizens to effectively use public

[57] Entrepreneurship in Poland. Ministry of Entrepreneurship and Technology, Warsaw 2018, p. 72.

[58] Information society in Poland. Results of statistical surveys in the years 2014-2018, Warsaw/Szczecin 2018, p. 57, p. 115 – Indicators: Enterprises with access to the internet by size classes and Access to computers in households.

administration channels, which already aim to modernize its service technologies, it is essential to educate the public and improve their digital skills.

Key objectives included in the ISCP documentation include public administration re-organization to services oriented around the needs of the citizen (including digital public services, joint public administration portal, legal changes), implementation of horizontal tools supporting public administration activities (IT infrastructure management, electronic documentation, homogenous public identification system and many others) and development of digital competences among citizens, public administration employees, as well as Information Technology and Communication specialists (establishment of the Administration Competence Center, training specialists in Information Technology and Communication, education of the society)[59]. In order to meet the requirements and given assumptions, it was necessary to prepare infrastructure supporting the project's objectives. The optimal solutions covering this area are currently supervised by the Committee of the Council of Ministers for Digitization and the 'IT Architecture Council', who need an organized set of principles for building a digital state - the so-called 'architecture principles', as well as knowledge of functioning and already built systems to make correct decisions regarding the investment activities, so that they do not duplicate existing or developed solutions, but fill gaps in the planned vision. The AIP model was developed (together with the respective repository) and it defined the method of mapping architectural objects, their connections and identified key functional components ensuring the implementation of e-administration tasks.

The program does not respond directly to the issue of digital skills among entrepreneurs, but focuses on grassroot stimulation of digital competence development in Polish society. The modernization of services directed towards citizens (including entrepreneurs) will automatically affect the recipient of these services, who will participate in them. The Integrated State Computerization Program not only defines the framework of the ongoing digital transformation of Poland, but also aims to present a long-term vision of the digital state. The starting point for the objectives set out in the program document is an analysis that will show the results achieved and the problems identified in the field of integrated computerization.

Nationwide Educational Network by Ministry of Digitization

A government project which clearly falls under the category of 'creating fundamentals of digital infrastructure', was launched by the Polish Ministry of Digitization. A Nationwide Educational

[59] Integrated State Computerization Program for years 2018-2022, September 2019, p. 33.

Network is a technical framework that provides public telecommunications services for schools. One of the goals mentioned in the legal act regarding the project is to increase the level of digital competences among students and teachers by providing them with educational content and Internet access with a bandwidth of at least 100 Mb/s, along with the necessary security services[60]. The implementation of the above-mentioned objectives shall be supervised by National Educational Network Operator, whose duties will include preparation of the network in a specific manner enabling the provision of such services, removal of identified failures, modernization and operation of the network, supervision over its functioning, promotion of the principles of safe use of digital technologies, creating and providing services that facilitate access to digital technologies. If the schools' network infrastructure that is already existing is not satisfactory enough, the Operator is assigned to build a new digital base that will allow accessing the services provided by the program.

The Nationwide Educational Network is a government program with a primary goal of providing basic digital services to Polish citizens. However, unlike the Integrated State Computerization Program, it focuses only on primary, secondary and high schools' students (age range 6-18 years old) and teachers who can represent diverse age groups. This variety of ages ranging from school youth to mature citizens may indicate different advancement of their digital skills.

Digital Poland by Ministry of Funds and Regional Policy

The 'Digital Poland' project is thematically linked to two previous initiatives, because the three basic goals set by the Ministry of Funds and Regional Policy are focused around the following areas:

- uncomplicated access to high-speed Internet (the goal implemented i.e. through investments in the expansion/reconstruction of access and distribution networks),
- e-administration and 'open government' (providing online public e-services through websites and dedicated applications),
- digital competences of society (involving residents of small towns and villages in social life and activities connected with non-governmental organizations, educational campaigns, strengthening the potential of programmers).

[60] Act of 27th October 2017 on the National Education Network. Journal of Laws from 2017, item 2184.

The report on the implementation of the 'Digital Poland' Operational Program for 2018 presents aggregate data on the applications' recruitment procedure, the number of applications submitted, contracts signed and funds which were paid to achieve the above-mentioned objectives. The statistics included in the report show that the number of approved applications is 366 and funds paid are equal to 2,902.54 million euro (including 1,990.57 million euro from European funds), and 332 contracts for co-financing of project activities with a total value of 2,625.87 million euro have been signed (including 1,790.40 million euro of EU funds)[61].

Policy support

UKNF Innovation Hub

The Polish Financial Supervision Authority (UKNF), which is in charge of exercising supervision of the financial market in Poland, has introduced a specific program aimed at fintech enterprises. These particular types of financial businesses often state that unclear regulations and legal requirements stop them from taking action to launch innovative products on the market. The initial UKNF program focuses on supporting fintech companies that need appropriate explanations in relation to the complexities of the law. The Innovation Hub initiative is designed to support the development of modern technologies on the financial market while maintaining the highest standards of security for its customers[62].

According to the regulations of the UKNF Innovation Hub program, the criteria that determine the conditions for the participation of enterprises in this initiative are related to following matters: the innovative nature of the solution (if the proposed solution is considered to be innovative on the Polish market), interpretations of the regulatory and legal environment (if the company prepared a preliminary interpretation of regulations with regard to the proposed solution), an authentic need for support from the financial supervision committee. It is worth mentioning that the company's participation in the program is free of charge and does not oblige the company to later submit a license application[63].

Based on the information provided by the UKNF, a number of 35 Polish and foreign enterprises associated with provision of payment services, crowdfunding and cryptocurrencies have submitted

[61] Report on the implementation of the 'Digital Poland' Operational Programme for 2018. Summary provided for the public. Ministry of Funds and Regional Policy, 2019.
[62] https://www.knf.gov.pl/dla_rynku/fin_tech/Innovation_Hub (accessed: 27.01.2020)
[63] Komisja Nadzoru Finansowego, 2018. Regulamin Programu Innovation Hub w Urzędzie Komisji Nadzoru Finansowego.

their applications from the beginning of the program, i.e. January 2017, to the end of the first half of 2017. The Authority does not disclose the specific names of enterprises, however, it indicates that among them are both newcomer entities, as well as large institutions that reach for the opinion of the KNF Office[64].

Warsaw Startup Ecosystem

The capital of Poland is a place that has an obvious advantage over other regions of Poland in terms of the innovation ecosystem. The largest number of students and universities on a national scale forms the basis for developing R&D ventures, and, additionally, the profile of the main political, economic and cultural center of the country makes foreign investors more and more often decide to expand their businesses in Poland. The Warsaw Startup Ecosystem is not an organization, company or foundation - it is an unofficial name for an accumulation of projects taking place in the capital city that jointly build structures for developing enterprises. These initiatives not only include the above-mentioned R&D facilities, but also focus on creation of advisory institutions, coworking spaces and urban investments. Both the professional infrastructure and the atmosphere of Warsaw clearly affect an increasing number of Polish start-ups being established in this area.

Warsaw has been one of the first cities in Poland that has set itself the goal of investing in start-ups. It is a leader city in the country that has identified and understood the emerging trends on the business market. As the result of the above-mentioned features, the business incubators have developed within the city borders - Center of Education ‘Targowa’ and Center of Entrepreneurship ‘Smolna’ have been associated as parts of 'Grow with Warsaw' initiative. Both centers create a space aimed at aspiring entrepreneurs who are primarily looking for a shared place to work and mentoring services. The city also organizes many events and conferences enabling matchmaking between startup owners and potential investors (e.g. Wolves Summit Warsaw 2020)[65]. By joining the Warsaw startup community marked with the name #TechWawa, aspiring entrepreneurs can expect the continuous support on many different stages enabling them to develop effectively and successively not only in the country, but also abroad.

[64] https://fintek.pl/innovation-hub-w-knf-dziala-prawie-pol-roku-jak-sobie-radzi/ (accessed: 27.01.2020)
[65] http://firma.um.warszawa.pl/wp-content/uploads/2018/09/Warszawa-Miasto-Startup%C3%B3w.pdf (accessed: 20.01.2020)

Growing through e-Commerce

Shoper.pl

Shoper is an ideal example of a project that is involved in the development of e-commerce activities in Poland. The Dreamcommerce company, on behalf of which Shoper operates, has been founded in 2011 in Krakow. This enterprise is a representative of the IT industry that provides internet software to create an online store and, at the same time, start a business. As a part of a monthly or yearly subscription, the user receives an access to the Shoper platform, which enables him to create a website, add new products for sale and develop a brand by personalizing the store's layout. Different subscription options correspond to different levels of advancement of services that the platform offers in return. The user has the freedom of choosing the appropriate level according to the profile of their business and the packages available are Gold, Platinum, Diamond and Premium. From time to time, the platform applies discounts to individual subscription levels. Shoper is also able to satisfy even the most demanding tastes of customers by offering them personalized services or price rates, although the details are discussed between the parties.

A matter worth mentioning is that Shoper does not charge the user (entrepreneur) with additional fees based on his revenues or the number of orders placed, which is why the subscription fee is fixed and predictable for the customer. The only additional benefit for the portal is the commission on online payments. Shoper also offers its clients a 'Benefits Package', which includes various additional services including marketing, IT and package delivery, provided by external companies.

Shoper platform enables people aspiring to become entrepreneurs to start in the e-commerce business on transparent and straightforward terms.

InPost

It will not be an exaggeration to state that InPost has revolutionized the Polish e-commerce market. In an era when the vast majority of online customers bought products via mail or courier firms, InPost became very successful. The InPost company offers postal services not only in the form of traditional deliveries, but also has introduced to the Polish market the service of parcel machines - storage devices that can be operated 24 hours a day and every day of the week. They offer options dedicated to various types of companies, including e.g. weekend deliveries (due to which the company has the opportunity to increase its competitive advantage), sales of packaging for products, subscription fees (directed especially to e-commerce companies), as well as refrigerators

- parcel machines that due to their refrigeration functions can store packages with temperature-sensitive products.

InPost's solutions became popular among Polish e-commerce companies, because it offers a convenient service not only from the point of view of the entrepreneur, but also their clients. Any online store can start cooperation with InPost and configure its store for the additional delivery function to a parcel machine. InPost offers business owners preferential rates for product delivery, as well as the option of tracking shipments online[66]. The average delivery time from sending the product is 1-3 business days.

Due to the innovative approach to the supply business, InPost has earned a trusted position in the market and has significantly influenced successful companies in the e-commerce industry.

Booksy.pl

The Booksy website, founded in 2014 by Polish entrepreneur Stefan Batory, is a tool enabling companies from the health & beauty industry to arrange meetings with their clients. The idea standing behind the initiative is connected with Batory himself, when he encountered difficulties arranging his appointment with a physiotherapist. Currently, the platform also operates on foreign markets in almost 30 countries around the world and 4.2 million users have used it so far[67].

Entrepreneurs owning beauty, hairdressing, physiotherapy or fitness salons can set up a business account on the website, through which they will share their work schedules and the price list of services they provide, while customers can book appointments in their preferred time. Tools placed on the Booksy's website allow businesses to easily navigate their customer base and scheduled meetings, and offer effective salon management by monitoring profits in order to identify the most and least profitable services. In addition to tools that have a direct impact on salon management, the user also receives marketing expansion possibilities through customer base management options (sending mobile notifications with reminders about the next visit), web advertisements (access to graphics ready to post on social media) or offering additional services or products with discounts (e.g. along with hair dyeing, a client receives a free haircut). The Booksy platform also includes some statistical tools that may help entrepreneurs to track their monthly number of appointments, employees' performance, revenues and transaction history. This project is a

[66] https://inpost.pl/oferta-dla-firm-i-allegro (accessed: 01.04.2020)

[67] https://strefainwestorow.pl/wiadomosci/20190619/od-startupu-do-globalnej-firmy-booksy-liderem-e-rezerwacji-uslug-w-segmencie (accessed: 22.01.2020)

significant facilitation in daily business management and significantly improves the company's expansion process in the digital world.

Governing digital markets

Brand24

A Polish innovative tool aimed at enterprises helping to drive their development and design digital image is the project proposed by Michał Sadowski in 2011 called Brand24. The software offered by this project allows entrepreneurs to monitor the market by tracking mentions (or hashtags) of their own company or even competitive enterprises. According to the portfolio presented by Brand24, they propose several options to expand the possibilities of Internet monitoring, e.g. an ordered list of entries on the tracked topic, a transparent presentation of changes in the intensity of mentions and their scope, advanced indicators allowing better understanding of what is happening with the monitored brand, influence score (proprietary indicator for identifying key sources), the ability to set alerts based on defined filters, data export and topic filtering[68].

The options offered by Brand24 allow entrepreneurs to identify emerging trends and to become acquainted with customer opinions about their services, as well as help them to better manage their digital businesses. Due to these types of personalized statistics, an entrepreneur is aware of his position in the industry and company's strengths and weaknesses. Clients expressing their opinions on various forums and social networks about the services received are creating a certain kind of marketing that may not be influenced the entrepreneur, although because of Brand24 he is able to quickly respond to published comments and affect the final image of his brand in the digital world.

Urban Lab

The initiative developed jointly by the Ministry of Investment and Development and the Institute of Cities and Regions under the name Urban Lab was introduced in two Polish cities - Rzeszów and Gdynia. According to information published in the press, Urban Lab is a place that gathers city dwellers interested in developing their surroundings. The founders of Urban Lab are specialists with experience gained in local government work and in the innovation sector, which is why they are responsible for mentoring and moderating conversations in the laboratory.

According to the Vice President of Rzeszów Marek Ustrobiński, the city laboratory invites all people who would like to be involved in the development of their city and are interested in

[68] https://brand24.pl/funkcje/ (accessed: 22.01.2020)

administrative, business and industrial innovations[69]. Urban Lab has several thematic groups to which interested residents can sign up. As part of the mentoring initiative, novice entrepreneurs from the region can benefit from the advice of specialists, as well as develop their own start up concept. Relatively easy access to the service of business consulting means that almost every inhabitant can consult their innovative ideas and ask for financing options, as well as development opportunities in the region.

Summary

The initiatives collected in Section B of the following report coincide with the concept of 'Four Wheels Driving Digital Entrepreneurship', parts of which concern various issues related to modern digital entrepreneurship. For the appropriate presentation of the characteristics of above-mentioned projects, a matrix has been created showing the common points of the initiatives and the theory mentioned in the 'Digital Entrepreneurship' report[70]. The numbers assigned to the initiatives are equivalent to the numbering contained in Section B ('Overview of Country Context in Poland').

Table 1. Matrix of Polish projects implemented at the national level and the theory of 'Four Wheels Driving Digital Entrepreneurship'

		1	2	3	4	5	6	7	8	9	10
A	High-Speed connectivity	X	X	X							
	Skills	X	X	X		X				X	X
	Openness	X		X						X	X
	Equal opportunity		X	X		X	X		X		X
B	E-government	X		X	X						

[69] https://rzeszow.naszemiasto.pl/urban-lab-miejsce-dla-ludzi-z-pomyslem-na-rzeszow-wideo/ar/c1-7374383 (accessed: 01.04.2020)

[70] https://www.broadbandcommission.org/Documents/publications/DigitalEntrepreneurshipReport2018.pdf (accessed: 01.04.2020)

	Finance				X	X					X
	Innovation ecosystem					X					X
C	Online payments						X	X	X		
	E-commerce						X	X	X		
	Cross-border delivery						X	X			
D	Participatory governance				X	X					X
	Regional markets					X		X			X
	ICT in aid			X		X					X
	Monitoring				X		X		X	X	

Note: A - Digital infrastructure and fundamentals; B - Policy support; C - Growing through e-commerce; D - Governing digital markets
Source: Own elaboration

Overview of HE context in Poland

The development of digital entrepreneurship is the main trend noticeable on the globalized market, but it can not take place without the presence of certain stimulants, even in the form of academic centers. According to the Polish management consultant of KPMG Jerzy Kalinowski, Poland will not become fully innovative if there is a lack of an environment conducive to innovative projects and initiatives[71]. An innovative ecosystem according to Jackson (2011) should include material resources (i.e. funds), human capital (i.e. students, entrepreneurs), as well as institutional entities contributed to it – there we can distinguish universities, companies, R&D bodies, state and local organizations[72]. In this part of the report, we would like to present the projects and initiatives identified by us and initiated by Polish higher education institutions, which should be contributing to inspire digital entrepreneurship and develop skills appropriate to conduct this type of business. The initiatives have been arranged under three main parts: educate, stimulate, incubate.

Educate

Kozminski University

This Warsaw university is known to be the best business-oriented school in the Central and Eastern Europe as it was stated by Financial Times in 2019[73]. This academic center has introduced its own course for Bachelor and Master candidates on Management and Artificial Intelligence in Digital Society.

According to the course information published on the university's official website, this program is a rare but needed combination of in-depth management knowledge, programming skills, and data analytics. The idea for this type of education is a response to the demand of the labor market for managers whose professional profile combines business skills, knowledge of new technologies and their impact on society, quantitative and qualitative research methods and programming competences. In addition to these skills, students will also have the opportunity to master the tools for multidimensional analysis of digitization processes, and will also acquire an in-depth understanding of the ongoing technological revolution.

[71] M. Duszczyk, "Zbudujmy ekosystem innowacji na wzór fiński lub niemiecki", Rzeczpospolita 2018. https://www.rp.pl/Biznes/309129884-Zbudujmy-ekosystem-innowacji-na-wzor-finski-lub-niemiecki.html (accessed: 31.01.2020)

[72] Jackson, D. J. (2011). What is an innovation ecosystem. *National Science Foundation*, *1*(2).

[73] Financial Times, 2019. European Business School Rankings. http://rankings.ft.com/exportranking/european-business-school-rankings-2019/pdf (accessed: 28.01.2020)

The leaders of the Bachelor and Master programs in Management and Artificial Intelligence in Digital Society are management professors working in the Department of Management in Networked and Digital Societies (MNDS). The forecasts of the Kozminski University predict that graduates of this field of study will be able to find employment in manufacturing and service enterprises, banks, insurance and telecommunications companies, data analytics research centers and companies related to the digital economy (e-commerce, startups)[74].

Besides the study cycles offered by the Kozminski University, this academic center expands its offer of workshops addressed not only to students, but also to entrepreneurs and corporates. According to the information published on the university's website, in addition to courses organized on Kozminski University campuses, there is also the possibility of organizing a private training for corporate employees at the company's headquarters. Of the twelve thematic blocks included in their offer, Marketing & Social Media is especially worth distinguishing, due to the issues related to digital entrepreneurship and its development that are covered by the course. The topics included in the training are focused around web analytics, positioning the company in search engines and building a personal brand on the Internet[75].

SGH Warsaw School of Economics

SGH Warsaw School of Economics is one of two Polish universities classified in the Financial Times ranking regarding the best European Business Schools. SGH was on the 69th place ex aequo with such academic centers as Tilburg University (The Netherlands), Montpellier Business School (France), ICN Business School (France/Germany) and Sabanci Business School (Turkey)[76]. SGH has launched a course on 'e-Business' which is a Master cycle for Polish-speaking students.

The ‘e-Business’ field of study has three specialties that are available for further selection: Internet marketing, company management in e-business and information technology management. These studies are constructed to provide the latest knowledge regarding the company's functioning in the digital economy and develop the skills necessary to conduct business on the Internet. The study program aims to provide an insight into the issue of internet business from a marketing, management and information technology’s perspective. According to assumptions regarding the

[74] https://www.kozminski.edu.pl/ai/ (accessed: 28.01.2020)
[75] https://www.kozminski.edu.pl/szkolenia/ (accessed: 31.01.2020)
[76] Financial Times, 2019. European Business School Rankings. http://rankings.ft.com/exportranking/european-business-school-rankings-2019/pdf (accessed: 31.01.2020)

skills that a student should possess after completing education in this field, the graduate should i.e.:

- identify the basic patterns of consumer behavior on the Internet and information and communication systems,
- understand the impact of technology on the functioning of the company,
- be able to design an enterprise in the digital environment, in particular in terms of the business model and strategy for developing relations with clients and stakeholders,
- showed entrepreneurial attitudes in solving problems and searching for and implementing innovations.

The presented description summarizing the assumptions of Master's studies in the field of 'e-Business' certainly falls under the topic of digital entrepreneurship and focuses on educating a new generation of entrepreneurs whose main working environment will be the Internet.

Collegium Humanum – Warsaw Management University

Collegium Humanum is one of a few private universities located in the capital city of Poland. This academic center is offering a Master studies course on Management with a specialty in e-marketing and e-commerce.

This education path prepares its candidate for the practical use of the Internet in marketing activities by learning the principles of the Internet market and the successful implementation of company's e-commerce projects in a virtual environment in various business areas. The subjects included in the education process are i.e. IT management systems, CRM business strategies, Internet consumer behavior, marketing in social media and e-merchandising and social commerce.

The employment prospects of future graduates are connected to websites, advertising and PR agencies, companies responsible for production and services, banks and other financial institutions, managerial positions responsible for e-commerce and running a business[77]. The opening of this type of education path clearly indicates the growing importance of digital entrepreneurship on the labor market and acts as a response to its demand.

[77] https://humanum.pl/zarzadzanie/e-marketing-i-e-commerce-ii-stopien/ (accessed: 31.01.2020)

University of Information Technology and Management in Rzeszow

A private university located in the South Eastern part of Poland is a representative of an academic center responding to the market demand. Besides the first- and second-cycle studies, as well as PhD programs, it also offers a postgraduate courses covering a variety of areas.

Postgraduate courses that are particularly worth highlighting in the context of digital entrepreneurship include the IT project management, sales and marketing management, internet marketing, IT systems business analyst, User Experience, as well as an MBA course which includes subjects related to digital entrepreneurship in its learning path.

The subjects implemented in the above-mentioned fields of education include:

- business analysis and digital product strategy planning,
- cyber-psychology,
- communication management in projects,
- e-marketing and e-sales,
- marketplace - a simulation game,
- SEO,
- social selling,
- content marketing and copywriting,
- employer branding.

The main purpose of education in the field of internet marketing is to educate specialists who will use online media to create the company's image on the Internet, present and disseminate sales offer and contact the customers. One of the course partners is Ideo, which has committed to offer paid internships in their company to the top three graduates, and all students who operate their own online stores (or wanting to set up them) can receive a mentoring service free of charge[78].

[78] https://podyplomowe.wsiz.pl/studia-podyplomowe/marketing-internetowy/ (accessed: 31.01.2020)

STIMULATE

Business Workshops introduced by the University of Information Technology and Management in Rzeszow

Initiative, which is a part falling under the concept of 'stimulation' of digital entrepreneurship, but also any other type of business activity, are Business Workshops introduced by specialists of the Institute for Financial Research and Analyses at the University of Information Technology and Management in Rzeszow[79]. These workshops are addressed not only to people who are determined to start their own business, but also to those who are not ready for such a move yet. The trainings included in the program of Business Workshops mainly cover the subjects concerning developing soft and interpersonal skills, but also hard skills necessary to establish and run a company. The essential topics trained during the two-semester series of classes (the total number of hours is 77) focus on creating business concepts, choosing the right form of business activity, conducting simplified accounting in the enterprise, finding sources of business financing, insolvency theory, self-presentation and sales techniques, as well as marketing in business.

While participating in the workshops, participants have the unique opportunity to refine and develop their entrepreneurial predispositions under the guidance of experienced academic staff, as well as representatives of national business entities. Benefits resulting from participation in Business Workshops include stimulation of soft skills and business knowledge, gaining experience in teamwork and having the opportunity to consult entrepreneurial ideas with specialists.

Start-up Academy introduced by the University in Bialystok

Workshops developing universal skills - those that are necessary for functioning in the modern business world, were initiated by the University of Bialystok in 2018. This stimulating project is targeted at younger audiences, because the main participants belong to the age group of 11-15 years old.

Start-up Academy conducts its workshops at the Faculty of Economics and Management of University of Bialystok. Their program covers the implementation of three modules that focus on various practical issues, including for example:

- 'Cooperation - thinking - solving' - a section dedicated to the stimulation of critical thinking, problem solving and teamwork;

[79] https://wsiz.rzeszow.pl/studia/studiowanie/wb/ (accessed: 31.03.2020)

- 'ABC of Entrepreneurship' - training topics cover economic, marketing and management issues; in addition, workshop participants will have the extraordinary opportunity to get inspiration from entrepreneurship practitioners: business owners and start-ups;
- 'My own start-up. From the idea to implementation '- the last phase of the workshop focuses on the methodology of creating innovation and building a start-up[80].

Despite the fact that Start-up Academy is addressed to primary school students, the University of Bialystok provides participants with support in the form of mentoring acquired from the academic environment specialists carrying at least a doctoral degree, as well as qualified trainers and entrepreneurs. Stimulation of entrepreneurial attitudes and the development of young generation, which will be particularly active in the digital environment, are the main and direct products of this initiative.

Let's Start Up introduced by SGH Warsaw School of Economics

Valuable in terms of content, the SGH Warsaw School of Economics initiative focuses on networking of business representatives with students, which may result in their cooperation in creating a modern start up enterprise. Main assumption of the project is to support entrepreneurial attitudes among young people and stimulate their innovation.

The project consists of three parts, which are dedicated to various activities in the field of entrepreneurship. The first stage involves confronting the ideas of students with mentors who will provide them with their opinion on a given venture. Ideas marked as the most attractive ones will be presented to potential investors who, in exchange for some shares, will be willing to invest in the innovative start ups. The second part of the project (entitled StartUp2Night) plans that within three days dozens of students will develop visions and ideas for future initiatives. The last section of the project - Tech Expo, includes the presentation of start ups from the IT industry, discussion panels with invited representatives of the business world and mentoring of young entrepreneurs with representatives of venture capital funds[81].

Due to the above-mentioned initiative, young entrepreneurs who are just starting or would like to take the first steps in setting up a business have an amazing opportunity to test their ideas in a

[80] https://www.uwb.edu.pl/nowosci/aktualnosci/ii-edycja-projektu-start-up-academy-na-uwb/70cfbe41 (accessed: 31.03.2020)
[81] https://startupacademy.pl/lets-start-up/ (accessed: 31.03.2020)

professional environment, as well as consult experienced professionals and talk about the development of ventures.

INCUBATE

Academic Entrepreneurship Incubators (AIP)

The Academic Entrepreneurship Incubators foundation is the most popular and effective ecosystem for creating and developing entrepreneurship in the Central and Eastern part of Europe. It gives the opportunity to test business ideas without the need for formal company registration, offers legal and financial services, as well as continuous support in the development of the company. According to the research prepared by AIP, the factors that most often hamper the opening and development of the first business are fixed costs (incurred even when the entrepreneur has no income), variable costs (related to the income), lack of knowledge and experience, complicated legal provisions and bureaucracy. All these factors will not be dependent on the incubator user, because they will be dealt with by specialists from the AIP side.

AIP has created approximately 60 incubators located mainly at Polish universities, where work space and conference rooms are available. The largest (so far) AIP project is Business Links that includes co-working centers covering about 15 locations, 50,000 square meters of space and over 2,000 companies operating under this name[82]. Belonging to the AIP community also grants the access to services offered by the incubator's partners, as well as gives the opportunity to use specially prepared discounts on services and tools that are necessary for effective business. Partners associated in the AIP project include transport and postal companies, internet sales portals, companies monitoring the company's results on the Internet, as well as internet payment operators[83].

Until now, there were over 16,000 startups in the Academic Entrepreneurship Incubators and companies that are currently independent from AIP employ a total of over 40,000 people. Among the companies that have significantly distinguished themselves on the market and have been successful in Poland and abroad, are i.e. CallPage, Glov, Misbhv, Qpony.pl, Blix. Each of these companies is operating on the Internet and actively runs its business there.

[82] https://aip.link/o-nas/ (accessed: 31.01.2020)
[83] https://aip.link/benefity/ (accessed: 31.01.2020)

Success and failure factors and recommendations

SUCCESS

- Digital Poland by Ministry of Funds and Regional Policy

The Digital Poland Program established and coordinated by the Ministry of Funds and Regional Policy can be considered as a success mainly due to thoroughly prepared statements showing the status of implementation of the program's objectives. The report on the status of program implementation includes detailed data regarding the calls for proposals, applications for co-financing, concluded contracts and settled funds. This project is implemented with the support of European Funds, which can suggest that the scrupulousness in the documentation of all initiatives was probably a requirement of European Union support.

The Polish project of building an Internet network in Poland has won the first prize in the European Boardband Awards competition organized by the European Commission in the category 'Territorial cohesion in rural and remote areas' in 2018. The main advantages of the project highlighted in the competition were, i.e. sustainable territorial development, scale of initiative and its complexity[84].

The above-mentioned features lead us to conclusion that the main success factor of the Digital Poland project is certainly a constant control over expenditure documentation and the number of areas that were covered (scope), due to which project contractors were informed about the effects resulting from the initiative. Control over the project is extremely important, especially in the government sector, which often faces problems with meeting deadlines and achieving goals. If the documentation is carried out in a consistent and reliable manner, it may be treated as a basis for conducting further activities related to the settlement of the project.

- Shoper.pl

The Shoper platform proudly presents its achievements to potential customers in the form of success stories of stores already existing on their website. On the company's official portal, we can find a subpage called 'Customer Stories', under which statements of entrepreneurs using platform services are published.

[84] Report on the implementation of the 'Digital Poland' Operational Programme for 2018. Summary provided for the public. Ministry of Funds and Regional Policy, 2019.

According to its clients, the most frequently published advantages of the platform are, above all, its simplicity in use and transparency[85]. Customers also highly value the idea itself, because thanks to Shoper they can run their business without leaving home and without renting space, such as an office or warehouse. A definite advantage that should be highlighted is the tab 'Customer stories' itself, thanks to which interested, potential users can learn about active sellers and be inspired by their stories.

- Booksy.pl

The success of Booksy platform can be an obvious matter for people analyzing the company's activities. This company was founded by a Polish entrepreneur and initially focused only on the national market, but over time it began its expansion of countries from around the world. The health & beauty industry-focused website is already used by over 28 thousand specialists who manage their companies there, and the monthly number of reservations made through the portal reaches one million.

It seems to be quite simple to distinguish the factor that decided on the undoubted success of Booksy - it is a direct response to market demand. We were unable to identify another company that would create such a website on the Polish market before Booksy, which automatically suggests that the demand for this type of enterprise was a natural stimulant of success. Another reason can be distinguished by analyzing the platform's detailed information - according to the founder Stefan Batory, Booksy tried to learn from the mistakes of other companies (including Airbnb and Uber), which charged a commission on each completed transaction[86]. Booksy decided to charge only a fixed subscription fee and it turned out to be an excellent decision.

Currently, the company is testing another solution designed for the US market, which is aiming to increase platform's turnover, but at the same time will affect the development of the salon by acquiring new customers - in this case, the 'Uber' model will be the payment method, i.e. the commission collected from the first payment made by a newly acquired client. This type of action can be defined as developing the company's functions based on market needs, i.e. identification and active response to emerging trends[87].

[85] https://www.shoper.pl/historie-klientow/ (accessed: 07.02.2020)
[86] https://innpoland.pl/155937,stefan-batory-z-booksy-zostal-ambasadorem-polskiej-innowacji (accessed: 07.02.2020)
[87] https://innpoland.pl/155937,stefan-batory-z-booksy-zostal-ambasadorem-polskiej-innowacji (accessed: 07.02.2020)

Undoubtedly, an important point of the Booksy platform is also its CEO, who was mentioned in this report several times. Stefan Batory is one of the most recognizable Polish entrepreneurs who mostly deals with start-up companies, and has achieved his professional goals with his creativity, ability to respond to market needs and perseverance. In the interviews referring to the genesis of his success, he emphasizes the importance of hard and soft skills, which should be in the profile of a good manager[88].

- Kozminski University and Warsaw Startup Ecosystem

While distinguishing the initiatives that deal with a concept of digital entrepreneurship, we decided to combine projects initiated by the Warsaw Startup Ecosystem and Kozminski University. The main reason behind this decision is the location of headquarters of both of these organizations, as well as the nature of their operation.

Kozminski University was presented in this report as a modern university and, above all, a leader in teaching in the fields of economics, management and business (Financial Times, 2019). Kozminski's learning courses certainly respond to market demand and also follow the latest trends in the business environment. A special selection of subjects implemented in the field of Management and Artificial Intelligence in Digital Society is not a product directed only to potential entrepreneurs desiring to succeed in the 21st century, but also for IT enthusiasts who want to become specialists in the artificial intelligence.

The Warsaw Startup Ecosystem focuses primarily on providing tools and space for start-ups who would like to develop their business in the country, as well as abroad. The set of initiatives gathered in the capital of Poland is particularly important because their location influences the efficient access to the most important Polish institutions that may be necessary in running the successful business.

The factor that we would distinguish in the Kozminski University's success is certainly the timeliness of their educational offer, i.e. responding to the needs of the country and global current labor market, through which graduates have the opportunity to acquire knowledge necessary for modern entrepreneurship. On the other hand, in the case of the Warsaw Startup Ecosystem, the universality of location is a special factor - the capital of Poland is still considered the center around which business in Poland revolves.

[88] https://mamstartup.pl/nic-tak-nie-motywuje-jak-glod-i-strach-przed-bankructwem-stefan-batory-booksy-itaxi (accessed: 07.02.2020)

- Academic Entrepreneurship Incubators

Academic Entrepreneurship Incubators is an initiative well known to Polish students whose entrepreneurship awareness has increased mainly due to access to the Internet. The AIP is promoted as a safe ecosystem to try your business in. That 'safety' is resulting from the foundations characteristics - acting under the legal personality of the foundation, aspiring entrepreneurs are able test their products or services at a lower price than if they had to do so after registering their own business.

This project can be tempting, because Polish rules of running a business are quite restrictive and do not favor small and medium-sized enterprises. Academic Entrepreneurship Incubators allow to reduce the costs of operating a company, and at the same time offer support in the process of brand building, i.e. through mentoring, workshops for entrepreneurs or webinars. The specific ecosystem created by AIP is primarily characterized by a sense of support provided by professionals and consultants. According to one of the users of AIP Przemysław Radomski (Founder & CEO of Sunshine Profits), the biggest advantage of this platform is, above all, the opportunity to test your business idea, thanks to which he assured that he has made a proper decision on choosing his own career path[89].

FAILURE

- Integrated State Computerization Program

The project established by the Polish government - Integrated State Computerization Program, was described in details in documents published on the official website of the parliament. The over 50-page document contains extensive descriptions of the objectives that were planned to be achieved through the implementation of this program and indicators that can be used to measure its level of implementation. The table published on page 48 of the program's document describes six indicators along with their sources, due to which it is potentially possible to observe the changing level of digitization of society.

The biggest disadvantage of this program is the fact that no reports are published regarding the effects achieved through its implementation, which makes it impossible to state whether and to what extent it has influenced the development of Poles' digital competences, and also created the basis for introducing an e-administration system in Poland.

[89] https://aip.link/o-nas/ (accessed: 07.02.2020)

- UKNF Innovation Hub

The original name of the UKNF Innovation Hub was Fintech Hub, also initiated by the Polish Financial Supervision Authority. The assumption was to act as a center of knowledge about fintechs in Poland and publish information about i.e. entities creating a fintech ecosystem in the country, UKNF licensing processes or implementation of the Innovation Hub program. The initiative's website was founded in 2018, but since November 2018 no information has been updated on it. According to the Cashless.pl website, which contacted the spokesman for the Polish Financial Supervision Authority, the Fintech Hub website was moved to another Internet page[90]. The reasons mentioned as the motivation for this decision is primarily the reluctance to continue working on the platform created by the previous Polish government.

RECOMMENDATIONS

Projects that were focused on the subject of digital entrepreneurship in Poland shall definitely be associated with the private sector, due to their most significant presence there. A majority of initiatives are represented by companies that generate profits on providing entrepreneurs with Internet platforms to run business and support their professional development. Initiatives from the third sector are characterized by innovation and transparency in operation, because they are governed by the laws of the market and in the absence of reliability, their image can be undermined and, in the end, their revenues will decrease.

The institutions identified during the research that operate in the higher education sector are primarily universities and the Academic Entrepreneurship Incubators. Their major role is education, stimulation and incubation of digital entrepreneurship, however, in order for them to fulfill their role in each of the three areas, they must start with education, which is currently being implemented.

During our study, we were unable to identify the role of incubation in higher education, which would be initiated by an academic center (Academic Entrepreneurship Incubators is a foundation). The incubation of entrepreneurial ideas and subsequent development of start-ups by specialized departments dealing with entrepreneurship at universities would complement the effective education, combined with stimulation. Polish universities are equipped with high technology facilities and that is a reason of which the development of incubation would also have a chance to

[90] https://www.cashless.pl/6308-knf-innovation-hub-koniec (accessed: 07.02.2020)

appear in the higher education sector. However, first such an action must be initiated by academic centers.

IDEA Country report: Romania

Prepared by:

Malgrande Solutions

Summary of findings

Romania shows openness and growth potential towards digitalization. Although no common definition of digital entrepreneurship as a stand-alone concept is yet available at national level, entrepreneurship and digital fields being traditionally treated separately, various actors, both public and private have already taken initiative, and over the last several years, implemented projects and programs meant to support aspiring or existing entrepreneurs make the most of the digital.

Romanian society is still characterized by contrasts, in terms of skills, infrastructure, study programs and business. Digital entrepreneurship treated as a whole is not yet to be easily found in official reports or research existing at national level.

According to some reports, Romania is well situated in terms of artificial intelligence, augmented reality, blockchain, drones, IoT and 3D printing usage. Recent investments made and projects implemented by the Ministry of Communication and Informational Society in infrastructure, as well as tax exemptions for IT professionals should support business digitalization.

However, Romania still lacks in terms of digital skills of the general population (which is of extreme importance as a highly digitalized business cannot effectively work with digitally illiterate customers), and there is room for improvement of the online governmental services, which can be optimized.

Numerous programs and projects, free of affordable, are being carried out by private organizations, some in partnership with public institutions. They provide skilling opportunities for different categories of target groups, from training to mentoring and even business incubation. Although high quality, they are unfortunately isolated initiatives and not part of a larger vision, ineffectively supported by public policies, to some extent ‘short lived’ as after the

implementation of the project, not all put in place sustainability measures and results monitoring mechanisms.

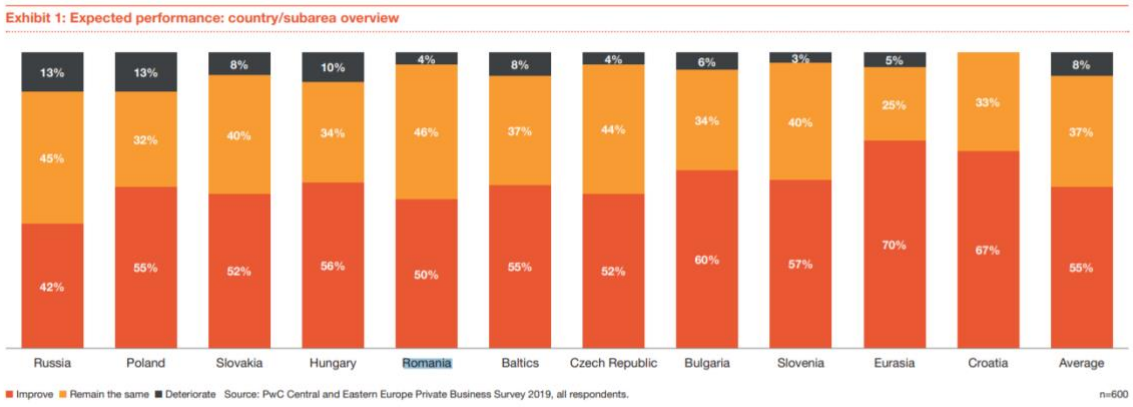
Higher education is very focused both on entrepreneurship and digitalization, but in many cases the two aspects are treated separately. Most universities have entrepreneurship-related programs and even business incubators. However, very few have study programs treating digital entrepreneurship in an integrated manner, and those who do, mainly address to those students with an IT background or inclination towards programming.

More study programs and support for non-IT aspiring or existing entrepreneurs, self-employed and professionals, carried out by HE institutions in partnership with stakeholders from the business environment would be necessary, along with more performance-oriented financing schemes.

Overview of country context in Romania

Although no 'official' definition for digital entrepreneurship exists at this point at national level, Romania seems to become more and more aware of its importance and opportunities it opens. Various public and private initiatives have been put in place during the last several years, and, while characterized by high disparities between different areas, and the lack of a common, longer-term vision, the situation in the country looks promising and optimistic.

According to the PwC Central and Eastern Europe Private Business Survey 2019[91], '82% of the Romanian entrepreneurial companies believe that the digital transformation will have a high impact on the long-term viability of their businesses.'



Source: PwC Central and Eastern Europe Private Business Survey 2019, p 4;

According to the same report, Romania seems to be one of the most advanced from the CEE countries in the use of artificial intelligence, augmented reality, blockchain, drones, IoT and 3D printing. However, there are areas that need to be explored more in-depth as those results, as encouraging as they appear, might not reflect the global situation with all its nuances. Aspects such as general populations' level of skill and access to technology, support from policy makers and appropriately skilled workforce are as important as businesses' digitalization strategies. Basic actions such as investments in infrastructure and equal opportunities are aspects that still need to be put in place. Therefore, without the pretense of exhaustiveness, we will present some of the aspects we considered to be representative for the current situation, structured according to the 4 wheels driving digital entrepreneurship.

[91] https://www.pwc.com/gx/en/entrepreneurial-and-private-companies/emea-private-business-survey/cee-epbs-report.pdf

Exhibit 6: Top countries/subareas rating Essential Eight technologies as relevant

Artificial Intelligence	
Country	Relevance
Romania	48.8%
Baltics	29.8%
Russia	29.6%
Eurasia	28.6%
(remaining countries)	18.6%

Augmented Reality	
Country	Relevance
Romania	39.5%
Croatia	25.0%
Eurasia	20.4%
Slovakia	16.1%
(remaining countries)	9.4%

Blockchain	
Country	Relevance
Romania	25.6%
Russia	14.8%
Slovakia	12.9%
Poland	12.7%
(remaining countries)	7.0%

Drones	
Country	Relevance
Romania	27.9%
Russia	20.4%
Czech Republic	18.2%
Baltics	12.8%
(remaining countries)	6.6%

Internet of Things	
Country	Relevance
Bulgaria	86.4%
Eurasia	69.4%
Croatia	62.5%
Romania	60.5%
(remaining countries)	45.5%

Robotics	
Country	Relevance
Czech Republic	63.6%
Poland	61.9%
Romania	60.5%
Baltics	53.2%
(remaining countries)	36.9%

Virtual Reality	
Country	Relevance
Romania	39.5%
Poland	22.7%
Bulgaria	21.3%
Baltics	20.8%
(remaining countries)	14.4%

3D Printing	
Country	Relevance
Romania	37.2%
Slovakia	32.3%
Czech Republic	30.3%
Hungary	25.8%
(remaining countries)	13.1%

Digital infrastructure and fundamentals

Infrastructure, and high-speed connectivity and digital skills not only of the business owners and their employees, but also of the general population are essential for entrepreneurial success. It would be useless developing a business within the online environment, as long as the main target groups of customers lack the necessary skills and access to internet or devices.

According to 2019 DESI report[92], Romania ranks 22nd at the connectivity dimension, and seems to have lost momentum gained during the previous years in terms of fixed broadband connectivity, with a 87% of households covered, ranking 26th, lagging behind most of the other states. However, it outperforms the EU average in terms of ultrafast broadband (45% compared to 20%). During the last years, Romania accessed funds to minimize the rural-urban differences and cover the so-called 'white areas'.

In terms of Skills/Human Capital, Romania underperforms and lags far behind EU average, with only 29% of the people aged 16-74 having basic skills (compared to 54% EU average), 10% with above basic (compared to a 31% average, and with no increase from the previous year).

Romania ranks better in terms of ICT graduates, 6th, with a 4.6%, a slight decrease from the previous year, but still above the 3.5% EU average. Another positive aspect is represented by the fact that Romania has the 3rd highest share of women among all ICT specialists (25.7%).

[92] Digital Economy and Society Index 2019, Country Report Romania

Infrastructure

Ro-Net Project

Between 2014 and 2018, Ro-Net Project, financed through the European Regional Development Fund (ERDF), has been implemented by the Ministry of Communication and Informational Society. The project, with an approximate value of 54 million Eur, out of which 45 granted by ERDF, foreseen broadband backhaul infrastructure for 787 localities – approximately 200000 households and 8000 public institutions.

Skills (investment in human capital), openness and equality of chances

During the last years, a variety of upskilling free initiatives, programs and projects have been implemented nationally/regionally mainly under the format of public-private partnerships, with the involvement of the Ministry of Education, private actors such as NGOs and SMEs, and other strong stakeholders such as Google or Microsoft. They address a variety of target groups, from schools, students, teachers, universities to entrepreneurs, employees and liberal professions (such as notaries).

Several remarkable examples of such initiatives, some of them recently started under the context of the COVID19 crisis could be the following:

National Continuity Program – Implemented by Digital Nation

Digital Nation (Dev Academy Association) is an NGO based in Bucharest, active since 2013 in the field of education – focusing on performance in education, strategic entrepreneurship and ICT. Since 2016, they operate and offer their trainings mainly online providing national coverage.

The national community program has been recently started, in April 2020, and has already achieved impressive results. It is implemented in partnership with the Ministry of Education and Google, providing, for the moment, free online training for 3 categories of beneficiaries, respectively: teachers (accelerated digital training for online teaching continuity), employees from SMEs (business continuity by migrating activities to online) and notaries (digitalization apps for public and notarial services).

The most visible results have already been registered and measured for the first category, as a first session has already finalized. The sub-program, named Teacher in Online, has already had 8500 participants in one month, out of which 4079 certified. It was a highly practical training

program based on RDEM (Remote Digital Education Model) and DigComp Methodology, over a period of 7 days of intensive activities, with 4 live streaming sessions daily.

Results from the other categories of beneficiaries, especially those of the Digital Employee sub program (addressing SMEs' employees' competences related to process and organization, online meetings, electronic archives, migrating products towards the online environment) are expected to be published during the next months.

Ro-Digital Program (Digitalization for non-IT Companies)

This program is implemented by the same Digital Nation, and it is open to any non-IT company (any field such as agriculture, automotive, banking, chemical, communication, consumer goods, energy, financial, healthcare, insurance, retail, real estate, travel, utilities). The duration of the program is of approximately 12 months, out of which approximately 10 initial weeks are dedicated to choosing a digitalization responsible, analyzing the actual processes, strategy and strategic planning, and the following weeks (20-41 as needed) are dedicated to implementation and evaluation of results. However, this program comes with a monthly cost for the company (approximately 350Eur), making it less accessible to the newer or smaller entrepreneurs.

Google for SMEs – an initiative supported by the National Council of SMEs

Google in Partnership with the National Council of SMEs launched the Google for SMEs website, which is a platform providing learning resources for entrepreneurs, free consultancy with a specialized trainer and additional resources, such as information concerning e-commerce platforms and financing.

The platform[93] has been launched at the end of April 2020 aiming to support companies to continue their activity in the context on the coronavirus crisis, therefore no results concerning the level of success are yet available.

Digital Incubator

Digital Incubator[94] is a program carried out by Digital Nation, dedicated to people who founded a start-up, especially but not limited to, those who already finished other programs organized by the providers. Admission is application-based, and the program is focused on supporting businesses in field such as: smart cities and urbanism, intelligent agriculture, fintech, artificial

[93] https://events.withgoogle.com/google-pentru-imm-uri/
[94] https://digitalnation.ro/startups/

intelligence and neuronal networks, blockchain programming, big data, cybersecurity, process automation, internet of things. The program supports start-ups to get a better market perspective, identify opportunities and problems, study competition and other major market players, set a development timeline, define roles, form strategic partnerships, design a revenue model, etc.

During the last 5 years, approximately 20 prototypes have been developed, such as: various mobile applications, virtual learning assistant, SME cashflow application compatible with other popular accounting applications already in use, neural-network based registration plates recognition software, healthcare smart application with diagnosis learning capabilities.

Policy support

Digital Government Services for Businesses

The Digital Government Factsheet 2019[95] contains an overview of the main Digital Government for Business available in Romania. Most of the actions are implemented by the Ministry of Communication and Information Society (MCSI) and by the Agency for Digital Agenda of Romania (AADR). The latest oversees the eGovernment Portal, the electronic System for Public Procurement, the Virtual Payment Desk and the IT System for the electronic attribution of international authorizations on transport goods.'

The eGovernment Portal[96] brings together central and local public services for citizens and businesses. A section dedicated to SMEs[97] centralizes nine services for businesses, under seven categories, respectively running a business, taxation, selling in the EU, human resources, product requirements, financing and funding, dealing with customers.

5 G Strategy

In June 2019 the Romanian Government approved the 5G Strategy for Romania, aiming to cover all major urban centers and mainland transport routes by 2025. There are high long-term expectations in terms of new jobs creation (250000) and economic input (4.7 billion Eur) through the multiplication effect of 5G technology integration.

[95] *Digital Government Factsheet 2019, Romania,* prepared for the European Commission by Wavestone, last actualized in March 2019, https://joinup.ec.europa.eu/sites/default/files/inline-files/Digital_Government_Factsheets_Romania_2019.pdf
[96] https://www.e-guvernare.ro/
[97] http://imm.msinf.ro/wps/portal

Tax exemption for IT professionals

IT professionals in Romania benefit from payroll tax exemption as long as they accomplish several requirements (formal education, a minimum early revenue, company structure).

According to the Law no. 227/2015 regarding the Fiscal Code, with the subsequent modifications and completions, the positions eligible for tax exemption are:

- Database Administrator, Analyst, System Engineer in Computer Science,
- Software System Engineer
- IT Project Manager
- Programmer
- Information system designer
- Information system programmer
- Help Programmer
- Help Analyst

SME Initiative Romania

The SME Initiative Romania is combining structural funds (from the Regional Operational Programme) with other EU and European Investment Bank resources to make available loans, under easier conditions and reduced interest rates, for at least 5000 SMEs. According to the European Investment Fund website[98] a number of 2000 Romanian companies have already benefitted of such loans until October 2019 (since October 2016). Nine banks operating in Romania are taking part to the program: ECBank, Banca Comerciala Romana, BRD - Groupe Societe Generale, Libra Internet Bank, ProCredit Bank, Raiffeisen Bank, Unicredit Bank, Banca Transilvania and ING Bank.

StartUp Nation Programme

The start-up ecosystem is supported by the StartUp Nation Programme (under the framework of the Regional Operational Programme, accessible to startups in various fields, including those aiming to produce innovation or develop ICT-related outputs). First launched in 2017, it is dedicated to newly created SMEs or SMEs starting a new activity, and under specific eligibility

[98] https://www.eif.org/what_we_do/guarantees/news/2019/eif-smei-romania.htm

conditions, the expenses can be financed up to 100%, up to 200,000 RON (approx. 41.000 EUR)/company.

Within the 2017-2018 edition, 19.297 applications were submitted, and the next year, 33.514 (out of which approximately 8.5000 respectively 10.000 financed). The launch of 2020 edition has been postponed several times, and is expected for October.

Some Romanian banks offer bridge loans (providing liquidity to StartUp Nation beneficiaries between grant reimbursements) along with a package of other benefits, such as electronic billing software, and other training, marketing and job platforms.

However, the focus of the programme is more on creation of new jobs, especially for those with fewer opportunities or unemployed, and less on innovation and business performance.

National Digitalization Program for Microenterprises

On 14th of August 2020, under the context of COVID19 pandemic, the Romanian Government has approved the National SME Digitalization Programme, financed through the Competitiveness Operational Programme and managed by the Ministry of European Funds. The value of the allocated budget is 150 million EUR out of which 127.5 million represent EU funds.

The main aim of the programme is to increase Romanian microenterprises and SMEs by:

- development of innovative products/services/applications in the field of ICT to support SMEs and public authorities to ensure the transition from outsourcing to innovative production and collaboration between IT cluster members;
- SME digitalization from non ICT sectors, to increase competitiveness and dynamization of the 8 development areas;

Among the eligible activities which can be financed during this program, according to the sector from which the applicant SME is coming from, the following can be mentioned: acquisition of hardware, data center facilities, acquisition or development of specific software, licenses, specialized IT services, electronic signature, data migration, automatization solutions.

Eligible applicants are microenterprises, small and medium size enterprises from the IT sector, members of IT sector clusters, or consortia formed of such enterprises, regional development agencies, and non IT companies beneficiaries of de minimis aid.

Growing through e-commerce

According to centralized data made available by the Romanian Online Shops Association (AMRO)[99], part of European organizations EMOTA and eCommerce Europe, although e-commerce growth tendencies are encouraging, Romania is still among the countries with the lowest percentage of people shopping online. This is confirmed by Eurostat data, showing that Romania, with 23% of population shopping online is the second last in the EU, only outrunning Bulgaria (with 22%).

GPeC[100], another private e-commerce organization, underlines the fact that most of the online shoppers (approximately 80%) still prefer cash payments upon delivery. In 2019, the Romanian online market (physical products only, excluding services, vacation and travel, plane tickets, utility bills, etc.) generated approximately 4.3bn Euros, a growth of approximately 30% compared to the last year.

People seem to prefer mobile devices to desktops when shopping online – with 63.6 % of people shopping from mobile and only 36.4 remaining loyal to desktops.

Shoppers tend to prefer buying from well-known marketplaces and online shops to independent sellers, due to fastest delivery and a higher degree of security. When it comes to purchase decisions, recommendations from friends (word of mouth) and user experience seem to be the most important.

The market is dominated by several online platforms, out of which the biggest and well known is eMag Marketplace, with 20.119 active online sellers in 2019, a very significant increase from 2018 – when there were 14.749.

Estimating the total number or revenue generated by smaller and independent sellers is difficult, as not all of them choose using platform and marketplaces.

However, there is still room to grow for the Romanian e-commerce market, and due to initiatives such as trusted.ro[101], a national program for online shops certification, helping sellers respect legal regulations and buyers to avoid fraud, the level of trust is expected to be improved.

[99] https://www.armo.org.ro/
[100] https://www.gpec.ro
[101] https://trusted.ro/

Governing Digital Markets

Participation in digital single markets, be they global, regional or local represent opportunities to reduce social and economic disparities and increase effectiveness, as it impacts various aspects of a country's economy, such as finance, e-commerce, banking, transport, tourism, energy and more. However, to effectively participate, countries and stakeholders need to align their capacity with all the other actors.

A study carried out in 2018 by the European Institute from Romania[102] concerning the country's integration in the European Digital Single Market is signaling a series of aspects which need to be addressed to reduce structural and operational disparities. Among the main weaknesses, which put Romania at risk of becoming only a consumer and not a mature contributor within the DSM are represented by lack of products competitiveness, low number of Government-backed-up digitalization projects, insufficient clusters and hubs, low competitiveness in goods and services production, lack of impact measures to develop digital economy, delays in Schengen space and Euro zone adhesion.

Along with these, although performing well in terms of infrastructure, broadband coverage and 5G readiness as presented in the previous sections, Romania needs to address integration of digital technologies, as it stands well below the EU average, with no significant progress during the last two years. Effective integration on digital markets is also hindered by the lack of interoperability of IT systems in the public administration.

With no national digital transformation strategy for companies and with limited Government support to the digital innovation ecosystem, Romania needs to take intensive and urgent measures, as well as monitor results in a more consistent way, in order to be able to be an active contributor within EU and other digital single markets.

Currently, according to DESI 2020[103] only 3 digital innovation hubs are active in Romania – one in Bucharest and two in Cluj-Napoca.

[102] Gaftea Viorel-Nicolae et al., *România şi Piaţa Unică Digitală a Uniunii Europene. Oportunităţi şi provocări,* 2018, Institutul European din Romania (http://ier.gov.ro/wp-content/uploads/2018/10/SPOS-2017_Studiul_3_FINAL.pdf)

[103] 6. Digital Economy and Society Index (DESI) 2020 Country Report, Romania https://ec.europa.eu/digital-single-market/en/scoreboard/romania

Transilvania Digital Innovation HUB

Transilvania DIH is an initiative managed by an NGO established in 2013 and located in Cluj-Napoca - Transilvania IT cluster by ARIES IT.

The main objective of Transilvania DIH is 'to stimulate technological innovative capabilities in order to support them delivering the products/services in the European Digital Single Market'.

Recognized in 2019 by the European Commission Joint Research Centre as the first ' fully operational digitalization HUB in Romania', it has applied for a 3 million EUR project under the framework of Regional Innovation Strategies 3 (RIS3), aiming to develop 3 support outputs to offer more digitalization services to Romanian SMEs: Transilvania Digital Innovation Hub Platform (bringing together business sectors, public authorities and specialized niche service providers), a data center, and a public policy monitoring platform.

Overview of HE context in Romania

According to the information available on the Ministry of Education's website, a number of 47 civil public, 7 military and 47 private HE institutions are accredited/authorized to function in Romania.

Most of them address entrepreneurship to some extent, in various ways: standalone study programs, disciplines within a study program, projects carried out internally /in partnership with other national stakeholders or internationally. However, integrated approaches of digitalization and entrepreneurship are not common, usually the two fields are treated separately.

Existing initiatives usually cover all the stages of the entrepreneurship encouragement model (SEEM) – however – the 'educate stage' is in most cases focused mainly on the pure 'entrepreneurship' component, and digital aspects of the business are treated rather marginally (excepting for those business which through their profile are digitally/IT oriented or their main product/service is IT related).

In this section of the report we will present a few initiatives that we considered relevant for IDEA's purpose as they successfully bring together the two fields.

However, none of them is a 'perfect' model, covering all the stages (educate, stimulate, incubate).

Some, such as the first two examples (master degree programs offered by universities in Bucharest and Cluj-Napoca) are focused on the 'educate' component of the model, although, incidentally, the other two stages can be reached (depending on the learners' involvement, opportunities can be created for stimulation and even incubation, through participation in various extra-curricular activities, projects or programs).

The third example, a digital workshop for programmers, covers all the stages to some extent, with focus on stimulation and incubation – the 'educate' stage being addresses only superficially (although the program foresees training – it is rather focused on digital skills and less on entrepreneurship concepts).

The last example covers the educate and stimulate stages to a higher extent, although again, tangentially, opportunities for the last stage can be created, depending on the performance of the learner.

Polytechnic University of Bucharest

One of the largest technical universities in Romania, through one of its faculties, namely Faculty of Entrepreneurship, Engineering and Business Management – offers a master degree study program, both in English and Romanian, called *Management of the Digital Enterprises*.

This study program is realized jointly with the the Faculty of Automatization and Computers, the students benefitting from resources provided by both faculties. The program offers students the opportunity of gaining both business management and digital competences, creating the premises for working in an international environment.

The curriculum covers disciplines such as: Production Systems & Group Technology, Batch Planning and Resources Allocation, Organizational Management, Scientific Research, Managing Human Capital, Economics for Managers, Business Intelligence and Risk Management, Quality Management, Integrated Supply Chains and Logistics, Enterprise Warehousing and Information Systems, Financial Management, Business Process Modelling, Project Management, Team Management, Power Management for Sustainability, Sustainability Product Design, Digital Marketing, Entrepreneurship, Service Management, Business Communication, Business Process Management, Customer Relationship Management, Asset Management

In terms of structure and time allocation, the first year of the program is mainly focused on business management, whereas digital aspects are to some extent addressed in the first semester of year II and, in our view, only marginally covered (digital marketing). There are no special admission conditions excepting for a bachelors' degree.

Babeș-Bolyai University from Cluj Napoca

Another example of digital entrepreneurship approached in a more integrated manner can be found at Babes-Bolyai University from Cluj-Napoca, which offers a one semester discipline, through the Faculty of Journalism – Digital Media. This discipline, titled *'Entrepreneurship in Digital Media'* covers competences such as: Identifying and describing entrepreneurial and monetization models within the digital environment, Identifying monetization opportunities within the digital environment, Sustainability in digital projects, Evaluation of an entrepreneurial project, Elaboration of a product/digital system. It also involves a practical approach – elaboration of a digital product is a requirement for the final examination.

Digital Workshop for Programmers

The Digital Workshop for Programmers[104], implemented in 4 universities from Bucharest (Polytechnic University from Bucharest, Faculty of Mathematics and Information Technology), Iasi (Faculty of Economics and Business Administration), Cluj-Napoca (Technical University from Cluj-Napoca) and Timisoara (Polytechnic University from Timisoara, Faculty of Production and Transportation Management), is carried out in partnership with Google and IT Informal School[105] and it is a part of global 'Grow with Google' initiative.

The 6 months program is addressed to students which are willing to learn programming and become entrepreneurs in the field of technology. Through those hubs, Google is offering training for mobile application development, but also supports the creation of new tech start-ups and provide resources for growth and mentoring for the students.

Activities carried out within Google hubs cover all aspects of the SEEM model (educate, stimulate, incubate) as it offers hands on training (10 weeks) – students can opt for Java and Android Development beginner and advanced courses (Python courses to be introduced in Bucharest and Cluj-Napoca Hubs).

At the same time, the hubs function as incubators providing free co-working space for the students which are developing their own applications and launching startups. Individual mentoring sessions are meant to support the young entrepreneurs in designing a business model and identifying real opportunities for growth.

JA HUB – Entrepreneurship and Digital Technology in Universities

Since 2016 Romanian universities benefit from completely equipped hubs under the framework of JA Hub program – carried out by Junior Achievement Romania in Partnership with Google and Romanian-American Foundation.

The program has 2 components:

Entrepreneurial University – carried out by Junior Achievement Romania in Partnership with Romanian-American Foundation, has been launched in 2016 (first edition between April 2016 and May 2018, second edition between December 2018- December 2020).

Results are available for the first edition:

[104] https://events.withgoogle.com/atelierul-digital-pentru-programatori/#content
[105] https://scoalainformala.ro/

A number of 17 entrepreneurial hubs have been created in Universities, as well as a set of learning materials and entrepreneurial education curricula. Also, university staff and management members benefitted from entrepreneurship and intrapreneurship trainings, modules for students have been created, and university courses in partnership with business community.

Digital Workshop Hub

This initiative is addressed to students willing to start a career in entrepreneurship and online marketing, and validate their competences with an internationally recognized Google certification.

A number of 14 universities from various locations benefit from a Digital Hub. For this initiative results'-related information is not yet available as it has only been launched at the end of 2019.

SEEM Matrix

The matrix below is showing the examples presented above correlated with the stages of the SEEM model. One initiative can cover one or more stages stimulate/educate/incubate) in various proportions (e.g. in some cases the educate component might prevail, whereas others can be focused more on stimulation and incubation).

Table 1. SEEM model correlation matrix

Initiative / **Stage**	Polytechnic University of Bucharest *Management of the Digital Enterprises* MSc	Babeș-Bolyai University from Cluj Napoca *Entrepreneurship in Digital Media MSc*	Digital Workshop for Programmers	JA HUB – Entrepreneurship and Digital Technology in Universities
Educate				
Stimulate				
Incubate				

Success and failure factors and recommendations

Most of the initiatives undertaken towards development of digital entrepreneurship cannot simply be labeled as either perfect 'successes' or 'failures' as most of them present both advantages and aspects that can be improved. In some cases, as for those that are still in their early stages, enough data for a correct judgement might not be available. Therefore, without the pretense of an exhaustive enumeration, we will try to underline the main success and failure (or limitation) trends and patterns that we were able to identify during the research.

Success Factors

- Existing programs – carried out by both HE institutions and other types of stakeholders offer free opportunities for business digitalization/creation of digital business and all the steps of SEEM are covered (educate, stimulate, incubate).
- Strong cooperation between education institutions and private actors/real people from the business field is a great added value, as no theoretical approach could replace the practical expertise and various 'learning from failure' lessons gained by business people over years.
- A large number of initiatives and projects are carried out by private actors in partnership with HE and public institutions.
- Recent investments in high speed internet infrastructure and programs carried out by the Ministry of Communication and Information Society, along with legislative measures such as zero income tax on IT professionals` earnings create opportunity for growth.

Failure Factors

- One limitation of the study programs carried out by universities in Romania is related to the fact that they are mostly addressed to the students with an ICT background. However, there are also non-IT business fields which could also be addressed which could benefit from digitalization. Also, the process of digitalization/development of a digitalized business should not necessarily be of a 'do it yourself' nature. Teaching students from other fields, who might not necessarily have an inclination for programming/ IT how to outsource parts of their businesses, where to look for the specialized IT skills, and what to require, could facilitate the development of successful companies in various sectors.

- Most of the initiatives carried out by various actors (both HE and other organizations or Government) only take into consideration the business owners and the development of their skills and infrastructure. However, a highly digitalized business working with digitally illiterate or skeptic customers might not be successful. The 'educate' component of at least some of the programs carried out should also address the market – the target customers. They also need to be educated/informed, not only on how to benefit from the digitalized services, but on 'why'. Why should they give up their habits and change the familiar ways? Entrepreneurs should know how to present the advantages in a persuasive manner – as resistance to change is known to be a serious obstacle in the way of digitalization progress.

- Although various projects are undertaken either by public authorities or private actors, no information about the concrete results or sustainability measures could be found.
- Limited functionality of solutions implemented by public authorities, such as eGovernment Portal – frequent downtime, some procedures still can not be completed 100% online – still requiring the physical presence of a person – as no online identity verification is possible.

Recommendations

- As not only students are interested in digital entrepreneurship, but also existing business owners and other categories, more open-access programs, especially for people with a non-IT background could be extremely useful. Online, self-paced learning courses developed by HE in partnership with business actors could fit the needs and cover a wider public. At the same time, those courses should be modular and differentiated on skillset levels and interest – some learners can be more advanced on the entrepreneurship side, others might have a more advanced IT background. On the other hand, outsourcing can be a solution for entrepreneurs less inclined towards advanced IT skills – this aspect could also be approached through the trainings, so as

- Different, more specialized roles within a digitalized business, and not only that of the business owner, should be taken into consideration. Some businesses might be interested in training their own people and equipping them with the specialized skills of implementing digitalization within the company.

- A clear, simple, online self-evaluation tool or companies – so business owners can determine their businesses' current (if case) and target digitalization levels.

-Free customizable digitalization strategies models/templates can be highly effective for start-ups and SMEs with limited resources.

-Trainings should be also addressed (or promoted to) the self-employed and liberal professions. If carried out by HE institutions, even a less formal certification (but still a proof of attending the course) might be sufficient.

IDEA Country report: Slovakia

Prepared by:

Summary of findings

The emergence of new trends in digital technologies and innovations has been accelerating at a record pace in recent years. The transition from an industrial society to an information society and industry 4.0 is a revolutionary global change. The most important technologies are Artificial Intelligence, Internet of Things, 5G Technology, Big Data, Analytical Data Processing, Edge Computing, Cloud Computing, and Blockchain. A prevailing industry's focus of Slovakia is on narrowly specialized production with low added value and low levels of digital skills of the workforce in this area. Hence, most attention is drawn to the impacts of automatization on Slovakia's workforce. For the economy to become more reliant on knowledge, it is necessary to invest in digital connectivity and digital transformation of businesses, in sustainable and green investments, in skills upgrading and in building social infrastructure.

According to the Report on Slovakia for 2019[106] the country's economic growth and GDP growth continue to accelerate, and Slovakia is one of the fastest-growing economies in the EU. However, significant regional disparities in access to employment opportunities, as well as high long-term unemployment remain. A very important remark is that it is precisely strategic investments in education, innovation, infrastructure, and technology needs that can ensure the country's growth and prosperity in the future.

There have been several achievements in this area already but likewise shortcomings. 59% of Slovaks have at least the basic level of digital skills which is above the European average, connectivity has been rapidly increasing with the available ultrafast broadband coverage. Slovakia is one of the countries that implement advanced technologies in practice and often earlier than other EU countries with high private sector innovation potential and the presence of global ICT companies. However, there are areas to be improved and perhaps the most important is an outdated educational system which should be transformed into a solution-oriented one with a special focus on the development of analytical thinking. In terms of education, the low and declining proportion of STEM students is also an issue to be addressed. Workforce with advanced digital skills and Digital Innovation Hubs are areas that Slovakia significantly lags behind other European countries. A serious problem is the poor quality of

[106] European Commission (2019). Country Report Slovakia 2019. Available at: https://ec.europa.eu/info/sites/info/files/file_import/2019-european-semester-country-report-slovakia_en_0.p (Accessed: 29.03.2020).

eGovernment services and the slow growth of the digital economy because of the strong focus on traditional industries.

Overview of country context in Slovakia

To provide a comprehensive overview of Slovakia, this chapter is compiled from four parts which are further divided into particular subchapters.

Digital infrastructure and fundamentals

Digital Economy and Society Index (DESI) report[107] monitoring member states´ digital competitiveness ranked Slovakia in 21st place (out of 28) with a score 46,3 (European average is 52,5). DESI is a composite index compound by 5 dimensions among which are connectivity, human capital, use of internet services, integration of digital technology and digital public services. In all five dimensions, Slovakia´s improvement is relatively slower than in the rest of the EU as well as its overall performance. The weakest areas compared to the EU are connectivity and digital public services.

Another source of information in the context of digital infrastructure is the World Digital Competitiveness Ranking Report[108] of the Institute for Management Development (IMD). Slovakia ranked 47th place out of 63 countries in 2019, which is better than the previous year when it occupied 50th place. The strengths of the country were the number of investments in telecommunications, the number of internet users and overall high digital or technological skills; on the contrary, insufficient financial support for technological development and a low number of foreign experts were identified as weaknesses.

High-speed connectivity

In terms of high-speed connectivity, Slovakia is evaluated rather poorly by both abovementioned initiatives. According to the DESI index is Slovakia slightly lagging in overall connectivity behind the European average (52,6 vs. 59,3) even though there are certain areas that Slovakia excels at, particularly ultra-fast broadband coverage and broadband Price Index. IMD report highlights a rather low number of mobile broadband subscribers.

On the Slovak market, several positive trends have emerged regarding the use of ultra-fast broadband coverage, which is above the EU average, but there are still problems related to the

[107] European Commission (2019). Digital Economy and Society Index (DESI) 2019 Country Report, Slovakia. Available at: https://ec.europa.eu/digital-single-market/en/scoreboard/slovakia (Accessed: 29.03.2020).
[108] Institute for Management Development (2019). The IMD World Digital Competitiveness Ranking 2019. Available at: https://www.imd.org/wcc/world-competitiveness-center-rankings/world-digital-competitiveness-rankings-2019/ (Accessed: 29.03.2020)

lack of overall fixed broadband coverage and low 4G coverage, as well as a poor use of ultra-fast broadband connectivity in general.

Skills

In the area of human capital, Slovakia ranks 18th among EU countries, which is still below the EU average even though this is the best result of Slovakia in the DESI index measurement. The proportion of people with basic (59%) and advanced digital skills (33%) slightly exceeds the EU average. Also, the IMD report marks digital and technological skills as Slovakia´s overall top strength. On the other hand, Slovakia does not rank well in terms of total public expenditure on education, graduates in sciences and even worse on employee training.

In 2018, the Slovak government approved a new National Education Strategy[109]. It emphasizes the need to improve the use of digital technologies in classrooms and to adapt education to match the socio-economic effects of digital transformation. The government's effort to improve Slovaks' digital skills is targeted on the needs of the industry. A more general approach, especially in schools, would give a chance to gain the right digital skills to a larger share of the population.

Openness

The use of Internet services has improved, but it remains below the EU average and the country has fallen to 20th place in 2019 compared to 19th place in 2018 according to the DESI report. The proportion of people who have never used the Internet is decreasing (now reaching 13%) but is still above the EU average (11%). Internet users in Slovakia offering online goods and services increased reaching 29% which is 6% above the EU average (23%). Many people also use social networks (74% compared to 65% in the EU). However, Slovakia lacks behind especially in using professional social networks, participating in online courses as well as the use of online consultations. SMEs in Slovakia use social media less compared to the EU as well as big data, cloud solutions, and internet sales. World Digital Competitiveness Ranking Report provides a different perspective and states that Slovakia has bad attitudes toward globalization (59th rank out of 63) and e-participation is low (44th rank).

Equal opportunity

[109] The Ministry of Education, Science, Research and Sport of the Slovak Republic (2017). National Program of Education Development. Available at: https://www.minedu.sk/data/att/13285.pdf (Accessed: 29.03.2020).

According to the DESI report, there are significantly fewer female experts in the area of ICT compared to both men (0,8% compared to 2,8%) as well as the European average (1,4%). There have been efforts to promote women in studying ICT as well as technology, however, these incentives do not seem to greatly influence their decision as both numbers of men and women in ICT has been steadily decreasing over the years. There were more than three times fewer women students than men in technical sciences in the academic year 2018/19 according to the Annual report on the state of higher education in Slovakia 2018/19[110].

Policy support

Slovakia has adopted several measures that are built on the strategic priorities set by the Digital Single Market Strategy and actively participate in the tasks to improve digital infrastructure. Implemented strategies are built on three pillars:[111]

1. *Better access for consumers and businesses to online goods and services across Europe.*
2. *Creating favorable conditions for the growth of digital networks and services.*
3. *The growth potential maximization of the European digital economy.*

The most significant initiatives in the area of digitalization are:

1. *Smart Industry Action Plan of SR*[112] - Slovakia is one of the countries with a strong industrial tradition and the ambition is to remain connected with the industry in the future. The Fourth Industrial Revolution presents several challenges such as robotics, automation, digitization, information and communication technologies (ICT) which are a part of the domains of the research and development strategy for smart specialization. Designed jointly for the public sector, industry and academia, the Smart Industry concept marks the start of a national initiative to transform and strengthen the industry through the latest technological developments, as well as helping Slovakia to adapt to the changes this transformation will bring until 2020.

[110] The Ministry of Education, Science, Research and Sport of the Slovak Republic (2019). Available at: https://www.minedu.sk/vyrocne-spravy-o-stave-vysokeho-skolstva/ (Accessed: 29.03.2020).
[111] Office of the Deputy Prime Minister of the Slovak Republic for Investments and Informatization (2016). National concept of public administration informatization of the Slovak Republic. Available at: https://www.vicepremier.gov.sk/sekcie/narodna-koncepcia-informatizacie-verejnej-spravy-nikvs/index.html (Accessed: 29.03.2020).
[112] Smart Industry Action Plan of SR (2016). Available at: https://www.mhsr.sk/uploads/files/8U6RKSS5.pdf (Accessed: 29.03.2020).

2. *Digital Transformation Strategy of Slovakia 2030*[113] - is a supra-governmental framework strategy that defines Slovakia's policy and specific priorities in the context of the ongoing digital transformation of the economy and society under the influence of innovative technologies and global megatrends of the digital age. It covers the period of 2019 to 2030, consisting of ongoing and partially managed digitization processes, informatization and the agenda of the European Union's Single Digital Market, as well as in the context of the global priorities of broad digital transformation. The vision is focused into 5 areas: Economy; Society and Education; Public Administration; Regional Development; Science, research and innovation.

E-government

In the area of digital public services, Slovakia ranks 21st among EU countries, well below the EU average according to the DESI report. The best performing indicator is open data, where Slovakia ranked 8th and exceeded the EU average. Slovakia continues to improve the digital public services offered to businesses but the share of internet users who submit forms to public authorities online was 54% compared to the EU average of 64% in 2019. Slovakia is introducing new e-government and e-health services. The challenge remains in making sure that people, businesses and institutions are equipped with the right skills, tools, and incentives to use these services even further.

National concept of public administration informatization of the Slovak Republic[114] is a concept that brings a new systematic and coordinated view on public administration informatization. The concept describes in detail the issue of informatization from different perspectives so that the public administration provides quality services not only to citizens and entrepreneurs but also to other public authorities. The basis of the concept is to define strategic goals, principles of informatization of public administration and to propose priorities of informatization of public administration for the period 2017 -2020.

[113] Office of the Deputy Prime Minister of the Slovak Republic for Investments and Informatization (2018). Digital Transformation Strategy of Slovakia 2030. Available at: https://www.vicepremier.gov.sk/wp-content/uploads/2019/06/Strategia-digitalnej-transformacie-Slovenska-2030.pdf (Accessed: 29.03.2020).
[114] Office of the Deputy Prime Minister of the Slovak Republic for Investments and Informatization (2016). National concept of public administration informatization of the Slovak Republic. Available at: https://www.vicepremier.gov.sk/sekcie/narodna-koncepcia-informatizacie-verejnej-spravy-nikvs/index.html (Accessed: 29.03.2020).

Finance

There are not any financial incentives that are solely proposed by Slovakia aimed at digitalization and informatization. However, Slovak SME´s are eligible to apply for European funds such as ISA2, Horizont 2020, Erasmus +, COSME, LIFE, Creative Europe, Connecting Europe Facility, Europe for citizens, CEF Trasport, etc. These incentives support the development of digital solutions that enable public administrations, businesses, and citizens in Europe to benefit from interoperable cross-border and cross-sectoral public services.

Innovation ecosystem

Slovak government puts lots of emphases as well as effort into enhancing the innovation ecosystem. One of the initiatives which greatly contributes to this objective is *National entrepreneurship centers*[115]. The services are provided for individuals as well as young SME´s and range from financial services, consultations, and support, organizing different events, workshops, international events, exchanges, and fairs, providing incubation, acceleration, and coworking services, to special services like enhancing different skills, providing e-learning services, support in terms of propagation and Creative Point or Fablab, which enables them to create their prototypes using 3D or 2D models.

Another such initiative is *Platform of innovative solutions*[116] which is a project that leads to the creation of a platform of innovative solutions. The cornerstone of this project is a dedicated platform using crowdsourcing elements. The principle of such a platform is to publish the demand for the solution of the problem on the website and the subsequent financial evaluation of the solutions offered by external solvers. Unlike conventional procurement, not the best offer for future delivery is valued but solutions that are already developed. In this way, the buyer will get ideas for solving a specific problem in a relatively short time and with minimal risk.

Growing through e-Commerce

E- commerce is a way to lower the costs of sales internationally as well as nationally. Therefore, the services need to be conducive towards such trade.

Online payments

[115] https://www.npc.sk/sk/
[116]https://www.vicepremier.gov.sk/sekcie/platforma-inovativnych-rieseni/index.html

The use of internet banking in Slovakia has improved over the years but remains below the EU average (62% of internet users vs. 64%) according to the DESI report. Furthermore, the IMD report evaluates cyber security rather poorly, Slovakia ranks 57th out of 61 evaluated countries while in banking and financial services it is slightly better, placing Slovakia in 50th place. On the other hand, Slovakia outperforms many other countries in terms of software piracy, reaching 26th place which can be considered one of its strengths.

E-commerce

The proportion of people who shop online is increasing and outperforming the European average (71% compared to 69%). Slovakia is ranked among the leading European countries in online sales. In 2019 it occupied 6th rank from EU member countries with 29% of internet users using sales online. According to Eurostat[117] only 12% of Slovak enterprises earn at least 1% of their turnover through e-commerce sales compared to 18%, which is the European average. Even more profound differences between Slovakia and EU can be found looking at enterprises selling electronically in their home country (Slovakia - 14% vs. EU – 20%). At the same time, the percentage of turnover from e-commerce is more significant for Slovak enterprises, which represents 21% of their turnover while the European average is only 18%. Only 38% of enterprises in Slovakia have a website and use any social media (EU-49%).

Cross-border delivery

An interesting indicator which Eurostat provides as well is enterprises with web sales to other EU countries. Only 5% of Slovak enterprises access the European market this way compared to 7% for the EU.

Governing digital markets

Participatory governance

Establishing participative governance is important to gain brother support of different actors to achieve a common objective. It was already mentioned in this report that many of the strategic documents were created in cooperation with policymakers, actors from the private sector, experts and academia. In this sense, several subjects oftentimes engage in policymaking

[117] https://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do

processes and are significant influencers in the area of the digital transformation of the country. Some of them are:

- *Working Group on Digital Transformation of the Slovak Republic* – its main task is to provide cooperation in the implementation of measures of the Digital Transformation Action Plan, which includes the affected ministries and main actors and coordinators of individual measures, as well as the professional public.[118]
- *Slovak Center for Artificial Intelligence Research (slovak.AI)*[119] - was founded in 2019 as a platform for excellence in artificial intelligence and a platform connecting students, researchers, entrepreneurs, teachers, investors and all others who are interested in artificial intelligence, professionally and/or excited about the potential that artificial intelligence brings. It connects the academic, private and public sectors, creating partnerships to exploit and improve artificial intelligence
- *IT Association of Slovakia*[120] - It is the largest Slovak professional association of the most important domestic and foreign companies operating in the field of information and communication technologies.
- *Digital Coalition, National Coalition for Digital Skills and Occupations of the Slovak Republic*[121] – it aims to mobilize across the spectrum of public, private, academic and civic organizations and institutions in Slovakia to improve the digital skills of citizens, IT specialists, all employees and in education.
- *Slovensko.Digital*[122] - is a civic association focused on improving the quality of digital services of the state. Although Slovakia. Digital does not have the power to decide on the content of public policies in the field of eGovernment, its goal is to contribute to the professional discussion by creating proposals or concrete examples of good practice that can be fully incorporated into strategic documents, legislation or as a complementary and auxiliary material for public administration experts.
- *SAPIE*[123] - The Slovak Alliance for Innovative Economy (SAPIE) is the largest innovative alliance in Slovakia, bringing together more than 90 members from the ranks of startups, scaleups, non-profit organizations, investors and corporations. SAPIE is

[118] https://www.vicepremier.gov.sk/sekcie/informatizacia/digitalna-transformacia/pracovna-skupina-pre-digitalnu-transformaciu-sr/
[119] https://slovak.ai/
[120] https://itas.sk/
[121] https://digitalnakoalicia.sk/
[122] https://slovensko.digital/
[123] http://sapie.sk/

dedicated to supporting innovative ecosystem through projects in the field of innovative education, support of startup and innovation ecosystem in Slovakia.

Regional markets

Slovakia is a relatively small country while all the incentives are generally the same for all regions. There are other incentives aimed at building regional markets and encouraging cross-border links between people and businesses which are usually supported by European funds.

ICT in aid

Slovakia heavily relies on European funds in the area of digital transformation and innovations in terms of finance. Also, the Digital Single Market initiative stimulated the creation of strategic documents.

Monitoring

Slovak statistical office measures, monitors and evaluates a set of indicators in the area of digitalization. There are also other interesting initiatives such as *IT Fitness test*[124] and *Innovation map Slovakia*[125]. IT Fitness test offers Slovaks the possibility to test their ICT skills. After completing the online test with 20-25 tasks, the participants receive a certificate with their score and a set of recommendations in which areas they need to improve the most. The test questions cover 5 main categories: • Internet • Cybersecurity and computer systems • Collaborative tools and social networks • Office tools • Complex tasks.

[124] https://itfitness.sk/
[125] https://innovationmapslovakia.sk/

Overview of HE context in Slovakia

This chapter is organized according to three stages of the Student Entrepreneurship Encouragement Model (SEEM), which considers some steps that must be followed by universities to encourage students in developing an entrepreneurial spirit. SEEM was developed by carrying out an empirical analysis and investigating the entrepreneurial encouragement offerings in three universities: MIT in the United States, IIIT in India and Utrecht University in the Netherlands. The three steps are: stimulation of entrepreneurial intention of dormant entrepreneurs, student's education and incubation of students' innovative ideas.

Educate

The Slovak government approved a new National Education Strategy[126] in 2018. However, it highlights the need to improve the use of digital technologies in classrooms, to adapt education to match the socio-economic effects of digital transformation and to improve Slovaks' digital skills based on the needs of the industry but do not propose a general approach how and to what extend digital skills should be taught at different stages of education or how to deal with decreasing number of students in ICT and lack of experts in this area.

Another initiative by the Slovak government is called *Transforming Education and Schools for the Digital Age* which had been just recently approved. The authors believe that one way to reverse the current situation (being not ready for changes which the new digital age is bringing along) is to start a change in thinking and education in schools. The primary objective is to prepare teachers for quality education and digital transformation. The school itself is to become a knowledge organization.

There have not been many independent projects related specifically to digital entrepreneurship in Slovakia, even though they have been increasingly supported, not just by the state but also by innovative firms, small entrepreneurs or universities. There are many universities, which partially provide education in the area of digital entrepreneurship and innovation in the form of classes or other initiatives. For example, Comenius University, Faculty of management has had a digital marketing club that created a digital university. Digital University is an innovative Digital Marketing Club educational project that has been

[126] The Ministry of Education, Science, Research and Sport of the Slovak Republic (2017). National Program of Education Development. Available at: https://www.minedu.sk/data/att/13285.pdf (Accessed: 29.03.2020).

specializing in the professional education of students, marketers, and entrepreneurs in online marketing for 8 years.[127] Slovak Technical University in Bratislava and Technical University in Košice are also important actors in this area, especially in bringing up significant number of STEM students in Slovakia. Another example is Pan - European University. At the bachelor's degree, there has been a subject - digital marketing. Students have got the opportunity to obtain a certificate certifying the quality of their professional knowledge. This university is also the partner of the Digital Garage project.

This interesting initiative which can boost the country in the area of e-commerce is Google´s initiative called *Digital Garage*. It is an extensive educational program prepared by Slovak Google. It focuses primarily on Slovak students and young people, who often have difficulty finding a job in the labor market for skills gaps, including digital skills. The main pillar of education is the free online platform digitalnagaraz.sk, which offers the development of digital skills and is accessible to all regardless of the level of knowledge or profession. Free courses are designed for beginners as well as advanced users of Internet tools, and the level of difficulty adapts to each participant.

Such initiatives are very important in Slovakia because the number of ICT students has been rather low over the years. In the most recent academic year 2019/20 there have been slightly more than 5600 students in the area of ICT out of which only slightly more than 700 were women. This number has been steadily slowly rising over the last two years both in the overall number as well as the number of women engaged.

Stimulate

From 2007 to 2013 several science parks have been built in Slovakia with support from the European Investment and Structural Funds. The main source of funding during that period was the ‘Operational Programme Research and Development’. The total investment in the construction and creation of science parks and research centers was nearly EUR 400 million. Most of the funds, almost 80 percent were allocated to Bratislava, Žilina and Košice regions. Even though these science parks are not particularly focused on digital entrepreneurship, this kind of projects are also eligible to participate.

[127] https://www.digitalnauniverzita.sk/onas/

One such example is *TECHNICOM University Science Park in Kosice*[128] – it is the University Science Park for innovative applications with the support of knowledge technologies. It is implemented within the Operational Program Research and Development and is co-financed by the European Regional Development Fund. The goal is to create a package of business center services - an association of business incubator and accelerator services that help start-ups (and spin-offs) in business.

Incubate

Many Incubators cooperate with universities, which in some cases are the main partners as well. There are incubators, which were created by technology universities and therefore they are known as technological incubators, which support innovation and new technologies in Slovakia. There are at least 17 technological incubators in Slovakia however none of them are especially focused on digital start-ups.

Below are a few examples of incubators that were created by the university initiatives.

University Technology Incubator, Slovak Technical University (STU) in Bratislava - supports students and startups and interconnects the university with practice. Incubated companies allow personal consultations with mentors, and with a team of lecturers. The incubator regularly organizes free events for the general public, aimed not only at education but also at networking. Besides, the incubator provides office and conference facilities for rent.

Incubator TUKE (Technological University in Kosice) - acts as a part of the TECHNICOM University Science Park ecosystem, where it is a key component of business acceleration, technology transfer, and innovation built within the University Science Park concept. The aim is to create a motivating environment in the region of Košice and Prešov, which helps innovative ideas to develop in different areas of activity. The idea is to kick-start a process that encourages people to realize their innovative ideas and helps turn the idea into a commercially useful product or service. Incubator TUKE significantly supports the area of innovation and technology transfer through high-quality expert advice as well as available top-class research infrastructure.

Incubator at University science park (USP) in Zilina - is primarily focused on young researchers, PhD. students, students with creative potential who need initial (professional and

[128] https://www.upjs.sk/en/faculty-of-science/technicom/

material) support to start their activities. However, it is also for older and more experienced innovators.

Success and failure factors and recommendations

Success factors

- Human capital - based on the results of the DESI index for 2019, we can conclude that at least the basic level of digital skills reaches 59% of Slovaks, which is above the EU average (57%) as well as above basic digital skills (33% compared to 31% in EU)
- Connectivity - rapid increase in mobile broadband coverage, the available telecom market data show that 4G / LTE mobile coverage is above the EU average, with the three largest mobile operators each having a population coverage of over 94%. Ultrafast broadband coverage is also a strong aspect of Slovakia reaching 80% compared to 60% which is the EU average.
- Saturated and competitive electronic communications market bringing technological solutions and innovation which are above-standard compared to EU - Slovakia is one of the countries that implement advanced technologies in practice and often earlier than other EU countries, as evidenced by the latest innovative services of Slovak telecom operators.
- Private sector innovation potential and the presence of global ICT companies – there are several successful multinational companies, IT companies, and start-ups in Slovakia that work with digital technologies and bring to market a number of unique world-class innovations and technology solutions - for example. IBM, Lenovo, Orange, Dell, Eset, O2, AT&T, Accenture, Exponea, WebSupport, sli.do, Innovatrics, GymBeam, Photoneo, Staffino, Quality Unit, and others.
- The Digital Coalition, founded in 2017 on the initiative of the IT Association of Slovakia and with the support of the Office of the Deputy Prime Minister of the Slovak Republic for Investments and Informatization, is a successful example of activation across the spectrum of public, private, academic and civic organizations and institutions in Slovakia to improve digital skills of citizens.

Failure factors

- Outdated educational system - the current model of education in Slovakia is based on a "push" system consisting of mass education. Its disadvantage is the great uncertainty in the employment of graduates, as the priority is on knowledge and less effort is devoted to its transformation into solutions or development of analytical thinking. There has also been a large gap between existing knowledge and achievements (knowledge-performance gap).

Slovakia is also missing a strategic document that would set the desired direction of development in the area of digital transformation.

- The low and declining proportion of students and graduates of Science, Information Technology, Engineering and Mathematics (STEM) - the McKinsey report[129] states that the proportion of male university graduates in the field of STEM is 6 7%, while even more alarming is the proportion of female graduates in these fields (0.6%). Also, Slovakia has a great lack of digital technology experts in general according to the DESI report 2019. Slovakia is facing an outflow of talented Slovak STEM specialists who either go abroad to study and stay there or after graduation in Slovakia, they leave to work abroad.
- Lack of workforce with advanced digital skills – DESI report 2019 shows as well that Slovak companies and public administrations have long been suffering from a lack of workforce with advanced digital skills and / or lack of experience in technology and / or lack of technical education.
- The untapped potential of a fiber-optic network: The available data from the telecommunications market show that fiber-optic networking in the country is progressing at a slow pace.
- Lack of Digital Innovation Hubs in Slovakia: The EC report on DIHs[130] points out that Slovakia is one of the last four EU Member States (along with Bulgaria, Romania, and Malta) that do not have a functioning digital innovation hub in the country. It is alarming that no hub is in operation in Slovakia, unlike in the other EU Member States.
- The low level of economic digitization and inefficient functioning of eGovernment - DESI results for 2018 show that Slovak production, services, and the public sector continue to show a low level of informatization. In particular, a serious problem is the poor quality of eGovernment services.
- The slow growth of the digital economy - EC analyses such as Report on Slovakia 2019[131] shows that the Slovak economy remains primarily based on traditional industries such as the automotive industry and is only weakly oriented towards the digital economy and the innovative industry.

[129] McKinsey, The Rise of Digital Challangers: How digitization can become the next growth of engine for Central and Eastern Europe –Perspective on Slovakia, https://digitalchallengers.mckinsey.com/files/The-rise-of-Digital-Challengers_Perspective-on-SK.pdf (Accessed: 29.03.2020).

[130] European Commission (2018). DG Connect, Digital Innovation Hubs. Available at: https://ec.europa.eu/futurium/en/system/files/ged/digital_innovation_hubs_in_digital_europe_programme_fina (Accessed: 29.03.2020).

[131] European Commission (2019). Country Report Slovakia 2019. Available at: https://ec.europa.eu/info/sites/info/files/file_import/2019-european-semester-country-report-slovakia_en_0.pdf (Accessed: 29.03.2020).

Recommendations

- Capture and develop talents, stimulate lifelong learning among employees and grow the pool of ICT specialist population.
- Increase public and private support enabling the population to improve their digital skills and gain work experience – by creating different platforms to get skills by young people or unemployed people who want to get a higher qualification.
- Increase the early adoption of digital skills at schools and promote and take-up of internet services by the general population.
- Promote and increase the adoption of digital tools by SMEs as well as large companies.
- Reskilling of work-force - the biggest labor pools are in manufacturing and retail, with low current digitization rates and high future automation potential which creates exposure for the labor market stability.
- Prepare education, healthcare, arts and entertainment sectors for evolution – these sectors exhibit low digitization and low automation potential.
- Develop, implement, and promote e-government solutions in the public sector.
- Foster entrepreneurship in Slovakia to stimulate the startup ecosystem.

IDEA Country report: Spain

Prepared by:

Summary of findings

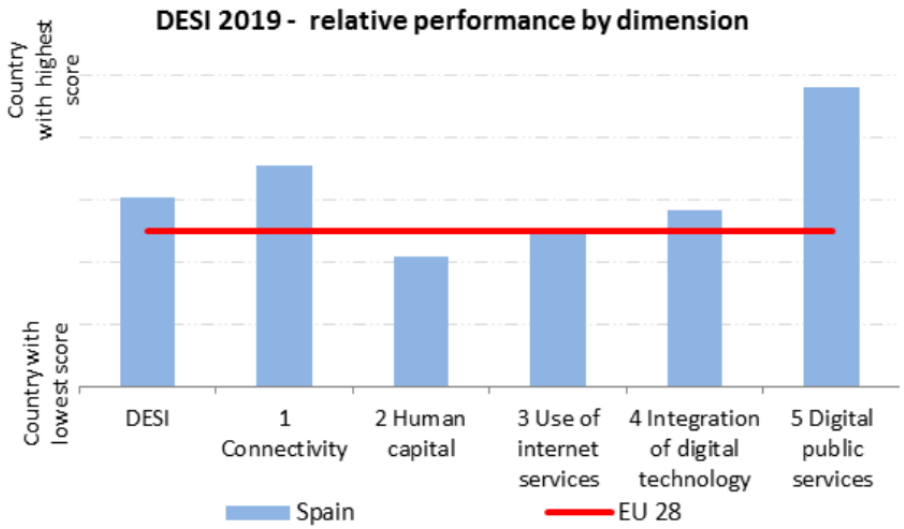
The arrival of technology has brought important changes to the Spanish market place. The arrival of new technologies has revolutionized the society and with it, the world of work. It is more and more changing and that is why companies are looking for upper skilled digital profiles. Digital managers are what most companies in Spain are asking for: 51% of the total job offers, according to the ISDI's Digital Employment Observatory in Spain in 2017. The business sector is currently suffering from a major imbalance between supply and demand for digital professionals who have a sufficient but not excellent repertoire of digital skills. One of the main reasons is that students do not receive specific practical training to develop digital skills during their educational career. Moreover, the existing high level of unemployment in Spain which is around 20%, even more dramatic if we take into account youth unemployment that reaches figures close to 50%. This issue requires that measures launched by the different administrations need to be boosted in order to help decrease these figures, with a more focused approach to digital companies in programs and employment possibilities for young and practitioners. For this purpose, RED.es, the public entity attached to the Ministry of Economic Affairs and Digital Transformation of Spain has launched a call for proposals to develop training programs oriented to the digital industry and aimed at young people enrolled in the National youth guarantee system. The aim of the call is to develop high level digital skills for ICT professionals in all industry sectors, supporting access into jobs that boost the digital transformation of companies. Moreover, government together with private companies started to drive innovative spirit as a new model for job creation to promote citizen's initiative, increase, strengthen and diversify business ecosystem, promote the generation and renewal of business such as the programmes run by TELEFÓNICA ESPAÑA, the private telecommunications company that is one of the largest telecommunication companies in the world and is the fourth largest client number in the fifth total market value. It includes a funded scholarship plan that seeks to promote innovative young talent, providing the tools and support needed to encourage them to participate in the creation of a new digital world. The

comprehensive qualification and employment programme (*programa integral de cualificación y empleo – pice*) designed by the Chamber of Commerce of Spain and implemented by its territorial offices is another initiative that perfectly matched the previous mentioned. It aimed to reach a total of 16 600 contracts and 1 228 new digital companies for young people as well as 3 000 youth on training mobility during 2016-18. Within these policies, creation and development of new enterprises have become a major challenge of Spanish policy for employment and SMEs.

Overview of country context in Spain

Technology has brought important changes to the Spanish marketplace. The automation of processes and digitalization caused many important advantages to organizations and also in society. Productivity increased as technologies favored the creation of modern, more competitive and productive companies; new professions were born as companies had to adapt to digital changes and this caused workers who are or intend to be in companies to adapt to change as well, mastering in ICTs and digital skills. A rising search for digital talents as suitable candidates is now more reliable and faster. The number of managerial positions available for the Internet is growing by 34% and accounts for more than half of new employment. Digital managers are what most companies in Spain are asking for: 51% of the total job offers, according to the ISDI's Digital Employment Observatory in Spain in 2017.

Despite this growing demand on the labour market, the supply of Spaniard ICT specialists is still below the EU average. The European Commission has been monitoring Member States' digital competitiveness with the Digital Economy and Society Index (DESI) reports since 2015. 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.



According to the DESI 2019, as regards the Human capital dimension, Spain ranks 17th out of 28 EU countries and is thus below the EU average. Basic digital skills levels remain below the EU average. Only 55 % of people between 16 and 74 years of age have basic digital skills (the figure is 57 % in the EU as a whole). The proportion of ICT specialists represents a lower percentage of the workforce compared to the EU average (2.9 % compared to 3.7 % in the EU).

ICT graduates in Spain account for 3.9 % of the total. Female ICT specialists account for a mere 1 % of total female employment

	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

Nevertheless, according to the ISDI's Digital Employment Observatory in Spain in 2017 digital employment in Spain continues to rise and Madrid is the majority leader (67%) for job offers in the country with the following dominant sectors: Media and Advertising (14%), marketing (28%) and strategy (22%), although job demand in new fields such as Big data, HR and innovation occurred. Moreover, the evolution in the last five years points to a market place where the continuously changing society is in need of new ICT specialists, as their involvement in the business strategy grows constantly.

However, this is only on side of the coin. The other side of the coin is represented by youth unemployment due also to a lack of digital skills among youngsters and the difficulty of finding a job or layoff for digital automation. In facts, in Spain, 21.7% of jobs are at risk from automation and another 30.2% may undergo a profound transformation due to the technological revolution, according to a recent report by the Organisation for Economic Co-operation and Development (OECD).

In this context, a strong cooperation between Public Institutions, private and third sector is important to face these current social issues.

Policy support

According to the 'Plan Digital 2020' run by the 'Spanish Confederación Española de Organizaciones Empresariales' the country needs to undertake measures to digitalizations. Those measures will contribute to increase the GDP growth rate by more than 40% and require the revitalization of three basic pillars: education, innovation and entrepreneurship. Moreover, the involvement of all the Public Administrations and all the productive sectors is needed in

order to place Spain, in the year 2020, in a prominent position in the world digitalization to manage the challenges and take advantage of the opportunities of the Digital Revolution. This plan includes also a push towards the e-commerce for SMEs considering their low percentage of presence into the e-commerce.

The call for aid from Spain, which is funded by the European Social Fund (ESF) for the 2014-2020 programming period and by the Youth Employment initiative, specifically from the Youth Employment Operational Program (POEJ), will allocate 19.95 million euros to promote youth training and employment in the digital economy, which will benefit 28 entities that will develop a total of 33 comprehensive employment projects through 82 training actions in 15 Autonomous Communities.

The problem of youth unemployment has been one of the main concerns of the country's political program over the past decade. To respond to this problematic the government of Spain approved in 2013 the "Strategy for entrepreneurship and youth employment" 2013-2016. This Strategy, clearly influenced by the New Public Organization, is the result of an intense process of dialogue and participation with trade unions, business associations and other social and economic agents. Direct measures were established for education, training, with special attention to the acquisition of skills in information and communication technologies aimed at the promotion of entrepreneurship and self-employment for young and students.

The national public body develop programs to boost the digital economy, innovation, entrepreneurship, training for young people and professionals and support for SMEs by promoting the efficient and intensive use of Information and Communication Technologies (ICT) is called Red.es.
Many of the projects that are carried out from Red.es receive the co-funding from the European Union, through the European Regional Development Fund (ERDF) and the European Social Fund (ESF). Among the eligible projects there are national initiatives for training projects with a commitment to hiring in the field of ICT and the Digital Economy, aimed at young people enrolled in the National Youth Guarantee System. The hiring commitment is that at least 30% of young people who complete the training will be inserted in the job for at least 6 months, in positions related to ICT and the Digital Economy (maximum 5% as self-employed workers). One of the objectives of Red.es is to promote the development of the information society in Spain. This initiative is part of the Spanish Digital Agenda Strategy, which has 106 lines of action structured around six axes, the sixth being to promote digital inclusion and literacy and the training of new ICT professionals. It targets young people aged 16 to 29 with or without

qualifications or work experience who wish to receive adequate vocational training to improve their digital skills, find employment or start their own business. The comprehensive qualification and employment programme (*programa integral de cualificación y empleo – pice*) designed by the Chamber of Commerce of Spain and implemented by its territorial offices was another initiative that perfectly matched the previous mentioned. It aimed to reach a total of 16 600 contracts and 1 228 new companies for young people as well as 3 000 youth on mobility during 2016-18. Another initiative run by The Ministry of Economy, Knowledge, Business and University of the Andalusian Government allows young entrepreneurs to make a self-diagnosis of their digital competences and assess their level of ICTs skills through an online tool. At the end of the evaluation, a report is provided to the user with a diagnosis of the level of digital competence and a personalized training itinerary to cover any gaps found. This could be used as a starting point for young entrepreneur to define their weakness and strengths.

Moreover, the Government is currently working on the 'Spain Start-up Nation' strategy as an overarching strategy to embed innovation and digitalization in all aspects of the economy and society. This strategy would include the following elements:

1) a new plan for the deployment of digital infrastructure;

2) investment in enabling digital technologies;

3) programs to promote skills and talent;

4) a national Artificial Intelligence strategy.

In addition, new initiatives such as the "*Retail modernization plan 2019-2020*", included in the "Agenda for Change" will promote innovation and digitalization in specific economic sectors of the country.

Growing through e-commerce

Spain B2C E-commerce Report 2019 demonstrates a continued growth of Spain in e-commerce, with a decline in the global unemployment rate and a promising rate of growth in Internet penetration. The report also shows consumer behaviour, consumer trends, and interviews with leading experts in retail and logistics. However, according to CEPYME -Confederación Española de la Pequeña y Mediana Empresa- in English the Spanish Confederation of Small and Medium Enterprises, although in Spain e-commerce is on the rise, the percentage of use is also low, with only 19.6% of large companies already selling through this channel. The small and medium enterprise are still far from e-commerce. Despite this, B2C e-Commerce turnover

grew to 23,905 million euros in 2018, driven by a growth rate of 25.23%. The main reason why Spanish consumers buy online is convenience, price is also a key factor when choosing a web store. The cost of shipments is a priority for Spanish consumers and, without a doubt, something that an e-commerce must take into account. Spanish buyers have a strong preference for third-party online payment services, such as PayPal. These data are confirmed by the VI Annual Study of eCommerce in Spain 2019 which states that more than half of Spanish e-shoppers already buy from their mobile. Currently 71% of Spanish Internet users between 16 and 65 years of age purchase their products online, that is, 20.3 million people, representing a growth of 4.6% compared to 2018. When e-shoppers search for information before deciding where to buy they opt for marketplaces such as Amazon, eBay and Aliexpress or similar platforms that are the portals where Internet users prefer to find out about prices, products and services (66%, three points more than in 2018). When searching for information, 9 out of 10 online consumers largely use marketplaces as a price comparator. Virtual assistants are becoming more relevant for online consumers. In fact, the V Annual Study of eCommerce in Spain 2018 revealed that 23% of consumers had ever had contact with a virtual assistant or chatbot, a percentage that rises to 25% this year. Of these, 54% claim to have formalized purchases thanks to these tools. E-commerce sales in Spain will grow faster than any other country in Western Europe in the next three years, propelled by the rise of AliExpress and its continued competition with Amazon to be the go-to marketplace. Analysts at eMarketer Alibaba affirms that Given the popularity of the AliExpress marketplace in Spain, the Alibaba Group is using Spain as the jumping-off point to grow its marketplace in Western Europe also partnered with El Corte Inglés, one of the largest retailers in Spain, to add its products to AliExpress's marketplace. El Corte Inglés is also offering click and collect to AliExpress customers. In conclusion, E-commerce sector is rapidly growing in Spain and, for the consumers, online shopping is becoming more frequent every year. The data reveal a growing business in a context of a strong economy. As it has been shown in this article, the scene for the next years is very optimistic and the Spanish online shop managers are very confident about the future.

Governing digital markets

The Spanish Chamber of Commerce is a public law corporation whose purpose is to represent, promote and defend the general interests of Spanish companies. It also represents and coordinates all the territorial Chambers of Commerce. It manages the various regional initiatives to build a stronger digital country market such as ‘InnoCameras’ that supports the innovation in SMEs, ‘Xpande Digital’, to boost the digital positioning of new company to

compete into international markets. Undoubtedly, many of the actions made in this perspective have a positive impact on entrepreneurship. However, one of the objective of the Chamber of the Commerce is to facilitate knowledge of existing initiatives aimed at promoting and educating in entrepreneurship, through:

- Making an inventory of all public and private initiatives that promote or stimulate digital entrepreneurship;

- Dissemination initiatives through a "single agenda/web" that manages and publicizes all success stories, advice, guidance, resources, grants, etc.. reference for the entrepreneur;

- Promoting the specifically digital entrepreneurial spirit, which has important facilitators, with the inclusion of fiscal measures that stimulate activity, as well as the creation and development of ecosystems that structure entrepreneurship in such a way that new initiatives can take responsibility for a small part of the broader and more ambitious set.

The "Digital Skills Awards Spain 2020" will be presented within the framework of the 3rd Forum of the Alliance for the Development of Digital Talent, a top-level event that will take place on 4 June 2020. High-level representatives from the European Commission, the Spanish Public Administration and the main stakeholders of the Spanish digital talent ecosystem are expected to participate. The first edition of this award recognizes the merits of companies that stand out for their digitalization projects. Among those there is: IVECO. IVECO wins the Connected Industry 4.0 award from the Ministry of Industry, Trade and Tourism , which recognizes its commitment to an innovative and connected transformation of industry, such as the IVECO plant in Valladolid, which was awarded this prize.

One of the organiser of the 'Digital Skills Awards Spain', is Ametic, the main employer representative of the digital technology industry sector in Spain takes place. Ametic launched in October 2017 the Alliance for the development of Digital Talent, that brings together about 50 companies in the ICT sector and other entities such as universities, business schools, training centers, foundations, or companies from other sectors interested in transformation and digital talent. The objective of the Alliance is to promote, educate and train in the new digital skills that demand the organizations of the ICT sector and other sectors that are in the process of digitization, and in general, Spanish society, under the new paradigm of digital transformation, involving all stakeholders from a model of open innovation and public-private collaboration platforms. AMETIC has been designated by the European Commission as the Technical Secretariat, at national level, of the European initiative "DIGITAL SKILLS AND JOBS

COALITION" which promotes digital skills and promotes the digital agenda of Member States in the field of digital skills.

In this scenario, another initiative created to recognize and reward the projects that drive digital skills and transformation is offered by RED.ES. Every year it launches a program called Oficinas de Transformación_Digital (OTDs) aimed at encouraging the creation and consolidation of digital transformation offices that facilitate the digitization process of the Spaniard company and also boost digital entrepreneurship. It is endowed with 5 million euros from the European Regional Development fund co-financed by the operational program for smart growth. The objective is to strengthen the ecosystem of support to SMEs in ICTs matters through:

- dissemination services: awareness-raising and dynamization actions for SMEs in their digital transformation process and for entrepreneurs
- support services: attention and resolution of queries on ICT solutions and methodologies to improve business management.

Applicants must submit an action project detailing the activities, which may be:

- dissemination actions: carrying out collective actions that allow communicating to a group of user SMEs the advantages or methodologies necessary for the implementation of technological solutions and publicizing red.es programs to promote the use of ICT.
- support actions: provision of a service for SMEs to resolve queries about solutions and / or methodologies to improve company management through the use of ICT.

The beneficiary entities will have a maximum period of 6 months to start up the services and an execution period of 1 year.

In 1973 the Fundación Universidad-Empresa was born with the aim of bringing the world of the university and the world of business and digital entrepreneurship closer. Since its creation, the University-Business Foundation has developed innovative programs and initiatives to achieve this, but above all, it has been able to adapt to the profound social, economic and cultural changes experienced throughout its history, always offering adequate responses to the changing needs of the company, the universities and the students. Its 45-year history, in which there has been a high impact on Spanish society, is full of great challenges that will mark the

next steps for a future in which the FUE will continue to promote university-digital company collaboration with the same goals of its foundation.

Talento digital, a spinoff of *Smartmind* and a training consultanf born in 2013 that in its first years of life managed to position itself as one of the main players in the sector in the delivery of subsidized courses for workers in Spain. It offers training courses to unemployed youngs to access or re-enter into the labor market in digital field. Those free courses, supported by the SEPE, Servicio Público de Empleo Estatal, are available to youngs in need to upskill their digital competences and develop an entrepreneurial spirit.

In the framework of best practice run by Spanish startups, is relevant the effort of Telefónica talentum startups that offers a comprehensive program intended to find and attract talent within Spain. It includes a funded scholarship plan that seeks to promote innovative young talent, providing the tools and support needed to encourage them to participate in the creation of a new european digital world. Through practical training, this scholarship program provides university students with the opportunity to experience at close-hand the realities of professional life, thus encouraging their early integration into the labor market. Internship students receive tutored practical training at the same time as performing tasks to support advanced research projects in the field of information and communications technology.

The different talentum scholarship programs are designed to cover different needs and situations, covering young students and graduates with initiative. The program is cofunded by *TELEFÓNICA ESPAÑA*, the private telecommunications company that is one of the largest telecommunication companies in the world and is the fourth largest client number in the fifth total market value. The programs offered are basically two:

1. Telefónica españa scholarship for graduates under the age of 30, in which youngs perform internships till one one year. Subsequent hiring possibilities. Annual call.
2. Curricular internships in Telefónica, compatible with other trainings and university carrer. Biannual call.

Overview of HE context in Spain

Today's Spaniard university students have a more tangible entrepreneurial spirit than their predecessors. Although the rate of students and youngsters heading towards a government job for life after graduation is still high, one out of every four students now see themselves at the helm of his/her own business in the near future. A joint study sponsored by the entrepreneurial partnership Educa 20.20 and the AXA Foundation, shows that the average age of the entrepreneur is going down from 35-40 years of age to the 20-25 age range. The entrepreneurial spirit of today's university students is a result of the fact that students have experienced the economic crisis and they are aware that the situation is very complicated, so they see more clearly that one potential way out is creating their own business but this is also due to the wide educational and training offers from Spanish University in digital competences and entrepreneurial skills.

As concerns the country-level policies and Spanish strategies on digital entrepreneurship education at universities there is no a unique strategy or educative path followed by all country. In facts there are many isolated initiatives and University programs for each Autonomous Community. Anyway, a common factor is that the methodologies and the study plans adopted in Spanish HE context have more a theoretical focus than a practical. That's why in the 'Plan Digital 2020' run by the 'Spanish Confederación Española de Organizaciones Empresariales' aimed at accelerating the country digitalization process the involvement of all social, political and economic agents is absolutely necessary to achieve an education system connected to the development of society and the new models of learning and knowledge transfer. Among the proposals there is:

- To carry out a permanent follow-up, study and analysis of the demand for professional qualifications and its evolution in the different productive sectors.

- To reformulate, as a matter of urgency, vocational training (VT) and university training, so as to solve the current gap between the demand from companies and the supply of professionals from the Spanish educational system.The system must be made more flexible and connected in order to provide a flexible training response to the needs identified by the productive sectors in the field of technology, and a commitment to dual training in vocational and university training, taking as a reference successful models in Europe such as that of Germany.

Among the top chosen Spanish Universities there are the Universidad Pompeu Fabra de Cataluña that offers a Master's Degree in Entrepreneurship and Innovation. The main objective

of this master's degree is to develop the skills of potential entrepreneurs so that they would think creatively and feel able to transform a digital idea into a commercial product from an interdisciplinary perspective. Every year the University Carlos III of Madrid presents the Máster Universitario en Iniciativa Emprendedora y Creación de Empresas Digitales. This master's degree offers specialized and advanced training in the field of entrepreneurship and the creation of digital enterprises. The objective of the master's degree is to offer the best training for the development and implementation of successful business projects in digital area, as well as to promote entrepreneurship, thus contributing to smooth the passage from university to the marketplace. These are just two examples of the numerous educational paths Spanish universities offer every year to students. Most of them are only theorical but others give the chance to follow an internship programme in a digital company included in the educative path.

Stimulate – support for ideation, business planning and creation

Universities represent the best place to stimulate the ideation of business even through the development of events and competitions. All over Spain there are lot of initiatives such as CantabRobots, a program supported by the government of the autonomous community of Cantabria, aimed at high school students who chose to study ICTs and technology. The program consists in carrying out technological projects on various subjects, such as structures and mechanisms, ICT tools or electronics and robotics. At the end of the course there is a competition in which all the projects are presented. Kosmodisea is a competition between the schools of Guipúzcoa, Basque Country and the Campus of Guipúzcoa in which, over a few months, students have to develop a project on an idea and present what they are developing in digital format: digital presentation, interview, radio program, video etc...). The objectives are: promotion of entrepreneurial skills (teamwork, decision-making, perseverance, initiative...) and promotion of digital skills especially TIC. Premios impulse from University of Alicante shares similar aims and objectives: foster entrepreneurship and promote the creation of new digital business. It addressed to research staff, Phd students, graduates and undergraduates who have to develop their own business ideas in digital field. Within this framework, a mention should also be given to 5u cv Start-up, the competition that aims to reward the best digital entrepreneurial initiatives and business ideas in Valencian community. Each of the 5 Public Valencian universities host the competition on their campuses, aimed at entrepreneurs from their university community. The specific objectives of the competition are: support and enhance the entrepreneurial spirit in the university field of the Valencian community; contribute to the

development and consolidation of digital companies created in the Valencian university system; build network among young digital entrepreneurs.

Incubate – business incubation and acceleration, support, networking, funding

According to various studies, there are currently a total of 250 digital incubators in Spain that provide spaces and services to help students create and develop a digital start-up company, although business incubation can be seen to be something of a 'late development' when compared to other European countries. Many of them offer interesting development programmes and are led by municipalities, autonomous communities in synergy with universities and higher institutions. Most of the time, activities are promoted to carry out pilot programmes with avant-garde companies with experience in digital start-up programmes with the collaboration of the autonomous communities. An example could be provided by the program developed by the Department of Education of the Generalitat de Catalunya and the federation of entrepreneurs and managers, FEMCAT, which consists of one-hour dialogues between a group of 60 university students of high-school last year students with a top-level executive of a digital company. In each weekly session students are taught the day-to-day of an entrepreneur, his problems, the skills required, successful stories of their career etc. Another initiative since 1994 is offered by 'Escola i Empresa', promoted by the Institute of Development of the Region of Murcia with a program that focuses on the network between students and a manager of a digital company that tells about his personal experience and business story.

A line of collaboration is also established among incubators born within Universities to stimulate the innovative process in the business ecosystem and to provide support to their students and graduates and set up competitions or initiatives. A valid example is offered by 'actAupm', a program run by the polytechnic university of Madrid aimed at students, professors and researchers who accepted the challenge of testing their digital business ideas. It aims to enhance the entrepreneurial spirit, incentivize digital innovation in the university community and support the transfer of technology theories into innovative entrepreneurial ideas. The 'Centro de Apoyo a la Innovación Tecnológica' (CAIT) from University of Madrid is oriented to international technological innovation. The Campus increases the quality of research and its international recognition through the development of new research centers in the field of ICT, inspiring students to develop their entrepreneurial aptitude.

In conclusion, according to the infographic prepared by the promoters of StartUp Map Spain, the country hosts a total 1783 technology-based start-ups and Catalonia is the national leader,

with 485 companies, followed by Madrid, with 456. However, in the Andalusia and in the Valencian community a remarkable operational program is Profundiza. It is intended for students with greater digital skills and motivation to learn how to develop a research projects and run a potential business. Through this program, students will be able to participate from February to May in research projects in educational centers during extracurricular hours that could help them to approach knowledge from another perspectives and actively turn skills into business ideas.

Success and failure factors and recommendations

Entrepreneurial culture itself emerged in Spain in the early twenty-first century as a result of globalization and the effects of the economic downturn. Government and private companies started to drive innovative spirit as a new model for digital job creation to promote citizen's initiative, increase, strengthen and diversify business ecosystem, promoting the generation and renewal of business. However, until relatively recently, stability and steady jobs remain the main goals of every student and worker in a rather conservative approach. Business incubators are located in many geographical areas throughout the Spanish territory, with very specific concentrations in the autonomous community of Madrid and Catalonia although many incubators stimulate actively the working and research context of Valencia and Andalucia.

Success factors (i.e. "what works", "Dos"):

- Numerous training courses aimed at developing digital skills among youngs and students are supported by the SEPE and also through the National Youth Guarantee System, cofounded by the European Union. Success factors reveal to be a **strong collaboration** with **big firms** such as TELEFÓNICA ESPAÑA, **academia and municipality** which is fundamental to give answers to market need and generate entrepreneurship aptitude among students and youngs.
- Indeed, there is an a **wide business network** with technology and startups, even created within university framework to promote digital entrepreneurship and technological innovation such as actAupm, aimed at students, professors and researchers of the polytechnic university of Madrid who accept the challenge of testing their business ideas and actively turn digital skills into business ideas.

Failure factors (i.e. "what does not work", "Don'ts"):

- Failure factors could be: a lack of detailed information for entrepreneurs who want to launch their digital business; a **lack** of **further support** after the first years of activity, not carry out a progress follow-up of the company, setting out an action plan calendar with the technical expert, the companies and institutions. Basically, **after a training period, young entrepreneurs are left alone.**

- Despite the effort to combine theory and practical know-how, the country snapshot shows that still the methodologies and the study plans adopted in HE context have **more a theoretical focus than a practical** one such as the above mentioned Máster Universitario en Emprendimiento e Innovación from Universidad Pompeu Fabra de Cataluña. From the collected data, it seems that there are numerous initiatives to promote innovation and digital entrepreneurship but they appear like isolated actions **without a coordinated global scenario**.

In this context considering the situation in Spain and the digital entrepreneurship in HE environment, University has long been aware of promoting technological innovation, the creation of training courses and programs to link the academic career to digital companies.

Recommendations:

- **Establishing strategic** and **cross-cutting syllabus in universities and high schools**, including the review of curricula and the inclusion a significant percentage of practical disciplines on technological and digital innovation from the early years could be an easily accessible recommendation.
- **Boost** for **SMEs** and the self-employed **to advance** their **digital transformation processes** and increase their competitiveness and enlarge the commitment and financing to contribute to promoting education in technological innovation, entrepreneurship, business skills and STEM disciplines.

As regards the projects developed with the participation of students, financed from the public government, private companies there are some interesting initiative such as the programme Profundiza, the operational program in Andalusia and in the Valencian community for students with the objectives to boost students' interest in scientific research and STEM careers. However, they are not enough to give the chance to every single student to develop his/her digital entrepreneur attitude.

Instead of conclusion: Policy, third sector and industry review at EU level

Prepared by:

Summary of findings

The phenomenon of digital transformation in Europe has fully affected all the Member States which over the past decade have defined a significant infrastructure and systemic adjustment for the reduction of the digital divide and the spread of digital literacy. Today in Europe, there is a shortage of more than 500,000 digital jobs and the demand for digital jobs is overtaking supply. Furthermore, new digital jobs are increasing at an average of around 4% a year. Also e-commerce is very popular in the EU; and the proportion of individuals aged 16-74 having shopped online stood at 63%. Nevertheless, the level of development of digital skills and specific training courses on digital entrepreneurship at Higher Education level still follows a worrying trend in EU. Currently there is no common framework of skills that can encourage the proliferation of courses of study geared to digital enterprise. To foster a digital-friendly culture, the EU should encourage its member states to integrate digital skills such as data science and computer science courses into their primary, secondary, and university curricula. The new European Commission's work programme for 2020, "A Union that strives for more"[132] states that investment in digital skills will be essential to address a widening skills gap and changing work patterns, showing renewed interest in increasing digital skills as a basic condition for economic growth.

This report collects several interesting cases such as SEEM in Netherlands, MOOC in Austria and Heinnovate at EU level. These examples, if shared and integrated in different European Higher Education environments, can contribute in reaching specific objectives as defined in the new EC 2020 work programme. The reasons why these educational objectives have not yet been achieved in Europe are attributable to: lack of training in synergistic methods; keeping the

[132] https://ec.europa.eu/info/sites/info/files/cwp-2020-publication_en.pdf

freshness alive; finding suitable entrepreneurs to take part in HE programmes; finding the right space in academic timetable and curriculum.

IHF asbl analysed EU sources as the European Index of Digital Entrepreneurship Systems (EIDES[133]), the Digital Economy and Society Index (DESI[134]) and others, with a specific focus on the Countries represented in the IDEA project starting from Digital Entrepreneurship and landing in the context of Higher Education. The snapshot that comes out in EU underlines a general fragmentation in the context of Digital Entrepreneurship and digital skills with high performances by the northern and Baltic countries (size of country doesn't matter) while the states of south-eastern Europe still remain below the European average.

Concluding, it is universally accepted that digital transformation is happening. What remains uncertain is the way in which it will unfold and whit what effects. Digitalisation in education will continue to grow the coming years. The demand for digital and personalised content, tools and environments will only grow. Schools must adopt digitisation as part of their overall strategy in order to transform existing structures and processes, enforce digital change, and enable innovation and entrepreneurship[135]. Nevertheless, only a few European member states have been able to cope with digital transformation and this is reflected in the lack at Higher Education level of shared initiatives which allow to educate, stimulate and incubate future digital enterprises. To foster a digital-friendly culture, the EU should encourage its member states to integrate digital skills such as data science and computer science courses into their primary, secondary, and university curricula[136].

[133] https://publications.jrc.ec.europa.eu/repository/bitstream/JRC117495/jrc117495_eides_2019_final_with_identifiers.pdf
[134] https://ec.europa.eu/digital-single-market/en/desi
[135] https://www.bcg.com/industries/public-sector/successfully-transitioning-digital-education.aspx
[136] https://www.datainnovation.org/2019/12/a-roadmap-for-europe-to-succeed-in-the-digital-economy/

Overview of digital entrepreneurship in European Union

European Digital Infrastructure, Fundamentals and Policy Support

In May 2015, the European Commission adopted a digital single market strategy[137] as one of its top 10 political priorities. The strategy had 16 initiatives that covered three broad pillars:

1. promoting better online access to goods and services across Europe
2. designing an optimal environment for digital networks and services to develop
3. ensuring that the European economy and industry takes full advantage of the digital economy as a potential driver for growth

The "Digital Agenda for Europe"[138] is the main policy documents guiding the digital policy in Europe, that represents one of the seven flagship initiatives of the "Europe 2020"[139] strategy. The European Commission's work programme for 2020 "A Union that strives for more"[140], states that investment in digital skills will be essential to address a widening skills gap and changing work patterns, as well as to regain European mastery and ownership of key technologies. Coupled with improving digital literacy, this will be the driver of the updated Digital Education Action Plan[141]. Since 2018 the action aims to foster digital competences and open science skills in higher education with the objective to engage, inform and train higher education students, teachers, researchers and staff.[142]

Furthermore, the EU scenario underlines how important are the openness and interactivity of the Internet that enable businesses to harness the co-creative potential of large, uncoordinated audiences for novel forms of value creation, which, combined with novel revenue models, enable businesses to fundamentally re-think how they deliver products and services[143]. Digital entrepreneurship can make everything fair in certain regions, making chances to work in remote regions, on various occasions, at home or out and about. It can assume a significant job in advancing gender equality and social/economic consideration, animating nearby development and adding to practical development, mainly when new advancements are related with the accessibility of public information[144]. Nevertheless, analysis show that businesses - and SMEs

[137] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52015DC0192&from=EN
[138] https://ec.europa.eu/digital-single-market/en/europe-2020-strategy
[139] http://ec.europa.eu/eu2020/pdf/COMPLET%20EN%20BARROSO%20%20%20007%20-%20Europe%202020%20-%20EN%20version.pdf
[140] https://ec.europa.eu/info/sites/info/files/cwp-2020-publication_en.pdf
[141] https://ec.europa.eu/education/education-in-the-eu/digital-education-action-plan_en
[142] https://ec.europa.eu/education/education-in-the-eu/european-education-area/digital-education-action-plan-action-5-open-science-skills_en
[143] Yoo et al., 2012; Zittrain, 2006
[144] Ngoasong, 2018

in particular - often struggle with digital developments. Barriers to cross-border trade, regulatory and administrative burdens, insufficient access to finance and digital skills in the workforce. Removing intermediaries, matching employers with their future employees, providing online education, adapting the educational material, giving people their first physical address and their first bank account are just a few of the areas that digital entrepreneurs have to address. In order to build innovation ecosystems, a number of measures are necessary[145]. A common framework will require harmonisation at European level in terms of e-government. This will help to define a common platform that will enhance business and interconnection opportunities. This vision should also be replicated at the educational level, especially in universities. The new EU skills agenda[146] recognises the need to support cooperation among education, employment and industry stakeholders to improve the digital skills of the wider population, not just IT professionals. To achieve such objectives, lifelong and non-formal learning play a key role in teaching skills, including digital skills. The European Commission recognises that formal education is not the only player in teaching digital skills and that non-formal education providers can offer efficient and fast ways to acquire and upgrade digital skills.

Despite the positive trend, the growth of digital enterprises in Europe is still characterised by a deep fragmentation as confirmed by the EIDES ranking for 2019[147]. The report states that Sweden, Denmark, Netherlands, United Kingdom, Finland, Germany and Luxembourg lead as for their digitalised General and Systemic Framework Conditions for entrepreneurship. Behind at a notable distance according to the EIDES are the followers made of seven countries: Ireland, **Belgium**, Austria, Estonia, France, Malta and **Spain**. A third cluster is made of catchers-up: Czech Republic, Lithuania, Slovenia, Portugal, Cyprus and **Poland**. Finally, the laggards are the remaining eight countries: **Italy**, Hungary, Latvia, **Slovakia**, **Croatia**, **Romania**, Greece and Bulgaria[148]. It is striking that Italy, in spite being one of the G7 countries, ranks in this group together with former centrally planned economies and Greece.

[145] https://www.broadbandcommission.org/Documents/publications/DigitalEntrepreneurshipReport2018.pdf
[146] http://ec.europa.eu/social/main.jsp?catId=1223
[147] https://publications.jrc.ec.europa.eu/repository/bitstream/JRC117495/jrc117495_eides_2019_final_with_identifiers.pdf
[148] In bold, countries represented in the IDEA Project

Exhibit 1. EIDEs scores for EU 28 Countries

Country	Stand-up System		Start-up System		Scale-up System		EIDES	
	Score	Rank	Score	Rank	Score	Rank	Score	Rank
Sweden	77,0	2	73,3	1	78,3	1	76,2	1
Denmark	79,1	1	70,1	3	76,1	2	75,1	2
Netherlands	75,2	3	66,8	5	74,5	3	72,2	3
United Kingdom	71,4	4	70,6	2	72,7	4	71,5	4
Finland	71,4	5	67,8	4	69,2	5	69,5	5
Germany	67,9	7	66,7	6	68,6	6	67,8	6
Luxembourg	68,1	6	65,4	7	67,0	7	66,8	7
Leaders	**72,9**		**68,7**		**72,3**		**71,3**	
Ireland	58,7	8	60,2	8	58,3	9	59,1	8
Belgium	58,4	9	56,1	9	58,8	8	57,8	9
Austria	53,3	11	53,2	11	55,2	10	53,9	10
Estonia	54,2	10	53,3	10	49,5	12	52,4	11
France	50,4	12	52,6	12	52,5	11	51,8	12
Malta	46,9	13	51,1	13	47,4	13	48,5	13
Spain	46,5	14	47,2	14	45,2	14	46,3	14
Followers	**52,6**		**53,4**		**52,4**		**52,8**	
Czech Republic	43,6	15	44,3	15	43,7	15	43,9	15
Lithuania	42,3	16	42,7	16	41,5	16	42,2	16
Slovenia	38,3	17	42,4	17	39,1	17	39,9	17
Portugal	37,6	18	37,0	19	36,6	18	37,1	18
Cyprus	36,7	19	38,6	18	35,4	20	36,9	19
Poland	33,4	20	36,7	20	35,5	19	35,2	20
Catchers-up	**38,7**		**40,3**		**38,6**		**39,2**	
Italy	33,3	21	35,6	22	34,8	22	34,6	21
Hungary	31,5	23	35,7	21	34,8	21	34,0	22
Latvia	32,4	22	35,0	23	34,0	23	33,8	23
Slovakia	30,5	24	33,0	24	31,3	24	31,6	24
Croatia	27,2	25	30,7	25	28,3	25	28,7	25
Romania	26,6	26	27,4	26	27,4	26	27,1	26
Greece	24,8	27	27,3	27	24,5	28	25,5	27
Bulgaria	23,9	28	26,1	28	24,8	27	24,9	28
Laggards	**28,8**		**31,4**		**30,0**		**30,0**	
EU28 average	**48,0**		**48,0**		**48,0**		**48,0**	

Source: EIDEs 2019

The EIDES 2019 index for the EU28 countries is shown in Exhibit 1. The table shows the digitalised versions of the index for the three sub-systems – i.e., the Stand-up, the Start-up and the Scale-up. These sub-indices represent a combination of the General Framework Conditions and the sub-index score for each of the three sub-systems, as composed of Systemic Framework Conditions. The rightmost column shows the overall EIDES score, which represents the

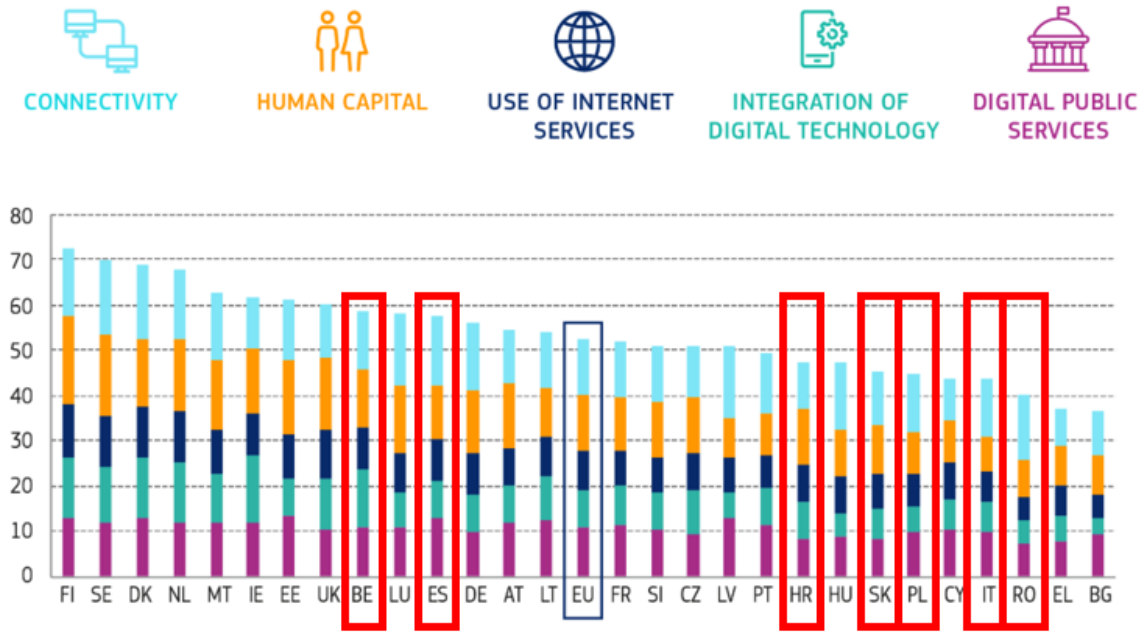
arithmetic average of the three sub-index scores. The range for all scales is from a low of 0 to a high of 100[149].

Today in Europe, there is a shortage of more than 500,000 digital jobs and the demand for digital jobs is overtaking supply. Furthermore, new digital jobs are increasing at an average of around 4% a year. Unemployment rates are at an all-time high, yet industries are unable to find the appropriately skilled people to fill their digital needs. A huge gap between the demand for digital skills and the actual skills of European citizens exists primarily due to low competences levels, since connectivity and access to basic ICT infrastructure is widely available in Europe:

- Broadband: Basic broadband is largely available across EU, Next generation access (NGA) voers 76%, Deployment of 4G mobile increase continuously (even in rural areas), 83.9 mobile broadband subscriptions per 100 people
- Internet: 85.4% of households have access to the internet at home, 86.5% of individuals in the EU are frequent Internet users

The Digital Economy and Society Index 2020

Exhibit 2. DESI 2020 Ranking



Source: DESI 2020

[149] https://publications.jrc.ec.europa.eu/repository/bitstream/JRC117495/jrc117495_eides_2019_final_with_identifiers.pdf

Basically, European Institutions and National Governments are making available the appropriate infrastructure to citizens, but they do not have the digital skills needed to embrace and fully take advantage of the digital transformation, as underlined by the 2020 Digital Economy and Society Index (DESI)[150] .

The 2020 DESI Ranking[151] shows that each member state share the same level of connectivity and use of internet services. The first substantial difference is underlined by the variable "Human capital" which instead finds a general fragmentation. Human capital dimension of DESI has two sub-dimensions covering

1. "internet user skills" which draws on the European Commission's Digital Skills Indicator, which is computed based on the number and complexity of activities involving the use of digital devices and/or the internet.
2. "advanced skills and development" that includes indicators on ICT specialist employment and ICT graduates.

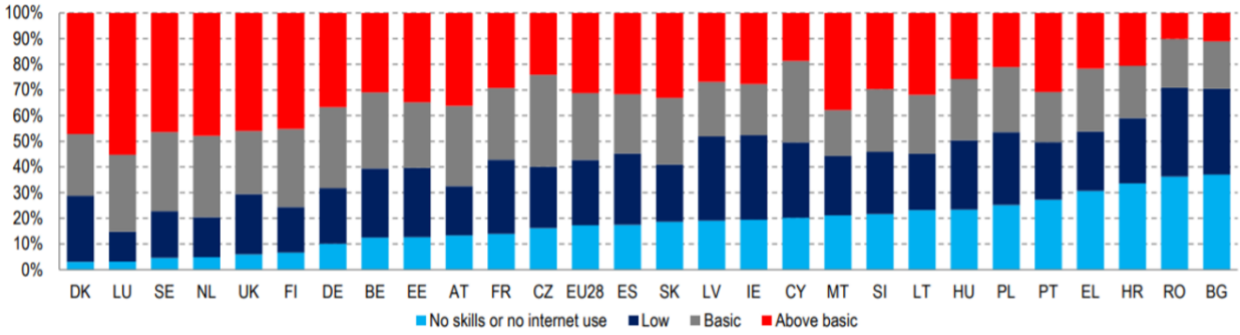
Over the past year, all EU countries improved their digital performance. Finland, Sweden, Denmark and the Netherlands scored the highest ratings in DESI 2020 and are among the global leaders in digitalisation. These countries are followed by Malta, Ireland and Estonia. Some other countries however still have a long way to go, and the EU as a whole needs improvement to be able to compete on the global stage. According to the latest data, Northern Countries are the top performers in terms of internet user skills, advanced skills and development. Bulgaria, Greece, Romania and Italy rank the lowest overall on DESI's Human Capital dimension[152]. This creates fragmentation in the way Europeans behave online. Furthermore, data allows us to state that size of Country doesn't matter as we can find high level of performance in the Baltic Countries while Italy, Poland, Romania and Bulgaria occupy the last positions of the ranking.

This is confirmed by the digital skills indicator (Exhibit 3.), a composite indicator based on the digital competence framework for citizens, which reports that 17 % of the EU population had no digital skills in 2017 and the main reason being that they did not use the internet. This represents an improvement (i.e. decrease) of 2 percentage points compared to 2016. These figures imply serious risks of digital exclusion in a context of rapid digitisation. There are proportionally more men than women with at least basic digital skills (respectively, 60 % and 55 %). In addition, only about 31 % of people with low education levels or no education have

[150] https://ec.europa.eu/digital-single-market/en/desi
[151] https://publications.jrc.ec.europa.eu/repository/bitstream/JRC112439/jrc112439_eides_report.pdf
[152] file:///C:/Users/IHF%20Bruxelles/Downloads/2019DESIReportHumanCapital%20(1).pdf

at least basic digital skills. 49 % of those living in rural areas have basic digital skills compared with 63 % in urban areas. There are still major disparities across Member States. The share of people with at least basic digital skills ranges from 29 % in Bulgaria and Romania to 85 % in Luxembourg and 79 % in the Netherlands.

Exhibit 3. Digital Skills of the EU population in 2017[153]



Source: Eurostat

Governing Digital Markets

Europe must harness the power of digital innovation not just to increase economic growth and expand prosperity, but also to address important societal challenges related to the environment, public health, transportation, and other pressing concerns: EU policymakers should seize the opportunity of a new political cycle to redouble efforts to deliver the Digital Single Market, thereby cementing and implementing a strong vision for the digital economy. In particular, the Internet of Things offers many opportunities to grow the economy and improve quality of life[154]. Just as the public sector was instrumental in enabling the development and deployment of the Internet, it must play a similar role to ensure the success of the Internet of Things. Therefore, national governments should create comprehensive national strategies for the Internet of Things to ensure that the technology develops cohesively and rapidly, that consumers and businesses do not face barriers to adoption, and that both the private and public sector take full advantage of the coming wave of smart devices.

To foster a digital-friendly culture, the EU should encourage its member states to integrate digital skills such as data science and computer science courses into their primary, secondary, and university curricula[155]. The European Parliament should ensure the Commission increases

[153] Data not available for Italy
[154] New, Castro, 2015 - Why Countries Need National Strategies for the Internet of Things – Center for Data Innovation
[155] https://www.datainnovation.org/2019/12/a-roadmap-for-europe-to-succeed-in-the-digital-economy/

grants to create entrepreneurship education programs and increases project-based learning in EU schools and universities. In addition, policymakers and other elites need to encourage the public to support digital transformation. By sharing and advancing an optimistic narrative about how digital transformation will lead to increased living standards and better quality of life; and by investing in knowledge and education the EU can ensure a climate conducive to competitiveness in the digital economy.

In addition, over the last two years, the European Union has further stimulated the development of online commerce by implementing new rules to encourage a reduction in delivery costs for online consumers because many online shoppers and retailers across the European Union are being confronted with high prices for deliveries to another EU country. In particular, EU rules have focused on the need to standardise delivery costs between Member States, which were previously highly diversified, without ensuring fair competition. One of the aims of the regulation on cross-border delivery services is to improve price transparency. The regulation requires that providers with 50 or more employees, as well as providers established in more than one EU country, provide their respective national regulatory authority with domestic and cross-border prices for up to 15 basic parcel delivery services (in certain cases, national regulatory authorities may have used a threshold of 25 employees to take into account certain conditions in their country). The Commission publishes those prices through an official platform where price information is updated every year on 31 March[156]. On this platform, both consumers and online retailers have the possibility to check the list of prices and look for the best deals. Aside from this, courier services have to provide customers with clear information on the delivery prices and conditions, while national postal authorities collect data from shipping companies to monitor the market and assess unreasonably high tariffs.

Digital transformation is driven by a strongly united and closely cooperative EU that has successfully managed to strengthen and protect European values and grow closer by focusing on European security as the basis for ensuring peace, freedom and prosperity in the EU. The EU provides the primary political organs and institutions for governance, uniting member states and fulfilling both legislative and executive functions. Through state-driven innovation and strong public-private partnerships, the European economy has become vibrant and is continuing to grow. Due to the high levels of digital security, and EU-wide investments in digital

[156] https://ec.europa.eu/growth/sectors/postal-services/parcel-delivery/public-tariffs-cross-border_en

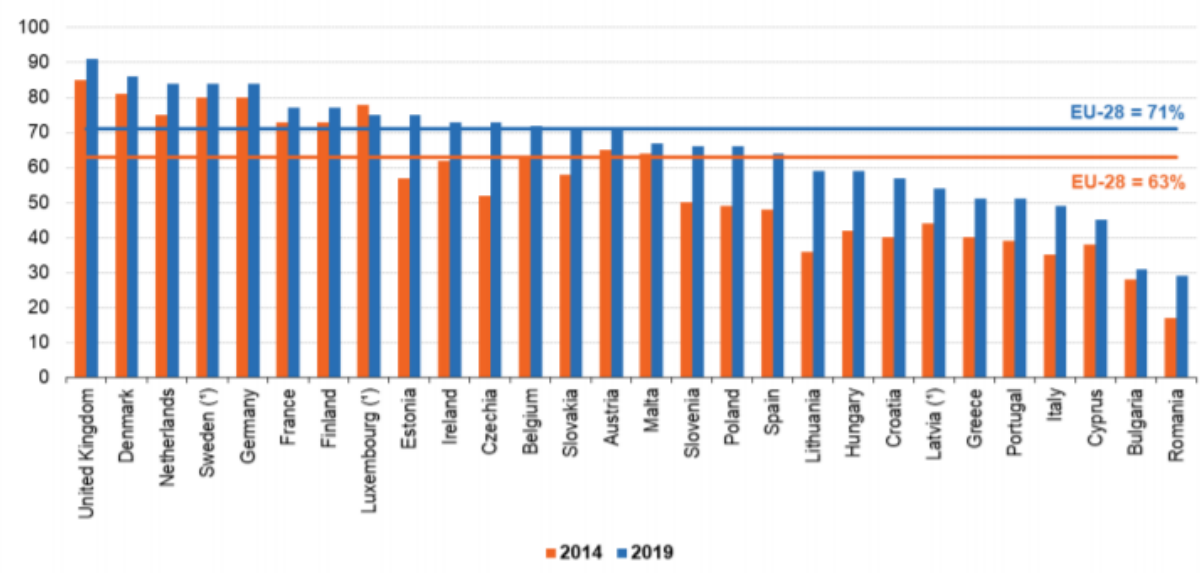
infrastructures and digital literacy, citizens profit from digital transformation and the dark side of digital transformation has been managed effectively and successfully[157].

Growing through e-commerce

As underlined by the last report of Eurostat[158] e-commerce is very popular in the EU. The proportion of individuals aged 16-74 having shopped online stood at 63 %. In particular, those aged 25-54 had the highest share of online shoppers among internet users up to 2016. In 2015, the youngest age group (16-24) overtook the EU average level, surpassing the level of the 25-54 years age group in 2019. E-commerce picked up over the 2009-2019 period among all age groups, with individuals aged 16-24 showing the biggest increase (28 percentage points). Over eight in ten internet users in the United Kingdom (91 %), Denmark (86 %), Germany, the Netherlands and Sweden (84 % each) had bought or ordered goods or services over the internet in the 12 months prior to the survey (Figure 2). On the other hand, fewer than 40 % had shopped online in Romania (29 %) and Bulgaria (31 %). The largest increases (15 percentage points or more) between 2014 and 2019 were recorded in Lithuania, Czechia, Estonia, Hungary, Croatia, Poland, Spain, and Slovenia.

E-commerce statistics for Individuals

Exhibit 4. Internet users who bought or ordered good or services for private use in the previous 12 months, 2014 and 2019



Source: Eurostat

[157] https://www2.deloitte.com/content/dam/Deloitte/de/Documents/strategy/deloitte-future-of-digital-transformation-eu-2035.pdf

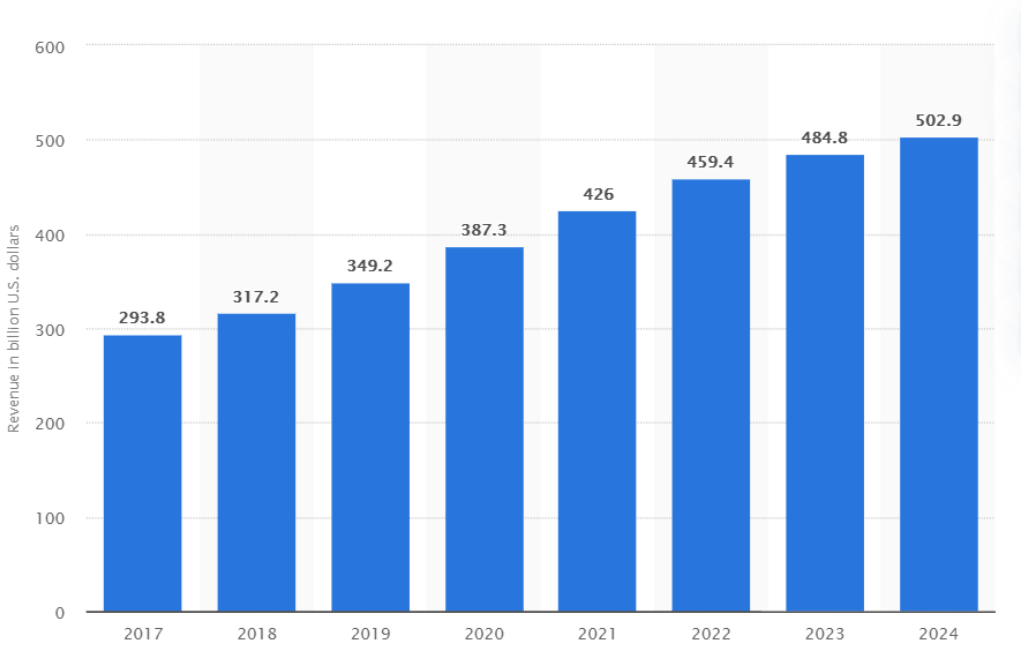
[158] https://ec.europa.eu/eurostat/statistics-explained/pdfscache/46776.pdf

(*) break in the time series

According the STATISTA February 2020 study[159], the European E-commerce market is experiencing a positive growth across all the most important countries, resulting in one of the most dynamic and fast growing industries. The share of e-commerce users in the European union has constantly increased, showing how companies are investing in their online presence and how users, or customers, are confirming their interest in online services. E-commerce obviously reflects internet usage. In fact, the share of individuals using the internet to sell goods or services in the European Union increased positively until 2013, before facing a slight decrease in 2016. Revenues are rising strongly, particularly the annual revenue of e-commerce in France, which reached 64.9 billion euros in 2015. Firm yields are also increasing in Germany, where revenues in online retail reached 73 billion euros.

E-Commerce in Europe

Exhibit 5. E-Commerce industry in Europe (2017 – 2024)



Source: STATISTA

The same positive growth can be seen in the southern countries of Italy and Spain, in terms of individuals deciding to purchase online rather than offline. The number of e-commerce users in Italy is expected to reach 20.4 million by 2020, while in Spain the number of e-commerce users will reach 27.6 million. Although positive trends are shown in Italy, Spain and France, only Germany seems to keep up with the fast paced growth of the United Kingdom. In fact the

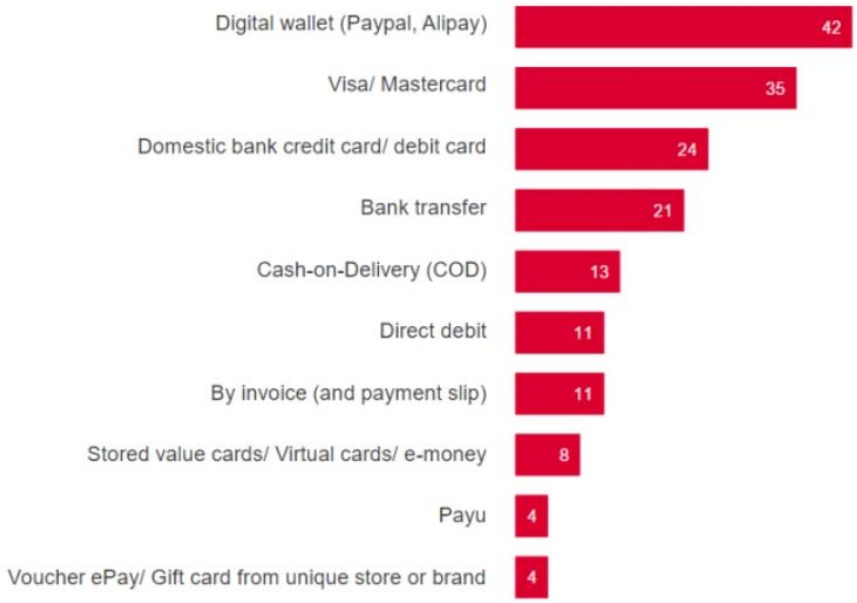
[159] https://www.statista.com/topics/3792/e-commerce-in-europe/#dossierSummary__chapter1

country of her Majesty leads the e-commerce charts with the strongest growth and turnover. Forecasts report that the B2C e-commerce revenue in Great Britain will reach 81 billion euros by 2017. Indeed, the average revenue per online shopper in Great Britain is expected to reach 1,551.3 euros by 2016, higher than other revenues per online shopper. The average revenue per online shopper in Spain for example will reach a lower 654.3 euros.

Exhibit 5. presents the e-commerce market revenue in Europe in 2017, and provides a forecast until 2024. E-commerce revenue in Europe is expected to grow to 502.9 billion U.S. dollars in 2024.

Digital Payments in Europe

Exhibit 6. Online payment methods in Europe



Source: E-Commerce News

Despite debit and credit cards retaining their position as the most popular, preferred payment method across the majority of European countries, the market continues diversifying in terms of local alternatives: although each state has its own specific preferences, entrepreneurs hoping to expand their operations into additional markets must familiarise themselves with the extensive payment options preferred by local audiences.

Exhibit 7. Most popular payment method per country

Austria	Invoice	43%
Belgium	Visa/Mastercard	51%
Croatia	Digital wallet	53%
Czech Republic	Bank transfer	58%
Estonia	Bank transfer	67%
France	Visa/Mastercard	45%
Germany	Invoice	51%
Hungary	Cash-on-delivery	54%
Ireland	Digital wallet	46%
Latvia	Visa/Mastercard	56%
Italy	Digital wallet	51%
Lithuania	BankLink	66%
Netherlands	iDeal	84%
Poland	Bank transfer	52%
Portugal	Digital wallet	62%
Romania	Cash-on-delivery	69%
Slovakia	Cash-on-delivery	72%
Slovenia	Cash-on-delivery	53%
Spain	Digital wallet	57%
Switzerland	Visa/Mastercard	55%
UK	Digital wallet	46%

Source: E-Commerce News

Overview of the HE context in European Union

The Student Entrepreneurship Encouragement Model[160] provides a complete overview of offerings that academic institutions can select and implement to further create a university's entrepreneurial ecosystem. Furthermore, a discussion on the role of universities in society and its functions as devices to create more new ventures and enterprises has been opened. Based on a series of students and teacher interviews, three stages in which entrepreneurs significantly benefit from certain entrepreneurial offerings at their university have been identified. The model foresees three stages over which a university can coordinate its offerings:

1. The education stage, to facilitate interested students by teaching them the skills and letting them experience what it is like to be an entrepreneur, as to make students aware of entrepreneurship as a career option. The goal of the education stage is to wake up dormant entrepreneurs.
2. The stimulation stage, focused on creating awareness of the opportunities regarding entrepreneurship, by

- having supportive faculty that are enthusiastic about entrepreneurship
- highlighting role models and success stories
- providing introductory courses that introduce the main concepts of entrepreneurship

The goal of the stimulation stage is to support students with a business idea in the transformation from an idea towards a complete business plan.

3. The incubation stage, which focuses on supporting the launch of an actual company: it covers activities to support young startup teams and things such as office space, meeting other entrepreneurs, and mentoring services.

EDUCATE

Universities across the world are increasingly trying to become more entrepreneurial, in order to stay competitive, generate new sources of income through licensing or contract research, and follow policy guidelines from governments. The most powerful resource universities have to stimulate entrepreneurship is their students. However, there is no evaluated theory on how to encourage students to become entrepreneurs[161].

[160] Jansen, van de Zande, Brinkkemper, Stam, Varma - How education, stimulation, and incubation encourage student entrepreneurship: Observations from MIT, IIIT, and Utrecht University – The International Journal of Management Education, 2015

[161] https://slingerjansen.files.wordpress.com/2009/04/1-s2-0-s147281171500018x-main.pdf

Despite the awareness of the importance of developing digital skills in Higher education, there is still a lack in terms of specific curricula and academic initiatives to enhance digital skills of students to be invested for entrepreneurial purposes. In Europe, a lot of initiatives have been taken to reduce the skills gap and stimulates digital entrepreneurship. In particular, the **Massive open online courses (MOOCs) in entrepreneurship education**[162] are one of the strongest trends in online education and influence the content and procedure of teaching and learning. The Graz University of Technology in Austria in 2017 applied this procedure as a new way of teaching entrepreneurship for engineers. Results show that a lack of self-discipline to finish a MOOC as well as missing interaction with others are main hurdles compared to lectures with compulsory attendance at University. However, findings also reveal that MOOCs are flexible in terms of time and location, thus can add convenience in reaching education, particularly entrepreneurial education

STIMULATE

Based on our mapping activity, we have collected an interesting case study that could be examples to be replicated on a large scale in the higher-education environment to stimulate entrepreneurship at academic level, with particular attention to digital entrepreneurship. At current stage there are not specific examples of digital entrepreneurship promoted to wide range in higher education environment but specific examples on how universities could stimulate entrepreneurial initiatives in their contexts.

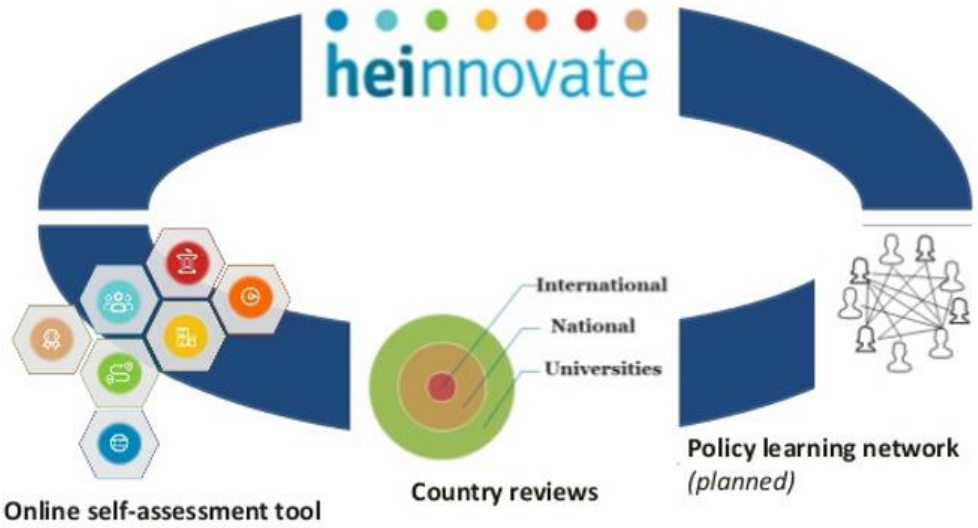
In particular, **Heinnovate**[163] is an initiative of the European Commission, DG Education and Culture and the OECD LEED Forum, and supported by a panel of six independent experts. HEInnovate is a free self-assessment tool for all types of higher education institution which allows to assess HE institution using a number of statements related to its entrepreneurial activities, including leadership, staffing and links with business. Extensive training and support materials, including practical case studies, are available to support workshops and further development within HE institutions. HEInnovate is intended for higher education institutions (Universities, University Colleges, Polytechnics etc.) who are interested in assessing themselves against a number of statements related to the entrepreneurial and innovative nature of their higher education environment. It covers eight areas for self-assessment as Leadership and Governance, Organisational Capacity, Entrepreneurial Teaching and Learning, Preparing

[162] Vorbach, Poandl,Korajman - Digital Entrepreneurship: MOOCs in Entrepreneurship Education the Case of Graz University of Technology, 2019
[163] https://heinnovate.eu/en

and Supporting Entrepreneurs, Digital Transformation and Capability, Knowledge Exchange and Collaboration, the Internationalised Institution, Measuring Impact.

HEInnovative

Exhibit 8. Guiding Framework



Source: European Commission and OECD

INCUBATE

The incubation stage appears to be one of the levels where more action is required. in particular, from the analysis of the European context, very few are the successful examples we have found. In fact, there is a lack of structures that allow the university student to start preliminary activities directly related to the world of work, in particular the launch of his or her business idea.

A prominent example is represented by the **University of Utrecht**, Netherlands. One of the courses that delivers the most start-ups at UU is the course on ICT Entrepreneurship. The course, in which student founding teams have to develop a software prototype and a business plan in a period of ten weeks, strives to provide an authentic start-up environment, to encourage students to consider and follow the path of an entrepreneur. According to the research, strong factors in the course are the involvement of successful entrepreneurs, the recreation of an authentic start-up environment for students, and the fact that students are exposed to actual start-up problems, such as creating a suitable financial plan and marketing plan. This example of fostering entrepreneurship in higher education has not yet been done before in other HE environment.

Other relevant examples of innovative start-ups in digital education are Marbelous Minds[164] in Nijmegen and the online learning platform Knowingo[165] in Breda. Marbelous Minds develops brain-inspired game-based learning experiences. Knowingo combines new technologies such as artificial intelligence and self-learning algorithms with gamification principles. Another example is Kleurrijker in Amersfoort, a publisher of educational content, experimenting with innovative online learning tools and environments. Kleurrijker provides learning materials for learning the Dutch language and for the preparation of the Dutch civil exam.

Outside Europe, in the USA Higher Education environment, many institutes already embrace innovation and facilitate entrepreneurship. LearnLaunch[166] in Boston, aims at educational technology specific as a market. Learnlaunch is both a start-up accelerator for EdTech start-ups (36 companies in 2 funds), a campus (40 start-ups), and an institute with 650 subscribers, 250 events, 25 MAPLE districts and 100 MassNET teachers.

Relevant initiatives at EU level

What the higher education environment is unable to guarantee at the moment is partially compensated on the basis of organs and bodies at the level of European policies that help to spread digital literacy. The main EU institutions, bodies, tools and initiatives in the digital field are the following:

Initiative at EU level	Description	Stage
The Digital Skills and Jobs Coalition[167]	It brings together Member States, companies, social partners, non-profit organisations and education providers, that are encouraged to make a concrete commitment to carry out actions to reduce the digital skills gap in Europe. It supports cooperation among education, employment and industry stakeholders with the goal of improving the digital skills of the wider population, not just IT professionals. With the Digital Skills and Job Coalition, the European Commission calls Member States to develop national digital skills strategies	**Educate, Stimulate and Incubate**

[164] http://www.marbelousminds.com/#xl_xr_page_index
[165] https://knowingo.com
[166] http://learnlaunch.com/about-us/
[167] https://ec.europa.eu/digital-single-market/en/digital-skills-jobs-coalition

DigComp[168]	Developed by the JRC as a scientific project and with intensive consultation of stakeholders provide evidence-based policy support to the European Commission and the Member States on harnessing the potential of digital technologies to innovate education and training practices, improve access to lifelong learning and to deal with the rise of new (digital) skills and competences needed for employment, personal development and social inclusion. It is a tool to support the common understanding of digital competences and to enable people to develop digital competences to support their life chances and employability	**Educate**
DESI[169]	The Digital Economy and Society Index (DESI) is a composite index that summarises relevant indicators on Europe's digital performance and tracks the evolution of EU Member States in digital competitiveness	**Stimulate**
The e-skills Manifesto[170]	It is an important tool for briefing and advising policymakers on the state of digital skills demand, supply, development and best practice across EU member states	**Stimulate**
ET2020 working group on Digital Skills and Competences[171]	It looks at the development of digital skills and competences at all levels and stages of learning and the potential and challenges of digital technology use in education	**Educate**

168 https://publications.jrc.ec.europa.eu/repository/bitstream/JRC106281/web-digcomp2.1pdf_(online).pdf
169 https://ec.europa.eu/digital-single-market/en/desi
170 https://www.eun.org/news/detail?articleId=658886
171 https://ec.europa.eu/education/policies/european-policy-cooperation/et2020-working-groups_en

Success and failure factors and recommendations

1. Success Factors

- General Benefits of Digital Transformation: The European Union is benefitting from a social, political and economic point of view from its advantages. Due to the technology enabled freedom of the EU´s digitally literate citizens and its enabling role for both the public and private sector, digital trans- formation has made Europe thrive, and it has become a global leader in the digital field

- Satisfactory level of connectivity: the level of connectivity and access to digital technologies is almost homogeneous in Europe from an infrastructural point of view

- Increased demand for innovative distance and online learning in Higher Education: digitisation of the learning process has the potential to change every facet of the academic experience [172].

2. Failure Factor

- Low level of digital literacy: only a few European member states have been able to cope with digital transformation and this is reflected also in Higher Education environment.

- Inequality and fragmentation between member states societies: while those able to adjust to digitalisation have become digital winners, those unable to do so are left behind[173]. This fragmentation is reflected in education, especially in the higher education sector.

3. Recommendations

- Fast-track access to cross-border markets for young entrepreneurs. One major potential reform would be a global mobility visa for young G20 entrepreneurs. This would be a temporary work exchange visa, rather than an opportunity to establish residency. Similarly, investment in a supporting cross-border body to help young entrepreneurs, and their investors, with international expansions and ongoing regulatory compliance could be an effective near-term initiative. These reforms would be quick wins for

[172] https://www.bcg.com/industries/public-sector/successfully-transitioning-digital-education.aspx
[173] https://www2.deloitte.com/content/dam/Deloitte/de/Documents/strategy/deloitte-future-of-digital-transformation-eu-2035.pdf

governments, as such changes could be more immediately achievable than reforming taxation, for example, or other major in-country reforms.

- Consider tax reform for fast-growth, digital entrepreneurs. Governments can also consult on and evaluate targeted tax concessions for young entrepreneurs. Importantly, this would be at the company level, not just for their investors. It could involve a combination of streamlined rules and concessions for companies that meet certain cap conditions for revenue or headcount. The focus here should be at least as much on tax compliance as the overall tax obligation.

- Drive differential investment in digital infrastructure. Young entrepreneurs indicate that digital is not only a key part of the business model, but a powerful force in continuing to strive for growth, despite conventional barriers such as tax and policy risks. The distinct, valuable role for government is in quick, responsive investment in framework policies for digital tools and infrastructure. For example, governments could establish a task force, which would work on a road map to take existing systems and regulations and adapt them to the digital environment.[174]

In addition we mention the Boston Consulting Group's successful approach "A Blueprint for Digital Education"[175], which is being adopted by several leading international universities, focuses on the following three primary pillars:

1. Digital Education and Research. Universities need to put in place a broad range of digital initiatives, not just online courses. These include: digitized pedagogy and supporting learning and monitoring systems; online education that is scalable and achieves wide distribution; dynamic accreditation and examination; and developed research using digital tools, digital data access, digital communications, and global transparency.

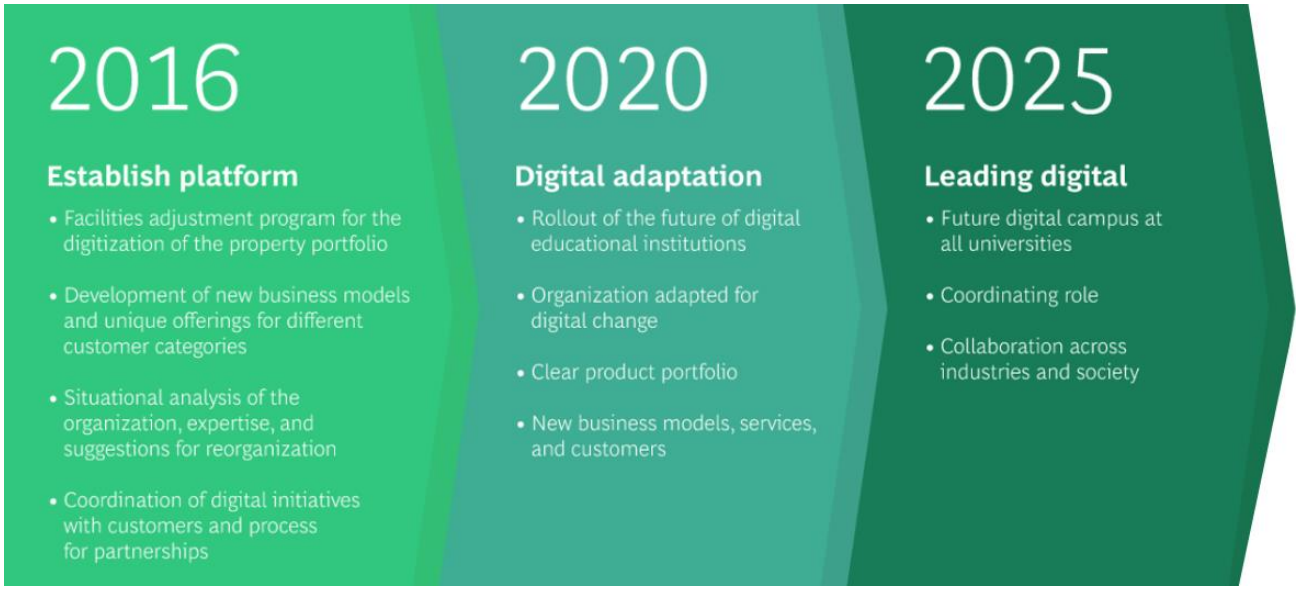
2. Strategy, Operations, and Partnerships. Schools must adopt digitisation as part of their overall strategy in order to transform existing structures and processes, enforce digital change, and enable innovation and entrepreneurship. They must adapt business models

[174] https://www.ey.com/Publication/vwLUAssets/ey-beyond-disruption/$FILE/ey-beyond-disruption.pdf
[175] https://www.bcg.com/industries/public-sector/successfully-transitioning-digital-education.aspx

that achieve increased quality and efficiencies, and encourage collaboration between constituencies while also pursuing partnerships with other universities, industry, and community organizations.

3. Facilities, Infrastructure, and Campus. Digitization must be built into the physical assets of the university. Among the new features expected: user-friendly, flexible and integrated work-study environments; digital labs; WiFi everywhere; wireless charging stations; outsourced data centers; and smart and green buildings.

Exhibit 9. The BCGs "A Blueprint for Digital Education"



Source: BCG analysis

This blueprint should be taken as main recommendation in order to enhance the presence of digital entrepreneurship at HE level. It shows how countries can leverage the digitisation of their higher education institutions to develop into a digital leading nation that satisfies the changing needs of students, employers, researchers and the larger community.

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Digital Nation Initiatives

https://digitalnation.ro/digitalizare/

Digital Workshop Trainings

https://learndigital.withgoogle.com/atelieruldigital/course/digital-marketing

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Digital Entrepreneur Resources

https://antreprenordigital.ro/

ARIES Transilvania (Romanian Association for Electronic And Software Industry)

https://aries-transilvania.ro/despre-noi/