# Potential of digital entrepreneurship

**Krnić, Kristian**

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# POTENTIAL OF DIGITAL ENTREPRENEURSHIP: POSSIBILITIES AND DIFFERENCES IN APPLICATION – CROATIAN AND INTERNATIONAL MARKETS

**Master Thesis**

**Kristian Krnić, 0067532251**

**Mentor: Professor Marko Kolaković, Ph.D.**

**Zagreb, September 2021**

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# 1 INTRODUCTION

## 1.1 Topic and goal of the thesis

The topic of my thesis encompasses the notion of digital entrepreneurship, whose coherent development proves to be essential for growth of countries' economies all around the world. The idea of transforming traditional means of conducting business into a digital realm has set the foundation for both, entrepreneurs and consumers, to gradually start abolishing old habits and obsolete perspectives, and rather shift their mindset, as well as behavior, towards a more efficient and straightforward way of doing business.

Conception of digitally transforming entrepreneurship ecosystems implies that all participants of the system, should they be successful and efficient, are well educated on trends within the IT industry so that they can use their knowledge and skills to better navigate and make decisions throughout their interactions inside of the system. Modern day entrepreneurs tend to adopt new technologies in order to revolutionize their businesses, and at the same time consumers tend to be more and better informed about products and services than ever before. The goal of this thesis is to understand the effects of digitization and digital transformation on countries' economies and how the advancement of emerging technologies such as automation, Internet of Things and data management influences entrepreneurs in their course of action for the development of their businesses. Furthermore, the thesis will compare Croatia's foundations for digitalization of entrepreneurship with other Member States of the European Union and outline main differences between stages of digital development among the countries.

## 1.2 Explanation of methodology

For the purpose of this thesis, research methods such as primary and secondary data were used in order to obtain relevant information through investigation of literature, collection and analysis of a relevant data sample and also the use of statistical and graphical diagrams which served as the basis for discussion of the research results. A fair portion of the used literature was available online, while some of the sources used in the thesis were obtained through my personal working experience with experts in the area of adoption and implementation of digital technologies in the telecommunications field.

## 1.3 Structure of the thesis

The thesis is structured and divided into 9 individual sections. In the first section called "Introduction" the reader is familiarized with the topic and goals of the thesis, explanation of methodology used to obtain information and interpret the results and also the structure of the paper itself.

Next section, called "Theoretical framework of digital entrepreneurship", is concerned with the theoretical framework and definition of digital entrepreneurship while the section afterwards, "Measurement framework for digital entrepreneurship", describes common criteria and metrics that help to quantify the value and meaning of digital entrepreneurship, and also its' role in the economy.

"Differences in digitization between European countries" is a section which signifies the differences in degrees of digital development between European countries.

Furthermore, section called "Technological drivers for environmental change" aims to outline the most prominent technological practices that help in revolutionizing the sphere of digital entrepreneurship while part with "Implications for policy makers and entrepreneurs" defines changes and regulations that may be introduced by policy makers to help entrepreneurs to participate in a level-playing field.

"Overview of Croatian digital development" delivers a snapshot of the current climate for entrepreneurs in the Republic of Croatia.

A section afterward is called "Survey on digital literacy in the Republic of Croatia" and it showcases results and statistics obtained from a survey which was conducted as a primary data research method on digital literacy of Croatian citizens.

Finally, the last section of the paper, "Conclusion and directions for future growth", provides an interpretation of the facts and results stated throughout the thesis and provides suggestive guidelines for further development of the digital entrepreneurship field in Croatia for bettering the country's economy.

# 2 Theoretical framework of digital entrepreneurship

## 2.1 Concept of digital entrepreneurship

The first written trace of entrepreneurship as a concept originates from the late 17th century, after the word was adopted from French language. The notion was introduced for the first time in the French dictionary entitled „*Dictionnaire Universel de Commerc*e", compiled by Jacques des Bruslons, which was published in 1723. Entrepreneurship emerged as a field of study in the early 18th century and was popularized by an Irish-French economist Richard Cantillon. He defined the term by focusing mainly on the role of an entrepreneur as an individual who buys a product at a fixed price and resells it at a variable price, thus making decisions about getting and using resources while admitting the risk of a business. Cantillon considered the entrepreneur as a risk taker who deliberately allocates resources to exploit opportunities in order to maximize the financial return.

Throughout history, many economists have coined definitions for describing the concept of entrepreneurship, each based on their own entrepreneurial experience, but the fundamental commonality remained the same across the board – it is viewed as an innovative value-creating process, undertaken by a risk taker who utilizes their resources to achieve financial benefit.

According to Kolaković (2006), the entrepreneur is usually defined as a person who launches new businesses and then organizes and controls the course of it all by himself. He creates new business possibilities in spite of risk and uncertainty, with the goal of achieving profit and growth, by identifying favorable opportunities and gathering all the necessary resources in order to add on their value.

Implementation of internet technology over the last two decades has provided entrepreneurs with immense business opportunities, given that they can utilize the same platform for selling their products to their consumers, who obtain knowledge about products or services and ultimately purchase them in a matter of few clicks. The interaction between buyers and sellers, although simplified to the maximum, provides both parties with necessary information and spares them precious time which they can allocate on other important activites, hence be more efficient in their everyday tasks.

Kolaković (2006) also stated that the advancement of information technology has hugely contributed to the development of entrepreneurship in general. He argues that the emergence of information and communication technologies lead to a new paradigm and meaning of entrepreneurship, moreover, that it lead to new types of entrepreneurs and the digital way of

doing business. The so-called virtual entrepreneurs, are described as leaders of smaller business projects with little to no initial capital or funds, owning only a laptop and a mobile phone with no other assets. Despite of that, these digital entrepreneurs possess something much more valuable than materialistic resources – a vision and the ability of imagination on which they base their business and create focused virtual enterprises (Kolaković, 2006).

Emergence and worldwide adoption of digital technologies over the past few decades have greatly contributed to the way that people nowadays generate, utilize and share their knowledge in order to create value, while simultaneously impacting (directly or indirectly) both – societies and economies. By understanding that some of the existing jobs are about to be extinct in the future, and some of them are already going through the process of digital transformation, meaning that new digital skills are required to efficiently perform them, we can conclude that we are currently living in an era of so-called digital economy. Spremić (2017) argues that we could define digital economy as all business models, products, services, markets and fast-growing sectors of economy, especially those based on digital technologies as their primary infrastructure used for conducting business activities, which are also based on the notion of knowledge economy – an economic system where production and consumption of goods and services is primarily reliant on knowledge, will power and innovation. Such knowledge-intensive activities are much more prevalent and frequent in developed countries rather than labor-intensive effort that we can witness in underdeveloped regions.
Further, Spremić has broken down the concept of digital economy into following four key principles:

1. Integration and simultaneous application of independently developed technologies such as hardware, software, computer networks and data. Also, everyday use of contemporary digital technologies such as mobile technology, cloud computing, social networks, Big Data network, 3D printers, robotics, virtual reality and other similar possibilities.
2. Integration of progressive business concepts such as corporate entrepreneurship, sharing economy, self-organizing systems, personalization and suiting business to the customers' wants and needs.
3. Use of digital business platforms, where related digital business processes allow for fast and simpler conduction of business transactions.
4. Innovative digital business models and management based on entrepreneurial organization culture, innovation and value-creation.

Finally, the notion of digital entrepreneurship encompasses not only newly-born ventures (startups) which penetrate their respective markets by utilizing brand new technology in their business, but also all previously established enterprises which are either willingly or unwillingly undergoing a process of digitally transforming their daily business activities and strategies for the purpose of boosting economic and social development.

The basis of digital growth and development, however, is not merely reliant on technological advancements, but also on the effort put into entrepreneurial and digital education of a younger generation of people who are expected to carry out the phase of transition from traditional to digital business environment.

Turuk (2018) concluded that development of digital technologies serves as a driver of emergence of new business models and also has a high impact on the increase of business process efficiency across enterprises, progressively making almost all industries more competitive. Naturally, such enterprises contribute massively to the development and growth of national economies since they require incredible amount of flexibility, organization and tenacity to undergo such demanding technological transformation, but managing such a shift early on makes them more likely to persevere in the long run.

## 2.2 Prerequisites for digitalization

To successfully enforce the proces of digitalization, one should first be able to distinguish the fundamental difference between two key terms: digitization and digitalization.

In its essence, a country (government, private and public companies, etc.) should first think about digitizing the sets of information which they intend to utilize in their everyday operations. It means that all written records of data shall be translated or transcripted into a digital format, that is, transforming data from their analog form to a digital one. Digitization is the first step out of three in a process of digital transformation. Distinction between digitization and digitalization can best be described using the analogy of technical and conceptual shifting. What is meant by it is that digitization refers to encoding of data and documents (also photographs and sounds) which, in technical terms, translates to its conversion into bits and bytes, or rather 0's and 1's. To illustrate it clearly in business terms let us take an ordinary paper document as an example. Instead of stockpiling a bunch of paper inside desk drawers and office closets one could simply scan the document and save it as a PDF file on a computer.

Furthermore, sometimes it might be necessary to go back over several years of business in

order to collect reports and transform them into a meaningful digital data which can be analysed and manipulated if need be. The point being is that digitization is not an easy step in transforming a business or another type of informational system. It requires a lot of time and effort, but the good thing about it is that it is only a transitional phase, while the awareness and importance of it has already been emphasized throughout society.

Now, the conversion of analog data into a digital format is virtually useless if the tools which use and process that information do not operate in a digital manner as well. What is important to distinguish is that digitalization refers to reorganization of business processes and activities around digital technologies. While data digitization is the stepping stone to the complete notion of digital transformation, being ready to adopt digitalized business processes necessitates SMEs to invest additional time and financial resources into training their employees to make sure their digital skills and ability to manage the requirements of new digital technologies match real demands. Sometimes, due to digitalization, some enterprises completely eliminate certain job positions within their organizations so there are instances where an employee might become redundant, and sometimes it is necessary that he or she just undergoes the retraining program since the nature of their job has changed only slightly.

Gartner states that digitalization is often seen as a means of changing existing business models and making them more efficient and profitable through the application of digital technologies. The process of digitalization within an enterprise can be accomplished in several iterations or projects. It means that the change does not happen overnight, but it rather comes gradually. Key role in such endeavors is often played by a Chief Information Officer (CIO) in larger-structure enterprises, while on the level of startups and SMEs it is most often done by the entrepreneur itself, especially if it is a digital enterprise in question. Responsibilities that such a digital business leader should possess are not limited to only managing data digitization and transformation of existing business processes; his or her skillset should also include strategic digital planning for the long-term, promotion of IT culture, management of the department's budget and development of bimodal capabilities within the organization (Gartner, 2016).

The prerequisite for making both, the digitization and digitalization processes, more efficient therefore, apart from having a genuine expert in place of a CIO, is to also have quality knowledge base about digital technologies inside the enterprise and the workforce which is competent enough to make the transition as seamless as possible.

The concept of digital entrepreneurship has been defined and divided by the European Comission (2013) into the following five essential pillars:

1. Digital knowledge base and ICT market

2. Digital business environment

3. Access to finance

4. Digital skills and e-leadership

5. Entrepreneurial culture

By observing these EC determinants it is clearly visible that the digital domain is a governing figure of the blueprint for new age of entrepreneurship. In order to fully capitalize on the arising opportunities which new emerging technologies offer, countries should realign their long-term strategies for entrepreneurial development by introducing digitalization throughout all levels of state administration: central, regional and local government. Only when a country leads by an example and instigates the change, can the society truly shift their current paradigm into adopting the new one, in this case digital transformation. Hence, in order to foster digital entrepreneurial culture of the future, individuals should also play their part by dedicating their time and effort to learn about new technologies and digital skills which are to be demanded on the labor market in the future. Such an outlook can only bring benefits to the ecosystem, whether we look from the entrepreneur's perspective or an employee's point of view.

## 2.3 The meaning of entrepreneurship ecosystem

Entrepreneurship ecosystem is defined as a system of interdependent economic and social factors whose interaction within an environment has a direct impact on entrepreneurial activity of a particular territory, either locally or regionally. Such ecosystems tend to rely on mutual dynamics of several key factors such as: human capital, market openness, financial capital, regulations and culture. Efficient interaction (harmonization) of these elements, together with creativity and innovation, makes a good candidate for successful entrepreneurial ventures. Entrepreneurship ecosystem is also characterized by specific organizational structures or subsystems, which usually present itself in 3 different forms. The first one is simply called a startup ecosystem where individuals base their entrepreneurial activity mostly

on innovation and high scalability of a venture due to a big growth potential of an enterprise. Next structure is often labeled as university-based ecosystem where higher education institutions play a vital part in shaping young people's perception of entrepreneurship as a cultural phenomenon. But their role is not limited only in educational sense, however; universities often set up their own business incubation centers where young entrepreneurs are able to foster their ideas and potentially bring them to reality. This type of incubators is seen more often lately since it tends to produce extraordinary results. Such academic incubators provide young entrepreneurs in the making with excellent opportunities for networking through partnerships between universities and industry. This way students have the chance to meet their potential employers, investors or other collaborators in these venues which really encourage entrepreneurial spirit.

The final type of the most commonly found entrepreneurship structures worldwide are so called business clusters which are basically considered as industrial and business centers which encompass almost every key stakeholder of an enterprise in an immediate vicinity: business headquarters, suppliers and academic institutions. Probably the most famous example of a business cluster is the Sillicon Valley in the United States of America which is almost a synonym for high-technology and innovation. Some of the most innovative and successful companies in the world are headquartered exactly there ,with the likes of Apple, Facebook, eBay, HP, Netflix, Tesla and many more.

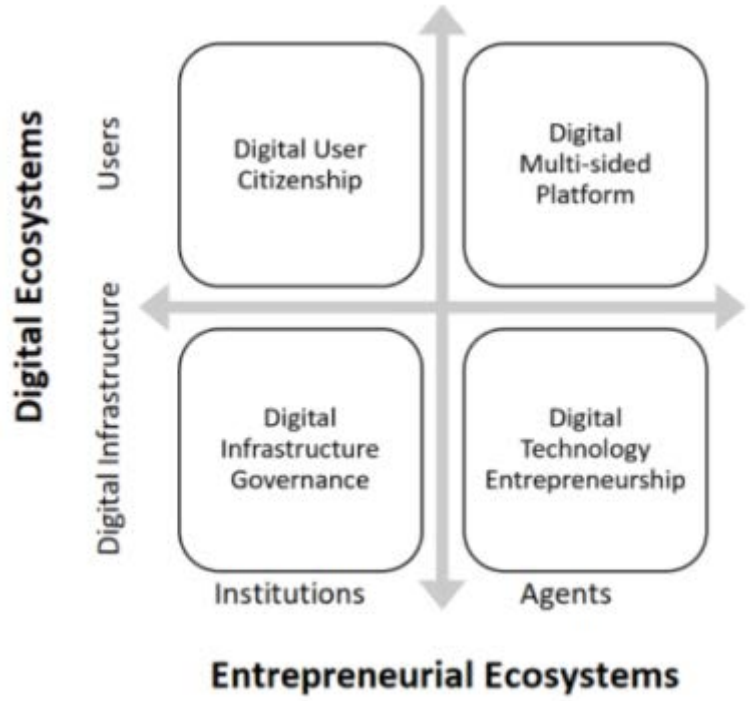
Although these thematic systems seem to produce incredibly successful results there might not be a need to extensively develop more of them in the future. The promising idea for the future development of innovation, economic growth and facilitated employment all at once might be through digitally established clusters and incubators. If such a conception comes to life it would mean that local and regional knowledge centers might begin to lose their value some time along the road.

When we add the ICT component to a regular entrepreneurial environment we get the phenomenon called digital entrepreneurship ecosystem. Addition of such innovation to the traditional system completely changes the dynamics of interaction between actors of the system. It is completely natural, however, because digital innovation at its core is based on disruptive technologies which change our everyday life. The indispensable need for mutual collaboration between all users of the ecosystem, given the possibilities that todays' technology offers, makes it so that the system is qualified for contiunous innovation and prosperity. Moreover, different categories of actors within the digital ecosystem contribute to

innovation according to their specific characteristics and capabilities. Collaboration of these actors tends to reduce overall R&D costs (technology and intellectual property rights) and minimizes risk exposure related to digital innovation.

Digital innovation processes include a wide range of cooperation activities (Biagi et al., 2015; Pesole & Nepelski, 2016). Small and medium-sized enterprises seem to contribute very significantly with the delivery and commercialization of their very own innovations. In fact, according to Pesole and Nepelski (2016) for example, 44% of all enterprises that deliver high potential innovations within the scope of ICT projects funded by the European Comission are SMEs. Universities which collaborate with SMEs or simply encourage their own students to innovate tend to contribute outstandingly to the creation of digital products and services very much as well. The same study from Pesole and Nepelski (2016) suggests that roughly 70% of innovations (EC-funded ICT projects) with high market commercialization success were co-developed between SMEs and universities.

Indeed, universities always used to play a peripheral role in a traditional entrepreneurship ecosystem, but should now be relocated more centrally in the new depiction of a contemporary version of a digital ecosystem.




*Source: The Global Entrepreneurship and Development Institute (2020)*

**Figure 1:** The digital entrepreneurial ecosystem

A classic literary concept of a digital entrepreneurial ecosystem is based on the integration of two separate but closely related systems: entrepreneurship and digital. As seen in Figure 1, the framework of this type of ecosystem is consisted of 4 essential components:

1) Digital User Citizenship – includes users in both, supply and demand sides.
2) Digital Technology Entrepreneurship – encompasses application developers and other agents[1] who use digital platforms to create value, experiment and make contribution in terms of entrepreneurial innovation.
3) Digital Multi-sided Platform – pertains to mediators who use digital technologies to coordinate economic and social activity between users and agents.
4) Digital Infrastructure Governance - refers to all government regulations and policies that control users', agents', and platforms' social and economic actions.

The idea of such a framework puts digital entrepreneurship in the setting of users, institutions and platforms with two biotic actors (users and agents) who make interactions within the system, and two abiotic actors (digital infrastructure and platforms) which constitute an external environment. The ultimate goal is to multiplicate the value of the system by expanding the number of its users in order to make the framework self-sustainable.
In other words, a self-sustaining digital entrepreneurship ecosystem is one in which user privacy is secured (DUC), platform efficiency is improved by third-party agents (DTE), market competition is not hindered by platforms (DMsP), and the security of digital infrastructure is assured (DIG).

Since the digital version of entrepreneurial ecosystem has improved efficiency, shorter time-to-market and shorter product life-cycles compared to a conventional one, high fluidity of people and resources within the system is inevitable. It is in fact expected, but also necessary because it facilitates the process of sharing innovative ideas and dissemination of knowledge within the system and makes it even more rapid. To examplify this scenario, let us take an employee who works in sales department in a telecommunications company for 3 years. They will learn ins and outs of the industry, together with consumer behavior patterns (their needs and wants) and will seek a new job position as a project manager in a software development company. They will already possess certain digital knowledge from their past working experience, but also a handful of useful soft skills. After 4 years of working there they could

[1] „Agent“ is a synonym for an entrepreneur in an ecosystem.

apply for a digital marketing specialist position within the same company because their employer was generous enough to subsidize them with online digital marketing courses during that 4-year period working as a PM[2]. In the next 2 or 3 years that same person could become the Chief Marketing Officer of a software development company to which they arrived because of previously absorbed knowledge about digital devices, platforms and application development and internally subsidized education via knowledge sharing platform. A decade of such career could potentially set an individual up for either a very fruitful and exciting continuation of work in a manager position or could even incentivize them to start their own business due to all of the knowledge about digital technologies and skills they have acquired in such a digital culture. Therefore, a rapid fluctuation of resources such as people and knowledge within the digital ecosystem is desirable, and it adds to the capability of the ecosystem to be considered as self-sustainable.

Digital skills are the backbone of a digital ecosystem, without which one cannot fully benefit from digital technologies. While the ongoing COVID-19 pandemic may be having a good impact on the number of internet users, higher usage does not automatically lead to the development of digital skills. Rather, focused intention to learn about technology and willing improvement of digital skills should be embedded into each person's lifelong education agenda to successfully transform our environment and blend into a true digital culture.

## 2.4 Role of digital entrepreneurship in economic development

The European Comission (2014) has published a roadmap containing five crucial factors which were supposed to set the foundation to help stimulate digital entrepreneurship in the EU. Factors that proved beneficial for the enforcement of digitalization across EU industries and businesses were the following:

- Digital Transformation accelerators
- Big Data platforms
- Skills to lead the digital transformation
- Regulating in the digital age
- Single digital market for SMEs

[2] „PM“ is an abbreviation for a project manager.

Looking back, we could say that the first four pillars were introduced and implemented quite successfully over the past 7 years, however, in March of 2020 (just prior to the COVID-19 global pandemic breakout) Thierry Breton, European Commissioner for Internal Market, has announced „*The EU SME Strategy for a sustainable and digital Europe*“. The intention of the initiative is to support European SMEs by boosting their capacity to adapt to climate-related issues, assisting them in reaping the benefits of digitalization, reducing the regulatory load that SMEs confront, and improving their access to finance.

In the same report, the EC have stated that there are approximately 25 million small and medium enterprises across the EU, that employ more than 100 million people, and they collectively account for more than 50% of European Gross Domestic Product (GDP). Additionally, since around 66% of all employed workers within the EU make their living by working for an SME, meaning that not only high-profile and well educated employees, but also low skilled workers are engaged in business activities of such entrepreneurial ventures across various industries and geographical regions, the overall economic welfare is a necessary consequence, which clearly significantly contributes to countries' economies. However, economic benefits are not the only byproduct of such healthy business environments; there are also notable positive effects on societies which will be discussed later in this paper.

Traditional SMEs are typically unsure about their digital business strategy. They often have difficulties getting into massive data repositories available to larger organizations, and are wary of powerful AI-based tools and applications. They are, nevertheless, extremely vulnerable to cyber-threats. Hence, in order to provide digital assistance to start-ups and even established small and medium enterprises, a network of up to 240 Digital Innovation Hubs (DIHs) will be established in each European region that will support such SMEs, using funding from the Digital Europe Programme and Structural Funds. The ultimate goal is to provide not only user-friendly and targeted sustainability and digitalization guidance, but also to connect support structures so that every SME has access to it.

Furthermore, in line with numerous surveys and research, primarily conducted and analyzed by the Global Entrepreneurship Monitor, it was statistically proven that the correlation between the country's entrepreneurial activity and its Gross National Product (GNP) per capita could be best represented graphically by using a U-shaped relationship, meaning that the entrepreneurial activity is higher for countries with either a low or high GNP per capita. That being said, it can be concluded that the most promising countries which are set to take

the advantage of digitalization of entrepreneurship in the years to come and reflect it onto their respective GNP numbers are those of Central and Eastern Europe (CEE), more precisely Poland, Slovakia, Czechia, Croatia, Hungary, Romania, Bulgaria and Slovenia. There are high expectations also, of some of the countries which are not yet EU Member States such as Serbia, Montenegro and Albania among others to further exploit the upcoming opportunities of digitalization to better their countries' income per capita numbers as well. That is not to say that higher-income European countries will not benefit from keeping up with digital trends in their entrepreneurial ventures, but statistically they have already established themselves as Digital Frontrunners on the continent so their returns might turn out very marginal compared to the lagging Member States. Further argumentation on the comparison between countries' positions in terms of their digital development will be discussed in a later chapter.

# 3 Measurement framework for digital entrepreneurship

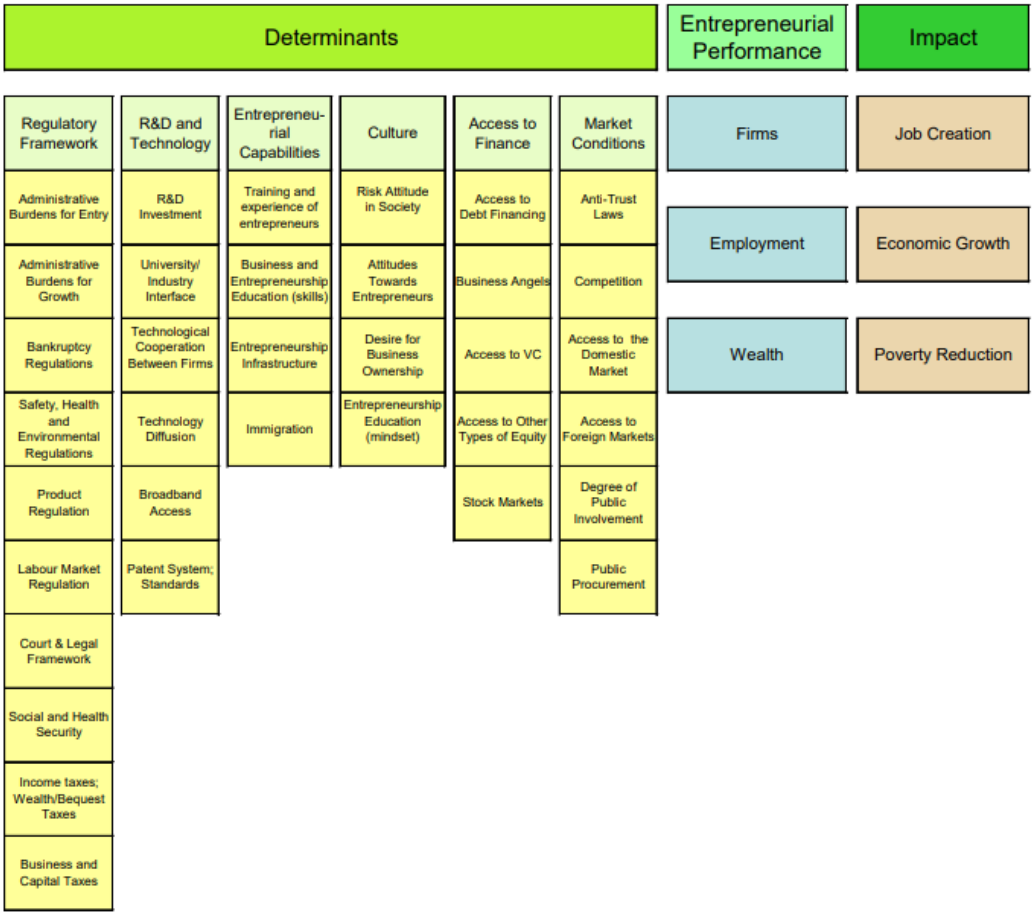
## 3.1 Criteria for determining the role of an entrepreneur

The OECD announced a program named Entrepreneurship Indicators Program (EIP) in September 2006 with the intention to develop internationally accepted framework of comparable statistics on entrepreneurship and its impacts. The ultimate goal of the program was to develop a long-term and sustainable program of policy-relevant entrepreneurship metrics. Therefore, the process required standardization of definitions and concepts on the one hand, as well as involvement of governments and international organizations in acquiring data on the other hand. The main idea behind the initiative was to set the foundation for indicators that support evidence-based policymaking. Given the fact that entrepreneurship is a multi-faceted phenomenon which cannot be evaluated with a single indicator, but rather a collection of indicators, the emphasis was put into harmonization of multiple policies so that the values provided on various different factors such as jobs created, wealth created and many more would not suffer due to a great diversity of policy goals. Following the pioneers of the program (Ahmad and Hoffman, 2007), a set of entrepreneurship performance indicators was derived and put into a framework. The classification of indicators was allocated into 3 main categories: determinants, entrepreneurial performance and impact. The most important of the three indicators mentioned which refer to entrepreneur's role in economy (and society per se) are the last two. Both criteria were further divided into 3 sub-categories each, with the „impact“ element being decomposed into job creation, economic growth and poverty

reduction, while the „entrepreneurial performance“ was broken down into employment, firms and wealth factors. These six factors describe the role of entrepreneurs in the society very succintly and precisely, however, their positive effect shall not solely be measured in terms of monetary prosperity, but should also be viewed as some kind of a community catalyst. The reason being is because not only do entrepreneurs help their families and government with the earned income and tax obligations, but they also create jobs for other people and share wealth in their local communities which can, over time, reach even regional proportions.

The third criterion, which authors had labeled generically as „determinants“, consists of 6 thematic units: culture, access to finance, R&D technology, regulatory framework, entrepreneurial capabilities and market conditions. These six thematic units are by no means considered as definitive nor exhaustive, yet each of them is further branched off into multiple different, but congruent sub-sectors.

The all-inclusive graphical representation of Ahmad and Hoffman's entrepreneurship indicators framework is shown in Figure 2:




*Source: OECD/EUROSTAT, Ahmad and Hoffman (2007)*

**Figure 2:** The framework for Entrepreneurship indicators

## 3.2 The index of digitization

In 2018, Euler Hermes developed and published the Enabling Digitalization Index (EDI) to measure the digital friendliness of the country environment and understand the risks and opportunities associated with the digital dividend. The key factor that is being studied is called digitagility (digital + agility) which translates to estimating countries' ability and agility to support their digital enterprises thrive and conventional businesses harness the possibilities of digital technology and digital ecosystem through transformation. The scoring of the EDI ranges from 0=worst to 100=best. The higher the score of a country the better and more transformative their digital environment is, while a lower score means less favorable conditions for growth or transformation. It is important to emphasize that the EDI focuses on the environment for enterprises to adapt or grow digitally, rather than measuring digital adoption or digital activity (the consequences of digitalization).
The final score of the EDI is based upon 5 components, and 10 indicators:

1) **Regulation** – use of the *„Distance To Frontier“* indicator from the World Bank Doing Business. The indicator encompasses the ease of getting credit and investor's protection.
2) **Knowledge** – use of *„Higher education and training score“* indicator. The indicator encompasses higher education enrollment rates, quality of the education system and the scope of employees training. Also the use of *„Innovation score“* indicator created by the World Economic Forum. It encompasses corporate R&D, collaboration between universities and the private sector and IPR laws.
3) **Connectivity** – 4 indicators are used. *„Internet user's ratio“* (the number of people using internet in % of population), *„Mobile phone line subscriptions per 100 people“*, *„Fixed phones line subscriptions per 100 people“* and *„the number of secure servers per 100 people“*.
4) **Infrastructure –** use of the *„Logistic Performance Index“* indicator. Used as a proxy of soft and hard logistic infrastructure.
5) **Size –** use of the *„number internet users“* and *„their income“* (captured by nominal GDP).

Figure 3 shows the EDI ranking of top 30 performing markets in the world, sorted by country. The ranking is done by the following 3 criteria:

1. The score of 115 individual markets from around the world is noted. Each raw indicator is rescaled to a range of 0 to 100 points.
2. The scores are combined using a simple average of the five components.
3. The final result is also a simple average of the five components.

| Country | Regulation | Knowledge | Connectivity | Infrastructure | Size | EDI 2018 | EDI 2018 ranking | EDI 2017 ranking |
|---|---|---|---|---|---|---|---|---|
| US | 92.8 | 100.0 | 69.5 | 90.1 | 82.6 | **87.0** | **1** | **1** |
| Germany | 86.4 | 92.6 | 79.4 | 100.0 | 17.9 | **75.3** | **2** | **2** |
| Netherlands | 81.1 | 95.7 | 92.2 | 98.4 | 3.9 | **74.3** | **3** | **4** |
| Switzerland | 80.9 | 99.5 | 96.9 | 89.9 | 2.8 | **74.0** | **4** | **3** |
| UK | 92.2 | 82.0 | 78.9 | 93.4 | 13.4 | **72.0** | **5** | **5** |
| Sweden | 90.5 | 89.1 | 76.7 | 99.1 | 2.5 | **71.6** | **6** | **6** |
| Japan | 80.5 | 84.8 | 73.9 | 89.2 | 25.4 | **70.8** | **7** | **7** |
| Singapore | 96.4 | 93.9 | 63.8 | 96.5 | 1.3 | **70.4** | **8** | **8** |
| Hong Kong | 94.4 | 76.4 | 83.7 | 93.4 | 1.6 | **69.9** | **9** | **9** |
| South Korea | 95.3 | 75.8 | 89.0 | 78.4 | 8.9 | **69.5** | **10** | **10** |
| Finland | 88.9 | 98.8 | 67.7 | 87.1 | 1.2 | **68.7** | **11** | **11** |
| Denmark | 95.5 | 88.3 | 75.0 | 82.6 | 1.5 | **68.6** | **12** | **12** |
| Austria | 85.6 | 83.3 | 76.9 | 94.6 | 1.9 | **68.4** | **13** | **13** |
| Luxembourg | 68.5 | 71.9 | 97.1 | 99.7 | 0.2 | **67.5** | **14** | **14** |
| Norway | 92.1 | 85.4 | 75.4 | 79.1 | 1.6 | **66.7** | **15** | **15** |
| Canada | 87.0 | 79.2 | 67.7 | 87.5 | 8.0 | **65.8** | **16** | **18** |
| China | 61.8 | 59.9 | 30.2 | 76.1 | 100.0 | **65.6** | **17** | **20** |
| Iceland | 85.5 | 79.4 | 100.0 | 62.7 | 0.1 | **65.5** | **18** | **16** |
| France | 81.3 | 78.2 | 68.9 | 86.2 | 13.0 | **65.5** | **19** | **17** |
| Australia | 88.5 | 78.2 | 69.3 | 81.7 | 6.2 | **64.8** | **20** | **19** |
| Belgium | 73.3 | 83.9 | 65.3 | 95.0 | 2.4 | **64.0** | **21** | **21** |
| New Zealand | 100.0 | 81.8 | 69.7 | 64.5 | 1.0 | **63.4** | **22** | **22** |
| Ireland | 87.4 | 80.6 | 61.2 | 81.7 | 1.3 | **62.4** | **23** | **23** |
| UAE | 86.0 | 69.5 | 63.7 | 88.0 | 1.9 | **61.8** | **24** | **24** |
| Israel | 72.8 | 91.8 | 56.7 | 76.0 | 1.7 | **59.8** | **25** | **25** |
| Estonia | 89.7 | 67.1 | 67.3 | 63.5 | 0.1 | **57.5** | **26** | **26** |
| Spain | 82.9 | 58.7 | 56.2 | 78.9 | 7.3 | **56.8** | **27** | **27** |
| Czech Republic | 81.5 | 61.5 | 58.1 | 76.6 | 1.3 | **55.8** | **28** | **28** |
| Italy | 75.1 | 59.8 | 47.7 | 80.1 | 9.2 | **54.4** | **29** | **29** |
| Malaysia | 85.4 | 68.7 | 46.2 | 66.1 | 3.0 | **53.9** | **30** | **31** |

*Source: World Bank; WEF; Euler Hermes (2018)*

**Figure 3:** Enabling Digitalization Index and sub-components score (100=best). Top 30 markets

The United States of America managed to firmly grasp the number 1 spot for two consecutive years, in 2017 and 2018. It does not come as a surprise, though, since the US leads by far as it benefits from its immense market size, comprehensive shared knowledge ecosystem and business friendly environment.

For the comparison, in Figure 4 we are able to see Croatia's EDI score and ranking for 2018 and 2017, respectively. The Republic of Croatia placed at the 49th spot of the total 115 countries included by the Index.

| Country | Regulation | Knowledge | Connectivity | Infrastructure | Size | EDI 2018 | EDI 2018 ranking | EDI 2017 ranking |
|---|---|---|---|---|---|---|---|---|
| Croatia | 73.3 | 39.7 | 48.9 | 54.9 | 0.4 | 43.4 | 49 | 46 |

*Source: World Bank; WEF; Euler Hermes (2018)*

**Figure 4:** Croatia's ranking within EDI framework

## 3.3 Existing measurement framework for digital entrepreneurship

There are numerous measuring frameworks for collecting empirical quantifiable information on entrepreneurship, its emergence factors, measurement of the phenomenon, and its economic or social effects. Measurement is a vital step toward stronger evidence that may be used to support policy decisions. However, there is not just one universal element or a number which would single-handedly indicate to us what and how entrepreneurship is to be measured, but it is rather a combination of multiple variables which, interpreted together, show us some hopefully relevant figures. In relation to digital entrepreneurship in particular, there are 3 most common and significant limitations to majority of existing entrepreneurship measurement frameworks which have to do with defining entrepreneurship as a universal concept. It makes quantification of data on this matter, therefore, fairly complicated. These 3 limitations include:

1) The definition either encompasses or omits the notion of innovation. This results in equating entrepreneur's risk-taking activities that make up entrepreneurship, with a manager's responsibilities of creation and management of a new business project.
2) Technical dimension of the innovation (ICT) is sometimes omitted, and sometimes included in the definition of entrepreneurship. More commonly it's being accounted for when speaking of digital entrepreneurship, and most frequently not when talking about entrepreneurship in general.
3) The definition of entrepreneurship does not clearly indicate the notion of creation of a new firm. It results in exclusion of entrepreneurial activity within an existing enterprise, which is also called intrapreneurship.

Currently there are exactly 12 relevant frameworks for measurement of entrepreneurship, and also 6 more recent mapping projects. The variety of definitions, aims, and procedures used by those instruments has shown to be crucial. Furthermore, none of the present frameworks allow for the measurement and analysis of digital entrepreneurship's determinants.
It is because of the purposes that had influenced the development of current frameworks:

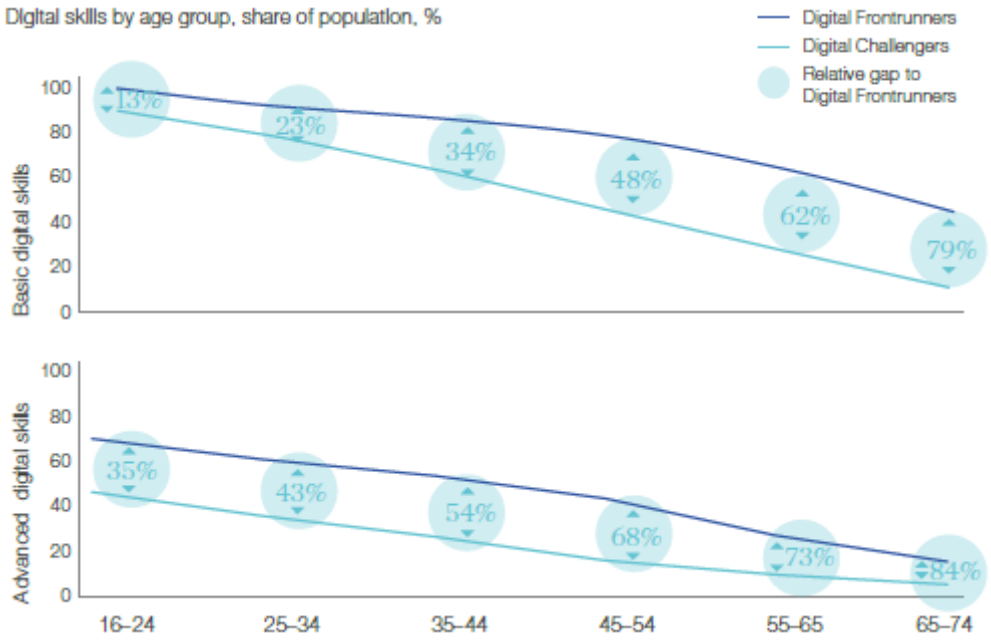
some define entrepreneurship as the setup of any new enterprise, while others are uninterested in technology, and then only a few consider intrapreneurship.
To distinguish ICT-driven innovation from non-ICT-driven innovation, entrepreneurship from intrapreneurship, a data-driven examination of digital entrepreneurship and its determinants must identify representative samples of enterprises and acquire company-level data. Some existing measuring frameworks provide surveys and indicators with some extremely intriguing features. These frameworks could be used as a starting point for developing a targeted measurement framework for digital entrepreneurship specifically. The research performed by the Global Entrepreneurship Monitor (GEM) and the Global Entrepreneurship Index (GEDI), as well as the World Bank's Enterprise Survey and EUROSTAT's Community Innovation Survey, provide enough information to construct a tool based on the Schumpeterian approach to entrepreneurship – meaning, putting emphasis on the innovation element.

# 4 Differences in digitization between European countries

## 4.1 Digital Challengers

Digital Challengers are considered to be the countries of Central and Eastern European region (Bulgaria, Croatia, Czechia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia) which have tremendous potential for growth in the "digital" sphere (McKinsey, 2018). They can follow in the footsteps of the second group of European nations, which consists of relatively small countries with tremendously high digitalization rates, which are also called „Digital Frontrunners“.
Transition of CEE countries to the market economy, along with their own traditional industries, foreign direct investments, labor-cost advantages, and funding from the European Union have all contributed to their continuous expansion over the last 30 years. The process of privatization of state-owned companies which started in the last decade of the past century and the adoption of comprehensive labor reforms liberated the local economies' innate strengths in the countries of CEE region. However, these elements of growth will not be sufficient for region's sustainable development in the future.
Basic digital skills, advanced IT abilities, and programming are the domains with the biggest potential for growth in value in the future and are considered to be drivers of economic growth along with disruptive digital technologies. Citizens of Digital Challenger countries, though, are significantly less proficient in basic and advanced digital skills compared to

people in Digital Frontrunner countries, across all age groups. Interestingly, the difference widens almost proportionally as people get older, particularly when it comes to the set of advanced digital skills (Figure 5).



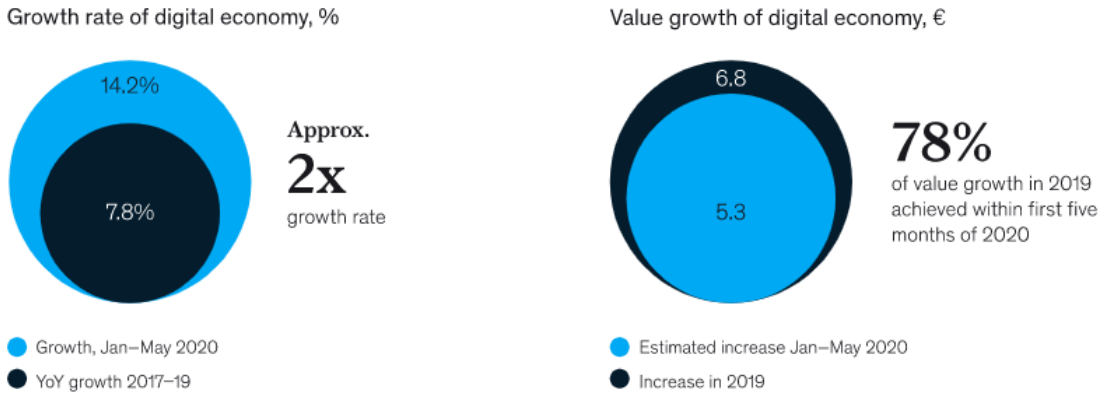

*Source: Eurostat; McKinsey analysis*

**Figure 5:** The difference in basic and advanced digital skills between Digital Challengers and Frontrunners

Another factor that is notably pronounced in the countries of CEE region is a lower activity rate of people in the labor market in general. Sweden being the European benchmark for labor market activity has around 14% more active citizens on average compared to the total population of CEE countries. The numbers are skewed, though, since the biggest gaps of 40% and 43%, among younger and elder citizens respectively. Because the CEE region's economic activity is now lagging well below Northern European standards, Digital Challengers are particularly well placed to capitalize from digital platforms that activate the workforce through supporting new, democratized marketplaces for independent labor.

That being said, the biggest obstacle for Digital Challengers to step forward turned out to be low digital engagement and lack of knowledge about emerging disruptive technologies which will as a matter of fact cause technological unemployment in the future according to multiple research. However, the recent breakout of the COVID-19 pandemic has, oddly enough, had some unexpected positive effects.

Interestingly, according to McKinsey's report from 2020, the digital economy of countries from the CEE region grew almost twice as fast in the first five months of the COVID-19 pandemic as it was the case in the previous 2 years. Figure 6 shows the growth rate of CEE's digital economy for the first half of 2020 at 14.2%, which is appoximately double the year-on-year growth rate to the one which was recorded in the period from 2017 until 2019 (7.8%). The Figure also suggests that the total growth of value within the domain of digital economy grew up to 78% of the total annual value recorded in 2019, capturing 5.3 billion euros in just five months.



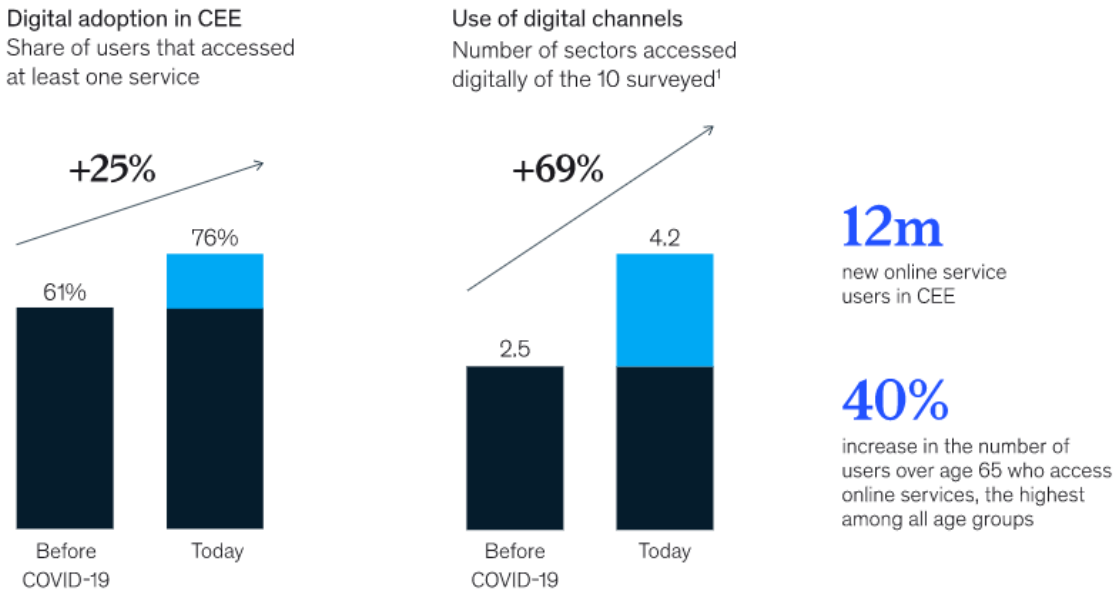

*Source: Eurostat; Euromonitor; McKinsey Analysis (2020)*

**Figure 6:** Growth of digital economy in CEE region in the period January-May 2020

The „new-normal“ paradigm which was imposed on the world population following the COVID-19 outbreak has certainly left some unwanted health-related consequences in many people, either physically or psychologically, due to mandatory isolation, quarantine and other restrictions. It is a top priority for healthcare services to come up with appropriate strategies to address these issues, but on the flipside, these sudden regulations of people's everyday lives may have actually accelerated the process of digital transformation like no other ordinary social phenomenon or initiative ever would. Although numerous businesses worldwide, especially SMEs, were forced to close their door either temporarily or forever, the ones who were in a position to take advantage of digital technologies and infrastructure happen to have felt the business consequences the least due to quick and determined habituation within the digital environment.

If we take a look at Figure 7 (left side) we can see that the share of users in CEE countries who had accessed at least 1 online service during the COVID-19 pandemic influenced the figure of total digital adoption by an increase of 25%. Another set of interesting findings from

McKinsey's Digital Sentiment Insights survey (2020) in the same Figure we are able to notice an increase of more than 12 million new and unique online service users within the same group of countries. To put into context, that finding suggests it is a greater number than putting the actual population of countries such as Croatia, Slovenia and Slovakia together. Furthermore, one gap-closing indicative in particular stands out the most in the mentioned survey. Namely, analysts have recorded a 40% increase in the number of online services users in the age group of people over 65 years of age – the highest percentage increase than in any other age group.




*Source: McKinsey & Company COVID-19 Digital Sentiment Insights (2020)*

**Figure 7:** Digital engagement of CEE citizens

It is obvious, according to the figures observed, that the gap between Digital Challengers and other more digitally advanced countries in the EU is beginning to close down given the fact that in the CEE's post COVID-19 era there are 3 out of 4 people digitally engaged, which is a tremendous first step towards the complete digital transformation. It means that the awareness of people has been shifted onto digital possibilites and the advancement is set to continue successfully.

Although this paradigm shift looks promising in the long run, policymakers and enterprises should still pay close attention and dedicate their financial resources into educating, reskilling and upskilling people in order to evade structural unemployment due to technological advancement in the coming years.

It is important to exhibit the numbers openly so the policymakers are aware of the stakes,

though. Concretely speaking, further digitalization of CEE countries, according to McKinsey analysts, could add an increase of more than 200 billion euros on their current collective GDP figure which is recorded at around 1.4 trillion euros. The analysts also predict that approximately 51% of work activities, which is an equivalent of 21 million job positions, in countries considered as Digital Challengers could potentially undergo automation as soon as 2030.

## 4.2 Digital Frontrunners

Northern countries of the European continent have been collectively named as Digital Frontrunners. In this context we refer to Belgium, Denmark, Estonia, Finland, Ireland, Luxembourg, Netherlands, Norway and Sweden. They have been settled into the same category because they share some commonalities in relation to important factors which have influence on the performance of a digital economy and below are the following key indicators:

- Enterprises in DF countries have digitalized approximately 25% of their business processes by 2016
- In the period 1990-2016 DF countries had recorded around 30% GDP growth, worth around 15 billion euros annually, thanks to technology diffusion
- Net employment in DF countries counts up to 80,000 new jobs every year due to implementation of digital technologies
- 40% of all new jobs created were in digital and ICT technology, while the rest is scattered throughout other branches of the economy
- More than 50% of new jobs are considered as high-skill, while the current total share of high-skill jobs in DF countries is more than 40%

From 2016 through 2030, new digital disruptive technologies, in particular automation and AI, have the potential to boost GDP growth in Digital Frontrunner countries by around 550 billion euros, or about 1.2% annually. The loss of jobs as a result of automation will contribute to approximately half of productivity increases, with the remainder coming from new goods, services, and possibilities provided by new technology. Nevertheless, it is expected that the consequences of automation will reflect in far more jobs being created than substituted. Moreover, it is believed that there will be more than 4.5 million jobs replaced and created by automation. This technology also has the potential to tackle economic challenges that aging of population has caused.

Equally important artificial intelligence technology (AI) is expected to tackle the challenge of sustainability in Digital Frontrunner countries so an increase of opportunities arises for entrepreneurs in the ecologic/environmental sector. The correct application of AI technology in this branch could see ecologically-friendly digital entrepreneurs succeed in providing solutions for following areas:

- Decarbonization (increased renewables efficiency or energy prediction)
- Water scarcity (water demand prediction)
- Plastic and waste management (smart waste sorting or intelligent trash bins)
- Land and agricultural sustainability (agricultural robotics or precision monitoring of environmental conditions)
- Material efficiency (optimal operating HVAC strategy)
- Future mobility (autonomous vehicles or traffic optimization)

Current capabilities of AI technology are projected to add more than 170 billion euros to the collective annual value of gross output for Digital Frontrunners which would make their current gross output of 4.6 trillion euros that much greater. Figure 8 illustrates this potential and also shows the levels of current AI adoption or maturity within DF countries across virtually all sectors. Hence we can notice that the highest levels are recorded in High-tech, automotive and banking sectors, while the lowest values stand for travel and pharmaceuticals industry.

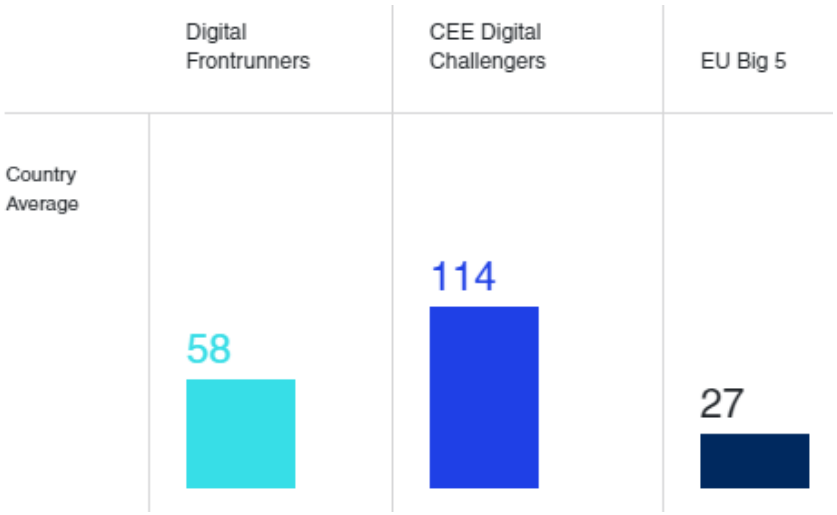

*Source: McKinsey Global Institute analysis (2018)*

**Figure 8:** Value potential of AI technology in Digital Frontrunner countries

It is highly suggested that SMEs in these 9 countries seriously embrace AI adoption since not doing so could significantly undermine their GDP growth potential in the coming years. Apart from the sustainability thematics, entrepreneurs living in DF countries could attempt to monetize their ideas with the use of AI technology across other fields with lower rates of AI adoption such as healthcare, transport and even try collaboration with public sector to offer them some sort of value and attractive solutions.

## 4.3 The EU Big 5

Five European countries (the United Kingdom, France, Germany, Italy and Spain) with the biggest GDP numbers, but the slowest per capita growth rate (Figure 9) are commonly known as the EU big 5.



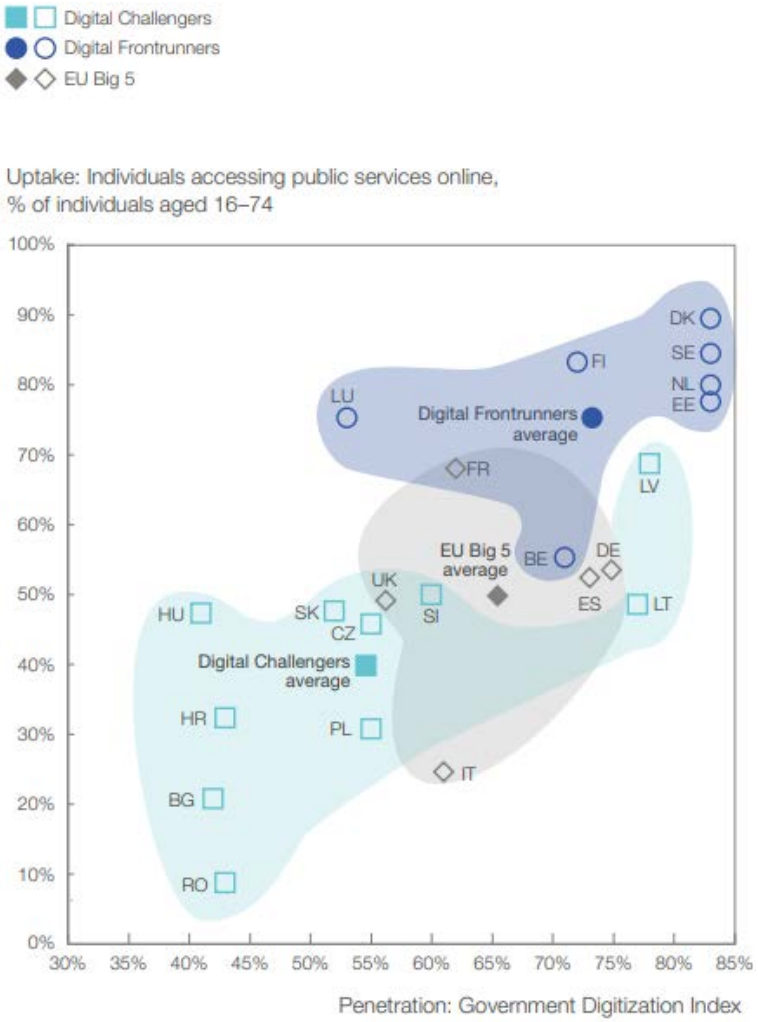

*Source*: *Eurostat; McKinsey analysis*

**Figure 9:** GDP per capita growth (1996-2017, %)

The reason for their lower growth rate (27%) is mainly because they had put their focus towards their internal markets, rather than external ones, which is the main point of interest among Digital Challengers, hence the latter group manages to record an incredible increase of 114%. General rates of digitization are high among the big 5 countries, but still at a lower level compared to Digital Frontrunners. In 2016, the digital economy of the EU big 5 accounted for 6.9% of their GDP, slightly above Digital Challengers (6.5%), yet still notably far away from the category of Digital Frontrunners who had recorded the value of 9% in the same area. Although Digital Challengers' industries lag behind their fellow DF countries for the most part, DC members can boast about their financial services and ICT sectors being almost on par with the EU big 5 benchmarks.

In Figure 10 we can notice a graphical representation of the percentage of people aged 16-74 using online public services in each of the concerned countries across 3 before mentioned categories (Digital Challengers, Digital Frontrunners and the EU big 5) in regards to the government digitization index. The interpretation of the numbers is following:

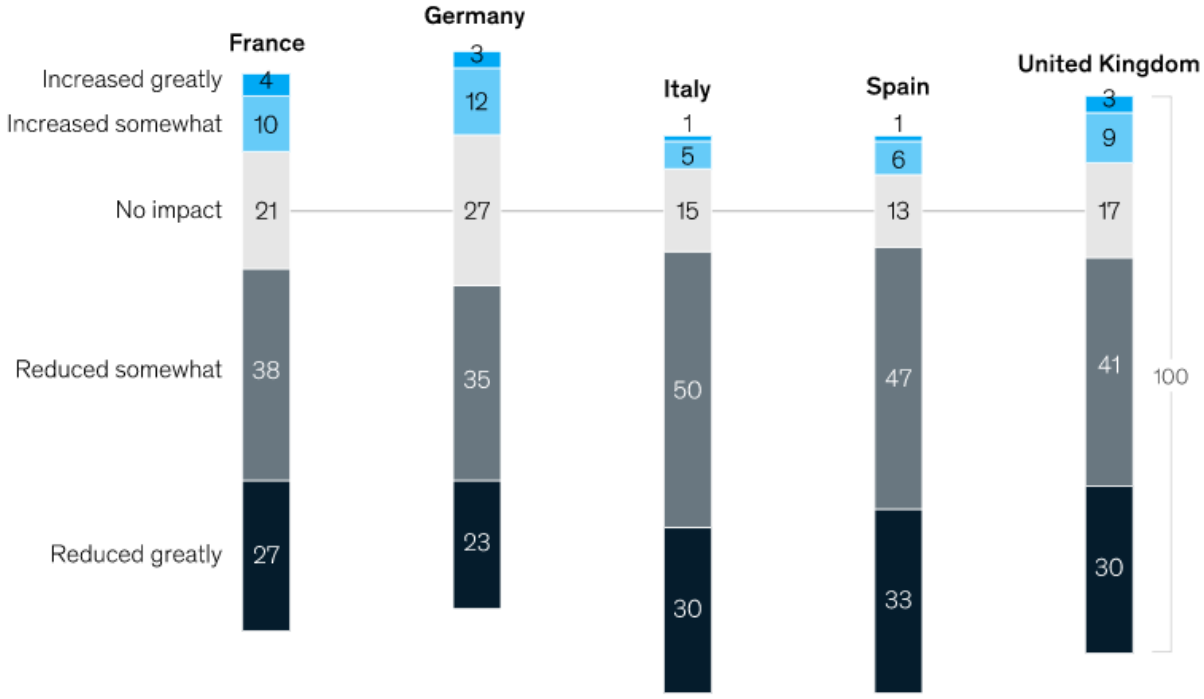
- DC average is calculated to be 55% penetration by 40% uptake; the biggest difference is shown between Romania (43% by 9%) and Hungary which has almost the same index of 42%, but the uptake of almost 50%. Slovenia seems to be the country closest to the DF average (60% by 50%).
- DF average is calculated to be 75% uptake by 75% penetration; the biggest difference is shown between Belgium (73% by 55%) and Finland (74% by 82%). By far the most dominant values in the Figure are represented by Denmark (83% by 88%).
- EU big 5 average is calculated to be 66% penetration by 50% uptake; biggest difference is shown between Italy (61% by 22%) and France (63% by 68%).




*Source: Eurostat; Digital Economy and Society Index (2017)*

**Figure 10:** E-government penetration and uptake

A McKinsey survey on the topic of COVID-19 impact was conducted across the EU big 5 countries in August 2020, with more than 2,200 SMEs. Approximately 70% of the enterprises said that their revenues had significantly dropped due to the pandemic. Regardless of the fact that 20% of the surveyed SMEs had already taken advantage of some sort through government assistance designed to alleviate their financial difficulties, such as tax breaks or payments to furloughed employees, more than half of those surveyed believed their enterprises would not survive for longer than 12 months.




*Source: McKinsey survey (2020)*

**Figure 11:** Respondents' views of COVID-19 impact on their enterprises' revenues, %

Figure 11 shows more precisely that Italian and Spanish SMEs have seen the biggest negative consequences of COVID-19 in their revenues. In absolute terms German SMEs seem to have suffered the least on average (58% of SMEs), while even recording the biggest share of enterprises who saw either a positive(15%) or no impact at all (27%).

As the pandemic fades, governments may decide to assist SMEs in strengthening their resilience by, for example, assisting them in finding new markets or digitizing more quickly. Following the crisis, small and medium enterprises have the capacity to become an economic and employment engine, and governments could be the catalysts of development, but their responses will be crucial.

# 5 Technological drivers for environmental change

## 5.1 Foundational pillars of digital transformation

The digital transformation is very well taking place before our eyes, affecting many aspects of everyday life and altering how enterprises plan and manage production. This transformation is being fueled by the advancement of digital technology, which has been made possible by huge increases in computing power and a concurrent drop in computing power costs.

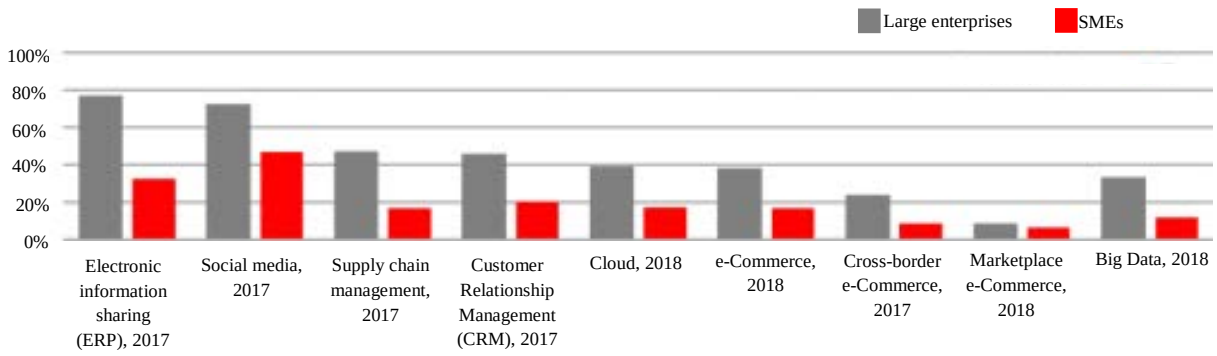
Jason Bloomberg (2018) stated that while digitization and digitalization are vital components of digital transformation, and they are both necessary, they are not sufficient separately from each other. He also said that both of these change processes are about technology in essence, while digital transformation is a change about the customer. The premise of digital transformation as an environmental driver of change is based on the concept that strategic decisions are meant to be made to take full advantage of opportunities that are possible thanks to digital technologies. As previously stated, emerging technologies contribute to the overall efficiency and prosperity of an enterprise, but its implementation greatly benefits the economy as a whole too. Categorically speaking, accessibility to digital (electronic) services is a prerequisite for establishment of sustainable, smart and inclusive digital society and economy where each citizen plays their part.

Information infrastructure, which encompasses all structures (physical and non-physical) that support information technology, serves the backbone for successful implementation of digital public services and also digital entrepreneurship ecosystem.

Additionally, “digital infrastructures (digital technology tools and systems that offer communication, collaboration, and/or computing capabilities to support innovation and entrepreneurship) infuse a level of fluidity or variability into entrepreneurial processes, allowing them to unfold in a nonlinear fashion across time and space” (Nambisan, 2017). Digitally-powered enterprises, including startups and SMEs, are the primary drivers for converting new scientific and engineering knowledge into economic gains. Virtually the only notable difference between a digital startup and a digital SME is that startups foster the idea of disrupting a certain industry, while SMEs are a bit more conservative on that note by placing their bets on their own competitive advantages. Both of those, however, generate positive externalities through their digital nature which have the potential to transform society at large, particularly within the ICT sector. It is becoming more obvious that a digital startup is more capable of surviving than a conventional one, and an ICT enterprise is much more likely to become a high-growth corporation than a non-ICT enterprise. This clearly shows that

utilization of digital technologies nowadays proves to contribute much more to the ecosystem's overall value creation and wealth generation than traditional business ventures.

The report on the *Digital Transformation of European Industry and Enterprises* made by the European Comission (2015) affirmed that, over the past 15 years, for every existing job that was being destroyed due to obsolescence or application of advanced technology, 2.6 new jobs were created. It was clear that employment of new technologies and digitalization of business overall is about to create some disruption of the economy in the short run, but large-scale benefits that would arise soon afterwards will last in the long run.




*Source: Eurostat/DESI (2019)*

**Figure 12:** Adoption of digital technologies in EU, 2018 (% enterprises)

Advanced digital technologies, such as artificial intelligence (AI), the Internet of Things (IoT), cloud computing, and big data analysis will improve productivity, boost efficiency, and bring up new opportunities for European enterprises across all sectors, all of which are critical for economic recovery and growth.

Figure 12 depicts the usage of advanced digital technologies throughout 2017 and 2018 across European countries. Despite the fact that enterprises are becoming increasingly digital, just a small percentage of European SMEs use advanced cloud computing (17%) and big data applications (12%). For comparison, Malta's usage of big data (24% of enterprises using it) makes it a European leader in that category, while Finland proves to be the most sophisticated in cloud adoption with more than 50% of all enterprises using it on everyday basis.

There is a significant disparity between major corporations and small-to-medium enterprises. This gap, though, is not only in adoption of advanced digital technology, but also in areas of simple digital systems such as e-commerce platforms, customer relationship management (CRM) and even enterprise resource planning (ERP) software.

An additional textbook reason for the disparity between different levels of digital adoption could be the lack of digital infrastructure between different countries. Although some differences in the quality of infrastructure do exist, it is not possible to attribute these disparities merely to that. Dimension of connectivity is the most important factor when it comes to digital infrastructure. It is defined through fixed and mobile broadband which are available in all countries, with major differences in classification among criteria: ultrafast broadband (minimum 100Mbps), fast broadband (minimum 30Mbps) and very high capacity networks under fixed broadband, and most commonly 3G and 4G coverage along with 5G readiness under mobile broadband.
Key technologies that drive the digital transformation include: automation, Internet of Things, Big Data, artificial inteligence, machine learning, cloud computing and wireless networks. Given the fact that only 17% of small-to-medium sized enterprises have successfully integrated digital technologies into their operations, compared to 54% of large enterprises, it is to expect further adoption in a rapid fashion.

Product life-cycles are becoming shorter thanks to the acceleration of technological expansion which happens exponentially. For the purpose of entrepreneurial viewpoint, it means that innovation cycles are becoming shorter as well and they result in faster prototype deployment and testing phases. The fluctuation of digital products and services (SaaS) with the use of agile frameworks is running at a relentless pace as well.

## 5.2 Automation

Automation is the development and deployment of technologies that allow products and services to be produced and delivered with little or no human interaction. Many tasks that were traditionally performed by people are now more efficient, reliable, and/or fast because to the use of automation technologies, techniques, and procedures. Manufacturing, transportation, utilities, operations, facilities, defense, and, more recently, information technology are all using automation at the core of their business activities. Business process automation (BPA) and robotic process automation (RPA) are two prevalent approaches to automation in an enterprise. Generally speaking, BPA is used to decide how to apply the concept of automation to a business processes, whereas RPA is used in making a decision on how to automate a specified, repetitive job.
Most industrial firms, for example, use robotic assembly lines as part of their automated processes inside the manufacturing plants. Human involvement is only necessary to define and manage operations; the assembly of the different components is left to the machinery,

which convert raw materials into finished products automatically.
Automation's significance in the technological sector is quickly growing in both layers: the software/hardware layer and machine layer. The adoption of innovative artificial intelligence (AI) and machine learning (ML) technologies is propelling the industry forward at breakneck speed. Automation will undoubtedly have a significant negative impact on employment and income in all occupations that do not have special training or skills. Many of these workers, on the other hand, might simply be retrained for other jobs, and the effect of this technology on our environment is transformative enough to open up new doors for everyone.
Digital entrepreneurs could seek potential employment od innovative automation ideas in the fields of automotive industry, construction environment and healthcare sector.

## 5.3 Data management

Big data refers to massive, difficult-to-manage data volumes – both structured and unstructured – that overwhelm enterprises on a daily basis. But it is not the quantity of data that really matters, it is about what organizations do with the data. Big data can be studied for insights that lead to better business decisions and strategic choices. It has always been about the three „V's“ in the field of big data ever since Doug Laney defined it in 2001:

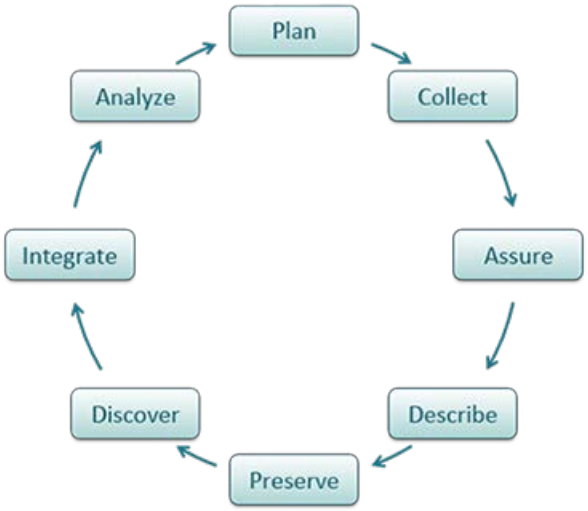
- Volume - data in enterprises is gathered from a multitude of sources, including commercial transactions, industrial equipment, Internet of Things (IoT) devices, social media, videos and more. Solution on the horizon are cheaper storage platforms.

- Velocity - with the rise of IoT, businesses are receiving data at an unprecedented rate that must be processed quickly. The need to cope with these streams of data in near-real time is being driven by technology such as RFID tags, sensors, and smart meters.

- Variety - data can be organized, quantitative data in traditional databases or unstructured text documents, emails, audio files, videos and financial transactions.

Figure 13 shown below represents all stages of a so called data lifecycle. The concept of big data management is intertwined with that of data lifecycle management (DLM). This is a policy-based method for identifying which data should be stored where in an organization's IT ecosystem and when data can be securely destroyed. Various job titles within a typical enterprise may be involved in management of big data, ranging from CIO at the top of the

hierarchy all the way downwards through data architects, data scientists, business analysts, developers and many others.




*Source: DataONE(2016)*

**Figure 13:** The Data Lifecycle

Big data is a field that deals with methods for analyzing, methodically extracting information from, or otherwise dealing with data volumes that are too vast or complicated for typical data-processing application software to handle.
To help enterprises make more data-driven decisions, the field of business intelligence (BI) incorporates business analytics, data visualization, data mining, data tools and infrastructure, along with the most efficient methods of organizing and processing data. In reality, you've got modern business intelligence when you have a holistic perspective of your company's data and can utilize it to drive change, quickly adjust to market or supplier changes and eliminate inefficiencies.

The European Commission will work towards making data more accessible and enable data flows between enterprises and governments, as promised in the European Strategy for Data, by building shared European data spaces for trusted and secure data sharing. All businesses, particularly SMEs, will have equal access. To prevent potential disadvantages for SMEs, the Commission will also look into potential concerns with usage rights for co-generated data, specifically from the industrial IoT. It will also address SMEs' adoption and use of cloud computing, for example, by developing a unique marketplace for cloud services with fair contractual terms. However, SMEs have yet to reap the full benefits of data, which is the

digital economy's lifeblood. Many people are unaware of the value of the data they generate, and they are currently very much unprepared for the emerging data-agile economy. The role of data scientists, a new breed of analytical data experts, is going to be greatly appreciated when entrepreneurs and managers discover their value and neccessity for any successful digital business environment.

## 5.4 Internet of Things

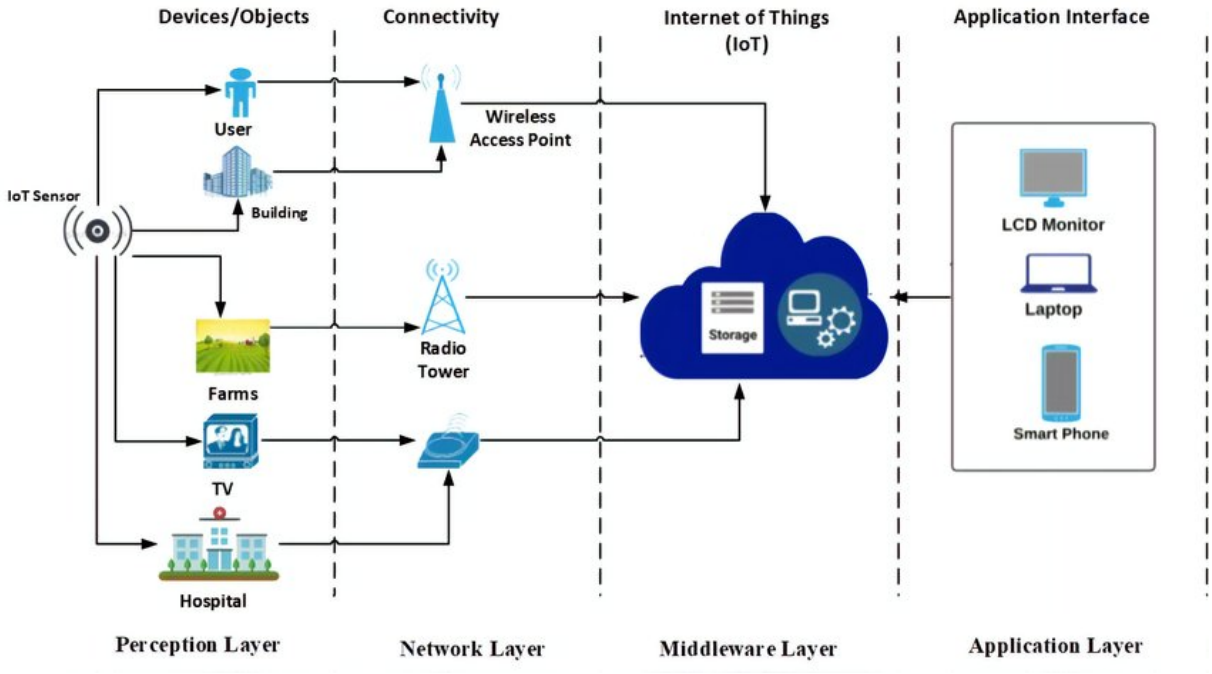
The Internet of Things(IoT) is a network of interconnected computing devices, mechanical and digital equipment, objects, or living beings with unique identifiers (UIDs) and the ability to transfer data without the need for human-to-computer or human-to-human interaction. IoT is basically a digital ecosystem made up of web-enabled smart devices that gather, send, and act on data from their surroundings using embedded systems such as CPUs, sensors, and communication hardware. By connecting to an IoT gateway via Internet Protocol (IP) address, IoT devices can share sensor data that is either routed to the cloud for analysis or examined locally on the spot. These gadgets may occasionally communicate with one another and act on the information they receive. Although individuals can engage with the devices to set them up, give them commands, or retrieve data, the gadgets do the majority of the work without human involvement.

A „thing“ in IoT ecosystem can be a source of inspiration for many aspiring digital entrepreneurs since the application of this type of technology is perhaps the most appropriate one for everyday use. It is believed that IoT will become irreplaceable as a functional mechanism of people from all walks of life. Some of the possible innovations in this field include:

- A wearable or ingestible device with the purpose of monitoring health, fitness or productivity.
- Smart home devices with the purpose of a home controller or as a security system.
- Appropriate for retail environment in a shape of self-checkout technology, personalized promotions or smart CRM systems.
- Workers' efficiency monitoring or augmented reality (AR) for training purposes.
- Operations optimization, equipment maintenance or IoT-enabled R&D suitable for various production environments.
- After-sale usage and performance tracking of vehicles.
- Smart cities – smart parking meters and pricing, adaptive traffic control.

- General outdoor usage in the view of shipment tracking, flight navigation and autonomous vehicles.

Figure 14 displays a basic preview of standard Internet of Things architecture. We can notice it is consisted of 4 layers: perception layer, network layer, middleware layer and application layer. The functionality of a system begins with a IoT sensor receiving a desired piece of data which is then transferred through „the thing“ which is usually represented by a device or an object. Afterwards the data is being transmitted via network waves to the IoT server/storage and then finally the end-user interface of a particular application connects to the IoT server and track the desired data.




*Source: Creative Commons Attribution 4.0 International (2016)*

**Figure 14:** Basic IoT architecture preview

## 5.5 Advantages of emerging technologies in digital transformation

Given all of the advantages which contemporary technologies offer to entrepreneurs of digital era to sustain or improve their business, it is only expected that both small to medium enterprises, as well as whole industries will grow and benefit from it equally.

Only an advanced group of SMEs that use digital technologies and data can put Europe as a global leader in creating the digital economy. SME's can benefit greatly from digitalization by increasing the efficiency of their manufacturing processes and their ability to create new

products and business models. By utilizing other sophisticated disruptive technologies than those mentioned above, such as Artificial Intelligence (AI), blockchain, High Performance and Cloud Computing can drastically improve the competitiveness of SMEs and put them shoulder to shoulder with some larger corporations and organizations.
Artificial intelligence, for example, has been in use for several decades but in recent years we are seeing ever more so of its commercial usage. To be more specific, there is a lot of AI technology usage by big enterprises in their marketing efforts through social media platforms. However, there is a window of opportunity even for smaller entrepreneurs to get the best out of it because the development of such advanced and complex technology requires significant amount of resources, primarily financial. Despite of that, small and medium entrepreneurs are able to fully utilize its capabilities of process management, problem solving, pattern recognition, but also image or voice recognition, which are constantly being improved. Furthermore, the combination of its machine learning and sentiment analysis mechanics offers an incredible ability to predict consumer behavior in order to increase sales of goods and services. Additionally, entrepreneurs have the chance to use an AI-based set of softwares which are useful in the domain of business analytics, meaning that they do not necessarily need numerous human employees to analyze firm's performance. Simply put, AI enables entrepreneurs to not only increase profits and track their performance, but also to react in real time as market dynamics and consumers' sentiment tend to change.

Cloud computing, on the other hand, does not necessitate a significant financial and time investment in hardware installations. Instead, it allows entrepreneurs to rapidly access the computer resources they need to run their IT department and operations. It is a pay-per-use business model that provides web-based individualized delivery of storage, computation power, servers, apps, databases, and other IT resources. It is not necessary to spend huge amount of money on infrastructure because cloud computing does not require a traditional LAN network and can thus be operated from a small space. Also, using cloud technology provides its users with additional security against server crashes, localized power outages, cybercrime and even natural disasters.

The third on the list of emerging technologies which could potentially be put into use worldwide and revolutionize the way in which data is being stored is blockchain. Blockchain is a system of decentralized, open ledger records which track and store data such as financial transactions or medical records by forming so-called blocks of information which are sequentially put one after the other in the chain. The information stored in those blocks is

recorded in a chronological order and is set in stone, that is, immutable. The greatest benefits that blockchain provides are its aspect of decentralization which translates into public transparency and also security – it is extremely difficult and almost unprofitable to manipulate data which is already recorded in blockchain since it requires an enormous amount of financial resources, as well as time. In business terms entrepreneurs could utilize the technology in departments such as accounting for reducing maintenance cost and time in maintaining ledgers, but also tracking assets ownership. Furthermore, the application could be seen in marketing department, supply chain managements and also human resources. The underlying advantages which entrepreneurs could benefit from by using blockchain, regardless of their scope of action or industry they are in, are reduction of operational costs as well as time needed to record or manage information in databases.

All three types of technology mentioned above are already widely used by many big and small enterprises across the globe, but there is still plenty of space for the rest of the businesses to join in and become early adopters or at least early majority of users of such revolutionizing technology. Meanwhile, each of the technologies is being improved continuously and their application is being studied by experts in the field which means that the true potential has certainly not yet been tapped into.

# 6 Implications for policy makers and entrepreneurs

## 6.1 Authorities and regulators

Policy makers are of significant importance in developing strategies to facilitate the growth of entrepreneurship, especially in the emerging digital era. Their responsibility is enormous and cooperation among legislative, financial and regulatory institutions has become more important than ever. Digitalization of worldwide economies has been recognized as a force for good, however, entrepreneurs from all across the globe have a tendency to encounter obstacles either very early in their entrepreneurial journey or even at later stages of development despite of their established business models and experience. What most entrepreneurs in Europe describe as complicated in terms of following various procedures is the fact that legislation is extremely burdensome, requiring a lot of steps to be undertaken, yet there is so much to potential to simplify it. The issue varies from country to country since each Member State has different policies about a certain matter, hence the harmonization of EU and national laws seems like the most promising solution. The way it could be done is by utilizing the digital system of e-government in each country and synchronizing it to the EU's

institutional databases. Since the number of digitally lieterate people will be increasing in the years to come this solution could prove to be the most anticipated one which policy makers should work out. In Eurochambres' business survey (2019) shown in Figure 15 it is clearly visible that almost 80% of SME owners experience difficulties with complex administrative procedures when setting up and registering their businesses for the first time. Other types of difficulties which entrepreneurs often find complicated to deal with include lack of access to information on policies, differences between national rules for products and services, and also difficulties complying with national laws and practices.


*Source: Eurochambres (2019), Business Survey*

**Figure 15:** Biggest obstacles for SMEs when operating in the Single Market (% of SMEs citing obstacles)

Reducing excessive or unnecessary legislative burden and one single contact point where entrepreneurs would receive expert advice on licenses, administrative procedures and finance, and also assistance on comprehensive information should be marked as the top priority. This would indeed encourage more of the established SMEs, along with upcoming digital entrepreneurs to engage in online practices of registering their enterprises through harmonized e-government platforms and seamlessly comply with all the rules and laws through online interaction. It would make for a much more transparent, faster and efficient process for all parties.

After the reduction and simplification of administrative burdens, authorities could further adopt the idea of making all deliveries of services and digital documentation to/from public administrations digital by default. The final layer of legislative touch-up could be the implementation of „once-only“ principle which would mean that entrepreneurs and their enterprises shall supply public administration with their data necessary for registration, taxation and other duties only once; the idea is to thoroughly synchronize all national

institutions of great importance so they could internally communicate and share the needed information, while naturally obeying GDPR.

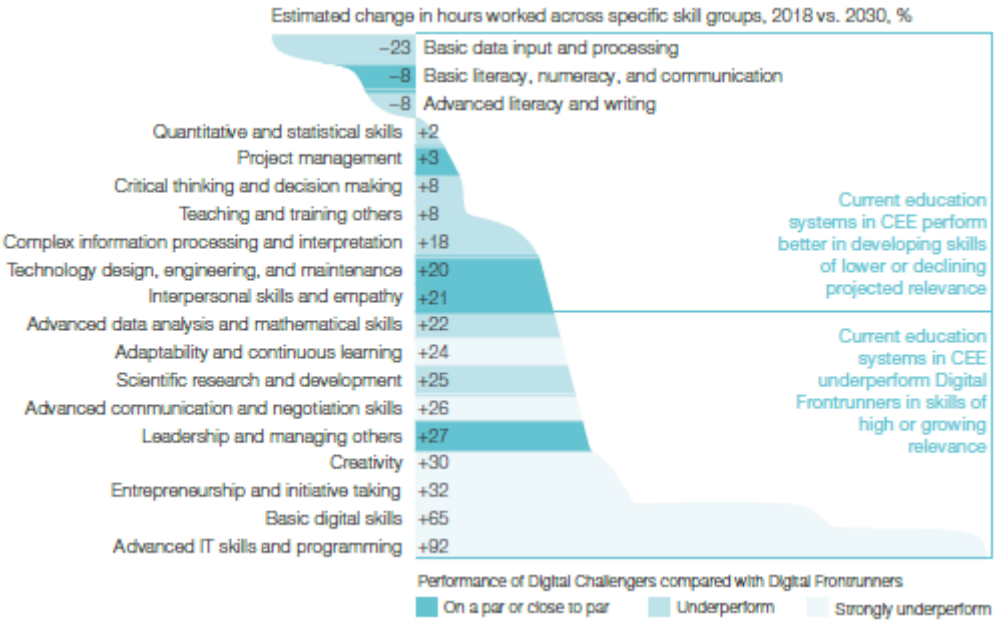
Furthermore, another big obstacle that SMEs generally face is the access to finance, that is, raising capital for starting or running their businesses. Generally speaking, it is indeed convenient and intuitive to provide financial aid, guidance and support in acquiring initial funds for startups, but according to worldwide statistics more than 50% of newly established enterprises tend to fail in their first five years of existence. With that in mind policy makers could develop better strategies of sequential financing and guiding of entrepreneurs within their first few years of setting up a business; essentially it would require support for new businesses throughout all phases of their lifecycle.

Additionally, SMEs usually face higher costs of tax compliance than some larger companies so it adds to the idea that national authorities could at least make it easier for newly established enterprises to follow a tax filing procedure by simpilfying VAT registration and the whole payment process.

However, an issue which arises in particular with digital entrepreneurs is that their enterprises, although requiring a significantly less financial expenses of establishing a business compared to any traditional business model, still have a tendency to grow and fail faster. The key component of their business models is that they utilize internet as the primary carrier of most activities, which is an inexhaustible resource, so they face very few entry barriers when starting up. That is precisely the reason why digital entrepreneurs should also have, apart from financial assistance, professional support and guidance in the beginning stages so they can have better chance of survival in the market.

Digital jobs that are created by digital entrepreneurs are increasing at an average rate of around 4% annually, yet only in the EU there seems to be a shortage of more than half a million digital jobs while its demand is overtaking supply. It is clearly a mismatch between the current skill level which people on the labor market possess and what the SMEs and even larger corporations actually need (McKinsey, 2018). Figure 16 shows that education systems in CEE countries tend to heavily underperform in teaching their students relevant skills for the year 2030 and onwards, compared to European countries with advanced digitalization levels.

The Figure also indicates that countries considered as Digital Challengers are almost on par with Digital Frontrunners in terms of traditional skills areas such as interpersonal communication, literacy and simple data mangement, but this set of basic cognitive skills will become greatly irrelevant in the future in contrast to technological or higher cognitive skills.




*Source: McKinsey Global Institute (2018)*

**Figure 16:** Comparison between education system performance in European countries

The conclusion is that low digital competences shall be put under the spotlight since most of EU citizens have access to elementary ICT infrastructure and internet connectivity, but the issue of education will be discussed into more detail in the next subheading.

On the one hand, from the common sense perspective, there are 2 crucial resolutions which each of the Member States should primarily focus on in order to directly influence the experience of their SMEs in starting up a business and give them a fair opportunity to stay alive and competitive in the market for longer than 3-5 years:

1) Simplification of tax filing procedures
2) Adjustment of payment schedules for new enterprises

On the other hand, the European Union as an organization should be responsible for far more extensive policy changes and law harmonization efforts, in coordination with its Member States of course. The moves which the EU might consider undertaking should focus on facilitation of entrepreneurial experience by striving to implement as many solutions via digital platforms to foster digitalization of enterprises and the Union to an even greater extent. The guidelines which may be followed by the EU policy makers would include:

1) Provision of a digital platform with the function of a shared knowledge base

2) Facilitation of networking for potential partnerships in local and international terms
3) Establishment of e-mentoring networks and cross-border cooperation
4) Inclusion of migrational entrepreneurs in a culture of digital nomadism
5) Free digital platform for education of unemployed people with little or no digital skills
6) Digital platform where SMEs can apply for raising capital – crypto assets (utility tokens)

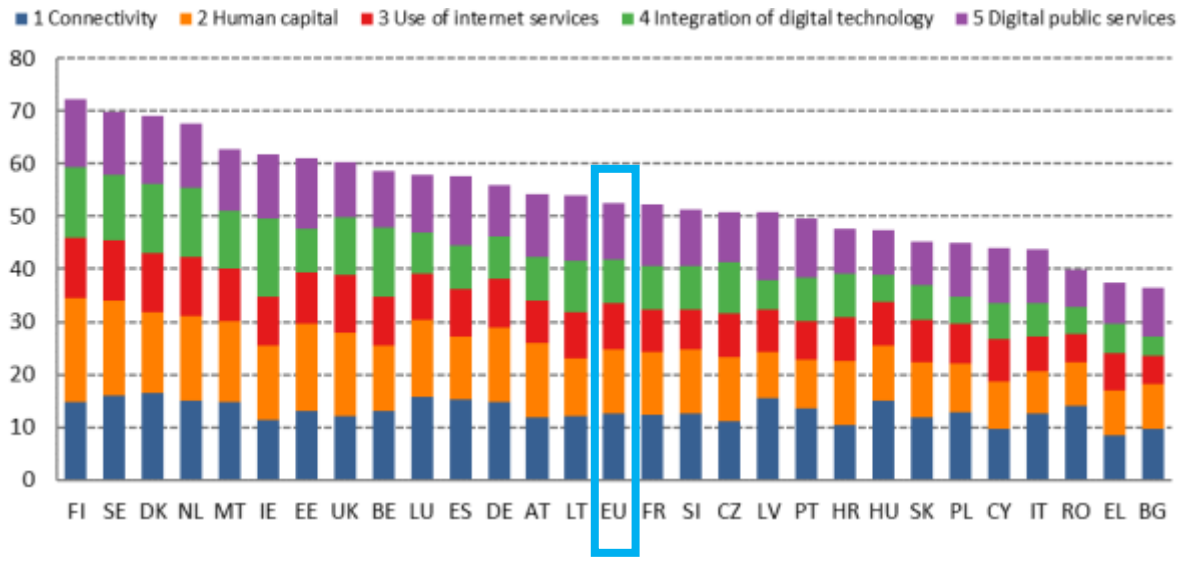
## 6.2 Higher education focused on digital entrepreneurship

By far the most important and most influential factor which determines the future growth and development of digital skills among younger (but also elder) population is the education system. The emphasis here is put mostly on the younger students who are either in high school or college studying dominantly about economics, engineering or IT. The IT and engineering faculties, for example, should strive to offer their students more courses related to entrepreneurship, while economics students could be engaged into much more of IT and digital skillset development. The curricula of high schools and universities should become standardized in terms of offering compulsory courses about digital technologies and specific work-related digital skills (i.e. AI, blockchain, cyber security), and simultaneously offer both in-person lectures as well as online courses making a unified mixture between tech and entrepreneurship as the core element of practical ability development. This would certainly require exhaustive organization on scholars' end, but would most definitely appeal to majority of students since it offers a lot of flexibility in terms of time management and also provides the opportunity where students are able to personally decide about which specific skillsets they ought to develop. Such an interdisciplinary approach would surely create both, more successful managers and entrepreneurs as well.

The underlying reason why higher education institutions should provide more up-to-date curricula and teach more applicable practical skills is because SMEs run by young entrepreneurs do not dispose with either enough financial resources to separately educate each new member of their organization, nor do they have excess of time to invest into it. European Comission (2020) decided that Digital Innovation Hubs will not only play the role of support provider to local and regional SMEs, but will also act as intermediaries between SMEs and universities/training providers at the local level. Furthermore, EU have allocated funds to numerous projects intended to bridge the gap between the areas of digital and entrepreneurial skills of students from across Europe. One such project is Inspiring Digital

Entrepreneurship and Awareness in HE (IDEA) which counts nine partners involved in business/IT sectors, higher education institutions and non-governmental organizations from seven European countries. The IDEA platform provides its users with opportunity to gain knowledge about computer and data science, use open resource courses and connect employers with their future employees.

According to recent studies, Nordic countries tend to have the most successful digitalization of their economies on average, while Eastern and Central European countries are considered to be laggards.




*Source: DESI 2020, European Commission*

**Figure 17:** Digital Economy and Society Index (DESI) 2020

Figure 17 shows ranking of European Member States on the Digital Economy and Society Index for 2020. Countries on the left side of the chart tend to have the most developed and advanced digital economies in the Union while the ones on the right side score the lowest on the index. Blue frame marks the EU average where scores of all Member States have been calculated across 5 common factors. When we analyze the graph it is, in fact, genuinely correct that countries from the north of Europe (Finland, Sweden, Denmark, the Netherlands) have far better digitalization index than Bulgaria, Romania, Italy and Greece for comparison. The changes in curricula and EU involvement in educational function are most certainly aimed to address the issue of digitally skilled staff shortage in the labor market so the outcome should produce very successful and measurable results.

Entrepreneurs are also expected to play a significant role regarding this endeavorment, though. Digital entrepreneurship shall be looked at as a completely new paradigm of

participation in a business environment – a much more complex, yet vastly efficient system. Hence, the well established enterprises who have already started reaping benefits of business digitalization could possibly become the movers and shakers of an initiative and take responsibility for educating upcoming generations on the importance of entrepreneurial and digital skills. A great example of such ambition can be seen in Croatia where Mate Rimac, the CEO and founder of Rimac Automobili has stated several times that himself and company representatives are lobbying the University of Zagreb to switch up their obsolete teaching principles on some of the faculties and instead apply contemporary methods, with handful of practical examples, case studies and applicable assignments. Rimac argued that the goal should be to educate students and enable them to the full extent to be able to participate in enterprise internship programs and later on earn full-employment thanks to their involvement with the field of study much earlier in college rather than later. This outlook would surely bring in more international digital giants to Croatia (as well as other countries with the similar strategy) and influence the labor market to become ever so competent. Of course, this idea would likely influence the entrepreneurship scene too, because more young people would feel confident that they actually possess skills that are necessary to start and manage a business – mostly because the higher education system would be focused on providing relevant teachings on challenges and solutions from real world. Young entrepreneurs would realize that they could utilize digital technologies and make them their ally in conquering the arising business opportunities.

## 6.3 Positive externalities as a result of fostering digital entrepreneurship

Although economic benefits are a center piece of the puzzle where each actor of an entrepreneurship ecosystem quantifies their contribution to the economy, there are numerous positive effects which are also significant for the development of traditional society into a digital one. As a consequence of implementation of digital platforms with the goal of democratizing the labor market, for example, more people will be able to participate directly in finding their own new job, even remotely or on-demand. According to the McKinsey Global Institute (2018), by 2025, marketplaces for independent employment and talent platforms might help up to 540 million people. As many as 230 million people may find new jobs faster, lowering the period of time they are unemployed. At the same time, a little bit more than 200 million people who are either completely inactive or work part-time could also benefit from freelance platforms. Furthermore, up to 60 million people may be able to find work that better matches their abilities or interests, while another 50 million may be able to

make a transition from informal to formal employment. This has a direct positive impact on job satisfaction rate across multiple sectors since people tend to feel more prepared and better educated for their job. They also feel that flexibility to work remotely (at some jobs) gives them greater freedom and puts work/life balance into place since majority of them have notably more time to dedicate to their families and other relevant life obligations.

From the perspective of entrepreneurs, given that their most common obstacles like regulatory burden and access to finance have been addressed to some extent by the state, they will save significant amount of time that used to be spent on legislative and other administrative procedures so they could put more focus into their collaboration with universities utilizing their talent pool, incubator practices and could even result into more involvement with business clusters within a city or regionally.
Furthermore, an effect of increased inclusivity could be achieved within societies through fostering digital entrepreneurial culture with the purpose of tackling 2 mostly pronounced societal (even discriminatory) problems which affect the sphere of entrepreneurship:

1) A stereotype that a typical digital entrepreneur is usually a young male.
2) Increased barriers for migrant entrepreneurs.

Such changes within an entrepreneurial ecosystem would in turn result in more digital small enterprises reaching the levels of middle-sized companies and potentially even larger businesses through more encouraged young people becoming successful entrepreneurs or even the failed ones gaining desirable knowledge and experience, and getting employed by their friend's or acquaintance's SME for example.
It is indeed a necessary consequence of a society which has a big number of entrepreneurs to have a greater supply of quality managers in the market than in areas with smaller number of entrepreneurs. The society as a whole would benefit greatly from state's educational push towards promoting STEM[3] subjects since more of high-skilled jobs will be in demand for the future generations, while the current supply is far off from the actual needs of employers.

One very subtle, yet very significant positive effect can happen in an ecosystem which is based upon the premise of a „failed entrepreneur“. Another term which relates to this phenomenon is the so called entrepreneurial recycling which simply means that an idea of a digital startup could fail either because of the lack of funds or the inability to execute the

[3] STEM – abbreviation for the group of disciplines: science, technology, engineering and mathematics

entrepreneur's vision with available resources. In this instance another firm takes over the business idea due to better knowledge and expertize or because they had access to sufficient funding of the project and hence continues the development of potential entrepreneur's idea which proves the significancy of even „to-be entrepreneurs“ for the ecosystem as a whole.

# 7 Overview of Croatian digital development

## 7.1 Digital entrepreneurship as a culture

According to Van Roy & Nepelski (2016), high levels of entrepreneurial culture, simple access to appropriate financial resources, and superior human capital access characterize European countries with strong framework characteristics for enterprise establishment and growth; these conditions are instrumental for the expansion of enterprises.

The main premise of digital framework which is being installed into a traditional entrepreneurial culture lies in the prerequisition of strong digital infrastructure which is the foundation for digitalization and digital transformation. More specifically, in order to enable digital entrepreneurship as a culture that could be fostered for the future generations, it all starts with the presence and competitiveness within the ICT sector in a particular country. If the competition within an ICT industry is fierce, there will be more inclination towards breaking norms in terms of achieving extraordinary business results. Successful results stem from strong infrastructure and what the Republic of Croatia is currently undergoing is exactly the type of tedhnological infrastructural change that was needed. By acquisition of Tele 2 Hrvatska d.o.o. for 220 million euros from the Swedish Tele 2 group, UnitedGroup has gained the 3rd (in terms of market share) telecommunications players in the industry. The UG's portfolio of ICT players is absolutely incredible from the perspective of a regional challenger. They are already an owner of Telemach Croatia, Slovenia, Bosnia and Hercegovina, and Montenegro, SBB Serbia, Vivacom Bulgaria, Nova Greece, totaltv and nettvplus in the telecommunications sector. In their media sector are companies such as United Media, Nova Greece and Nova Bulgaria. The also possess e-commerce platforms shoppster Slovenia and Serbia, and also have their very own technology development center united.cloud, branded as an innovation center. Telemach Croatia's innitiative of 10 Gigabit ethernet implementation has caused a positive disruption in the sector. This means HT and A1 need to make their own moves as a leader and a runner-up. However, it is not going to be made possible through simple marketing capaigns or slight price reduction. They need to act fast, and they need to act in the area of offering something more desireable from the consumers' point of view. The

issue is that local citizens are not yet aware of the potential which imporvement of digital infrstructure brings so the telecommunication companies will probably have to create the need for some new type of device or a service because that is how innovation is promoted. The most appropriate one besides the expansion of fixed broadband capacities seems to already be in place with 5G – expansion of mobile broadband.

This competition among large corporations within the ICT industry will result in more entrepreneurial engagement towards new and emerging digital technologies because all of a sudden (throughout the following several years) Croatia will have respectable infrastructural conditions to share awareness about digital technologies among their citizens more seriously so the conscience towards the digital will see a sudden increase.

If country's policymakers dedicate their programs and put their focus onto making these five conditions successful in the mid-run and long-run timeframe, there should almost be a guaranteed mindset switch towards the digital entrepreneurial culture:

1. Introduction of entrepreneurial education programs into STEM subjects
2. Development of relevant digital skills from elementary education and onwards
3. Improve collaboration between universities and enterprises
4. Improve the ecosystem for startups and foster innovation
5. Facilitate access to funding of entrepreneurial ventures

If these guideline are fulfilled, an increased influx of foreign direct investments would be the necessary consequence, given that more institutional investors would be introduced to the levels of digital SMEs which are usually not their favorite financing decisions. Authorities could pay attention to supporting initial public offerings (IPOs) of SMEs with investments gathered through a new special fund. By enabling SMEs to issue their crypto assets and digital tokens in the form of bonds, for example, investors would be attracted much more due to the ability to trade assets immediately.

With the digital literacy already in place, and deliberately raising awareness among society about not only digital technologies, but entrepreneurship and innovations as well, the digital ecosystem would have foundations firmly set for even greater e-creation of value.
Another potential solution in which digital awareness would be reinforced continuously would be an introduction of a single digital gateway to supply users in their own nations and across borders with information, help, procedures, and problem-solving services.

One additional concept worth mentioning in promoting the culture of digital entrepreneurship is the initiative of Jan de Jong, the Netherlands-born entrepreneur living in Croatia for the past 15 years. His initiative is concerned with the notion digital nomadism which is basically a concept where people of different nationalities travel worldwide and thanks to their ability to be able to work remotely choose to spend time in a foreign country for a few weeks or even months. Republic of Croatia has issued a new law which enables digital nomads to stay in Croatia up to 1 year. The idea is incredible since the money that digital nomads earn would be spent locally – on accomodation, food, utilities and even some other goods or services.

The brilliance of Croatia is that it has 2 of the most important factors for promoting digital entrepreneurship culture already in place: improvement of digital infrastructure for a better functioning digital ecosystem, and digital nomadism paradigm. Now what is also needed is for policymakers to dedicate their resources to enabling entrepreneurship and digital awareness through implementation of several crucial policies.

## 7.2 Current metrics of Croatian digital adoption

Since 2014, the European Commission has used the Digital Economy and Society Index (DESI) reports to track Member States' digital progress. Both nation profiles and topic chapters are included in the DESI reports. Additionally, each Member State's report includes a comprehensive telecoms chapter. Quantitative evidence from the DESI indicators across the five components of the index is combined with country-specific policy findings and best practices in the DESI country reports.

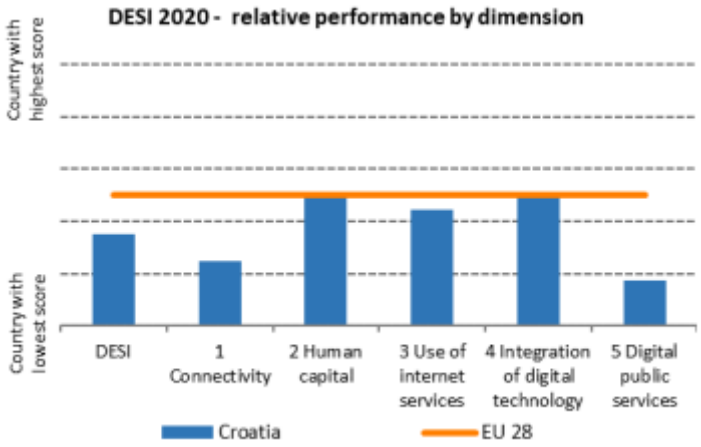
| | Croatia | | EU |
|---|---|---|---|
| | rank | score | score |
| **DESI 2020** | **20** | **47.6** | **52.6** |
| DESI 2019 | 20 | 44.3 | 49.4 |
| DESI 2018 | 21 | 40.8 | 46.5 |

*Source: DESI 2020, European Commission*

**Figure 18:** Croatia's ranking in DESI (2020)

In the Digital Economy and Society Index (DESI) 2020, Croatia is ranked 20th out of 28 EU Member States (Figure 18). Croatia's score climbed somewhat due to greater performance in some of the DESI dimensions evaluated, based on data collected prior to the COVID-19 pandemic, but is still farily below the EU average. Croatia has the greatest score in digital technology integration by firms and SMEs (Figure 19), as well as the ninth highest rating in

selling online cross-border to other EU Member States. Croatian businesses are gradually incorporating digital technologies into their operations. Republic of Croatia falls somewhat behind the EU average of 26%, with 23% of businesses having a high or very high degree of digital intensity.




*Source: DESI 2020, European Commission*

**Figure 19:** Relative performance of Croatia in DESI (2020)

Croatia maintained its steady improvement in terms of connectivity, with no changes to last year's ranking, shown in Figure 20. It increased the coverage of the Fixed Very High Capacity Network from 23% in 2018 to 43% in 2019. Still, the broadband price index score is influenced by the comparatively high prices of fixed and converged baskets.

| 1 Connectivity | Croatia | | EU |
|---|---|---|---|
| | rank | score | score |
| **DESI 2020** | **25** | **41.2** | **50.1** |
| DESI 2019 | 25 | 37.2 | 44.7 |
| DESI 2018 | 26 | 32.1 | 39.9 |

*Source: DESI 2020, European Commission*

**Figure 20:** Croatia's connectivity progress in DESI (2020)

Republic of Croatia came in 13th place in terms of human capital (Figure 21) which is just slightly below the EU average, with a notable achievement of having the sixth-highest share of ICT graduates in the European Union. Basic digital abilities are still lacking in comparison

to the EU norm, with only 53% of adults aged 16 to 74 having at least basic digital skills. Croatia, on the other hand, outperforms the EU average in terms of advanced digital abilities.

| 2 Human capital | Croatia | | EU |
|---|---|---|---|
| | rank | score | score |
| **DESI 2020** | **13** | **49.2** | **49.3** |
| DESI 2019 | 14 | 46.8 | 47.9 |
| DESI 2018 | 13 | 45.8 | 47.6 |

*Source: DESI 2020, European Commission*

**Figure 21:** Croatia's human capital progress in DESI (2020)

18% of Croatians, on the other hand, had never used the internet. In the past year, Croatia achieved some progress in terms of internet usage, but still lost 1 rank compared to the year before and now sits at the 15th position (Figure 22). Croatian enterprises use social media, big data, and e-commerce, and Croats are among the most avid readers of online news in the EU. Despite rising employer demand, Croatia's supply of ICT specialists is well below EU average. Croatia performed better in 2019 than it did in 2018 in terms of pre-filled forms and online service fulfillment.

| 3 Use of internet services | Croatia | | EU |
|---|---|---|---|
| | rank | score | score |
| **DESI 2020** | **15** | **55.5** | **58.0** |
| DESI 2019 | 14 | 53.4 | 55.0 |
| DESI 2018 | 17 | 49.2 | 51.8 |

*Source: DESI 2020, European Commission*

**Figure 22:** Croatia's use of internet ranking in DESI (2020)

Croatia is ranked 12th among EU countries in terms of digital technology integration in businesses, shown in Figure 23. Croatian businesses are increasingly taking advantage of the potential presented by internet commerce, with 21% of SMEs selling online, 10% selling across borders to other EU nations, and 22% employing cloud solutions. 22% of businesses regularly utilize social media, while 1 in every 4 businesses (26%) shares information online. Through EU-coordinated programs, Croatia is committed to developing and investing in digital technology.

| 4 Integration of digital technology | Croatia | | EU |
|---|---|---|---|
| | rank | score | score |
| **DESI 2020** | **12** | **41.5** | **41.4** |
| DESI 2019 | 17 | 38.5 | 39.8 |
| DESI 2018 | 16 | 36.7 | 37.8 |

*Source: DESI 2020, European Commission*

**Figure 23:** Croatia's integration of digital technology progress in DESI (2020)

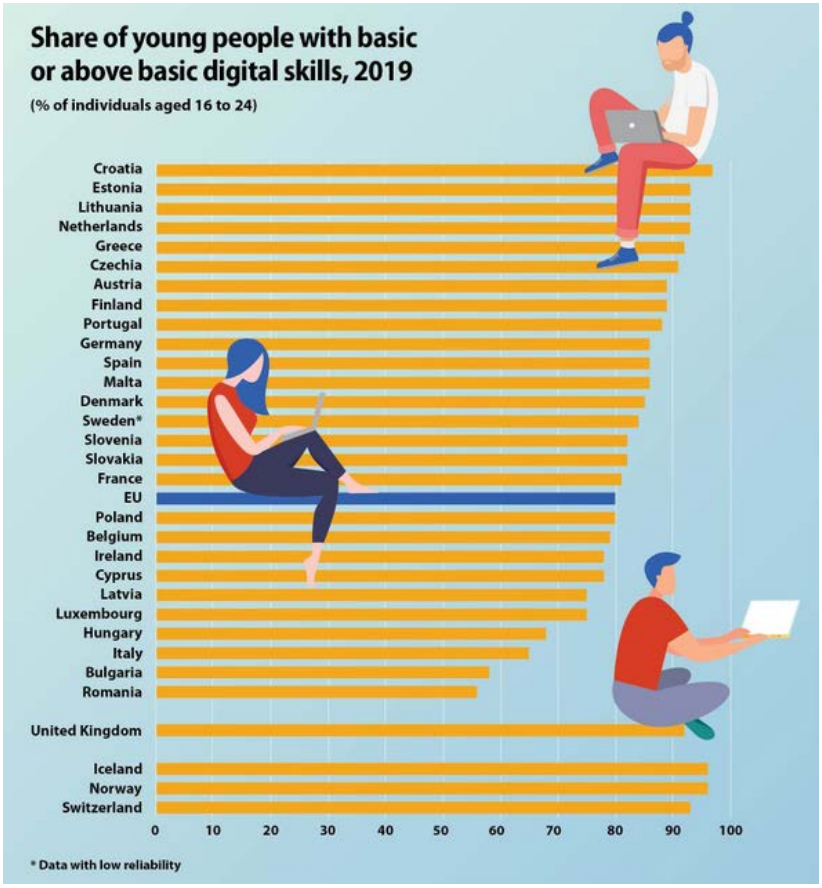
Croatia is ranked 25th among EU countries in terms of digital public services which is shown in Figure 25 below. It features a high level of internet engagement between government officials and citizens. E-government services are used by 65 percent of online users. E-government services for enterprises are becoming more widely available. In terms of open data, Croatia outperforms the EU average. Croatia's efforts to modernize and enhance e-government services have continued. The number of services offered by the e- Citizen platform expanded in 2019.

| 5 Digital public services | Croatia | | EU |
|---|---|---|---|
| | rank | score | score |
| **DESI 2020** | **25** | **55.8** | **72.0** |
| DESI 2019 | 24 | 50.8 | 67.0 |
| DESI 2018 | 25 | 43.7 | 61.8 |

*Source: DESI 2020, European Commission*

**Figure 24:** Croatia's digital public services ranking in DESI (2020)

Interestingly enough, Croatia recorded a number 1 ranking in young people (16-24) with basic or above basic digital skills across the entire European Union according to Eurostat (2019). The illustration of the survey results is shown below in Figure 25.




*Source: Eurostat (2019)*

**Figure 25:** Share of young people (16-24) with basic or above basic digital skills (2019, %)

## 7.3 Long-term approach to supporting digital entrepreneurship

Governments, businesses, and individuals may all benefit from more efficient and cost-effective e-government system. A successful pandemic exit plan may benefit from implementation of robust digital public services, such as e-health (e.g., electronic prescriptions) and the utilization of new technology to improve public services (e.g. use of AI and big data). Croatia has the 3rd lowest score in the EU on the rankings of e-government system development and utilization so there is a lot of room for improvement.

A possibility exists that a government could incentivize domestic enterprises to adopt automation technology by giving tax breaks for buying software and machines.

There are 2 things already in place which are considered as stepping stones towards further facilitation of digital entrepreneurship. The first one is the fact that since December 2, 2019, Croatian entrepreneurs can register their enterprises online through the START e-service

platform, which merges existing systems and processes into a single interface. This e-service allows you to register a corporation or a craft in the court register or the craft register. The other facilitative measure is that entrepreneurs can also benefit from a number of simplifications with regards to VAT procedures. These simplifications include:

1. Submitting an entry in the register of business entities, taxpayers' register, or VAT register;
2. Receiving a VAT ID number;
3. Submitting a bank account request;
4. Registering with the Croatian Pension Insurance Institute;
5. Electronically paying fees.

Governments can stimulate adoption of emerging tecnologies by investing in enabling digital infrastructure and platforms. Internet of Things and 5G are most likely the first upcoming technologies on the list that will be introduced to us very shortly.

Grants to universities, the establishment of government laboratories, and cooperative research ventures with the commercial sector are all key ways to fund science programs. The idea behind it is to introduce students of STEM subjects to the frameworks of digital entrepreneurship, while at the same time fostering digital innovation even among economics students. The emphasis shall be put onto sustainable and environmentally-friendly solutions. On the note of education, likewise, because technical knowledge tends to become obsolete fast, a greater emphasis on lifelong learning should be placed, possibly through the use of short-cycle education.

It is highly advisable to foster cooperation between private and public sector because great digital innovations can turn out as a result. This was the case, for example, with the Croatian Financial Agency’s so-called „COVID score“ platform. It's a digital scoring system that uses numerous government databases to estimate how sensitive a corporation is to COVID-19's effects. This universal score also aids in determining whether or not a company requires more funding.

Blockchain technology could be utilized by entrepreneurs to lower transaction costs, enhance supply chain management and also lower administrative efforts for record keeping. Through the development of national blockchain strategies, whole-of-government methods are also emerging. Examples can be found in countries like El Salvador and Ukraine.

Creation of innovation zones in important urban areas to promote collaboration between businesses and academia, including the development of shared objectives and working groups with universities, startups, SMEs, and other stakeholders.

# 8 Survey on digital literacy in the Republic of Croatia

## 8.1 Methodology overview

A survey at its most basic level, according to QuestionPro, is a means of gathering information from a sample of people with the goal of generalizing the results to a broader population. Nearly everyone involved in the information economy, from enterprises and the media to government and academia, relies on surveys for data and insights.

The primary goal of this research was to determine the level of digital literacy of Croatian people. A secondary objective of the research was to draw conclusions about the current readiness of Croatian citizens, based on the survey findings, for the next step of digital transformation – adoption of highly disruptive technologies.
Research sample is set to provide enough information to exhibit the level of digital literacy across different age groups and also to hint on the relative knowledge of Croatian people about new digital technologies.

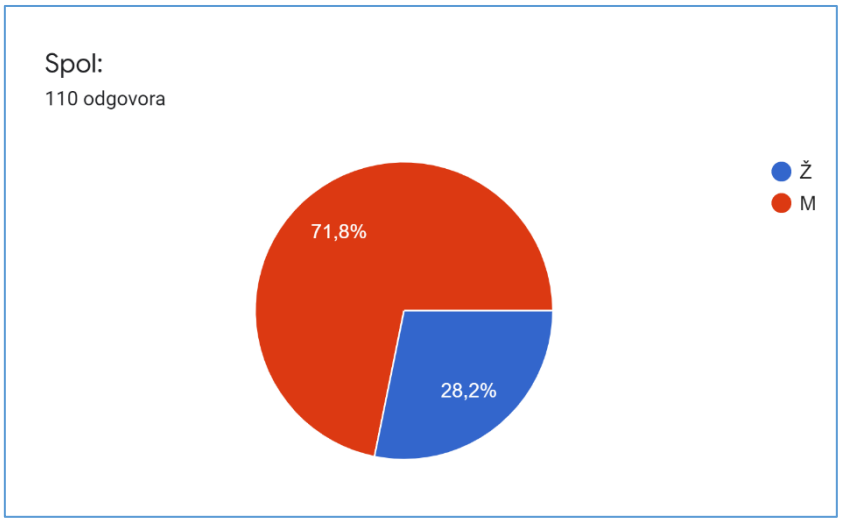
The survey was conducted in a questionnaire-type manner, where a sample of 110 participants answered 13 different questions on the topic of digital literacy and familiarity with emerging technologies. Results were thoroughly analyzed and interpreted in order to draw conclusions regarding primary and secondary objectives of the research. The survey itself was conducted over social media platforms in the period from 15th of September 2021 until 17th of September 2021 and can be found at:
https://docs.google.com/forms/d/e/1FAIpQLSeHucIqXt-A8w9Z3GOx6jbFDFeM79Y0KWzNBCAwjWWZ88gzhw/viewform?vc=0&c=0&w=1&flr=0

Questions within the survey were a combination of multiple choice and multiple choice grid type, divided into 3 main sections. The first section was concerned with a person's gender, age, employment status and education status. The second section of the survey was about determining the actuall digital skill level of participants, while the final section was intended to clarify the actual knowledge and familiarity of participants with new digital technologies.

The survey data is entirely of primary nature, meaning it was gathered personally by a researcher via a questionnaire.

## 8.2 Statistical analysis

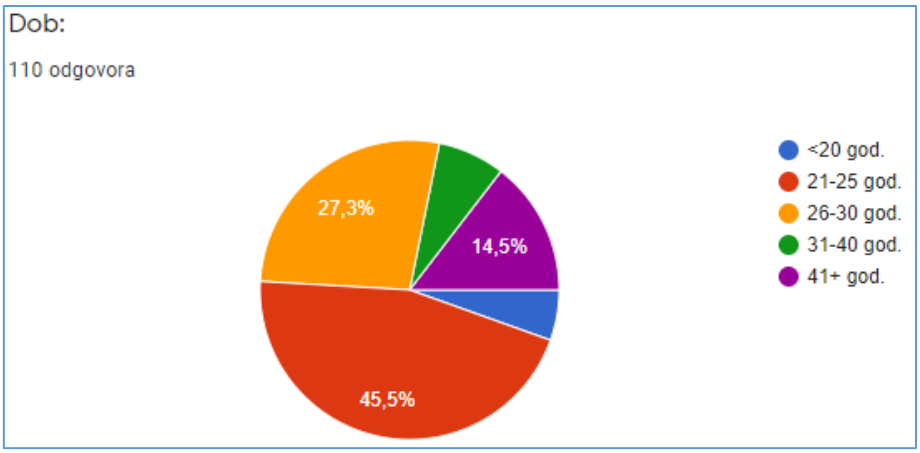
As previously stated, the survey was conducted on a sample of 110 participants, with 71.8% (79) being male and 28.3% (31) being female as shown in Figure 26:




*Source: Author's work*

**Figure 26:** Participants' gender

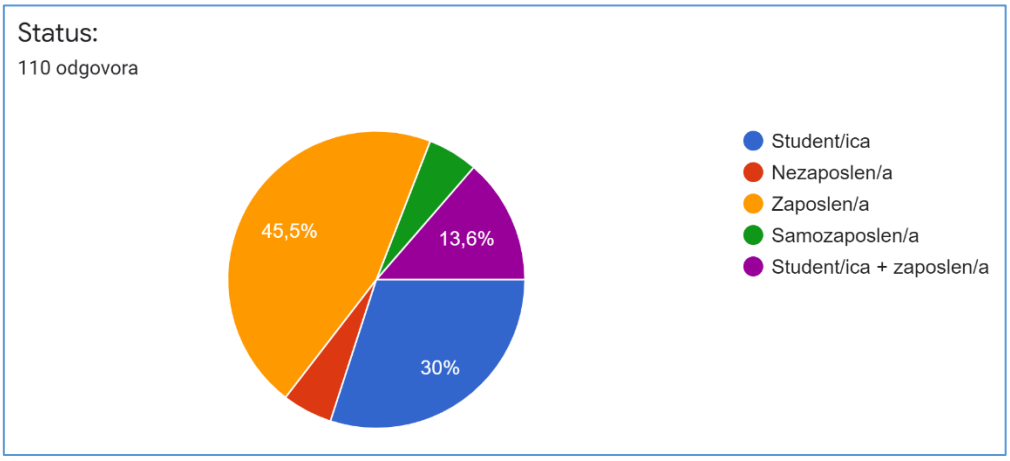
Figure 27 shows that participants of the survey were categorized into 5 age groups: 20 years old or less, 21-25, 26-30, 31-40, and 41 years of age or older. It is visible that 45.5% of participants (50) belong to the age group of 21-25, while the second most represented group with 27.3% (30) was the one with the age range of 26-30. Only 6 participants (5.5%) were 20 years old or younger.




*Source: Author's work*

**Figure 27:** Participants' age

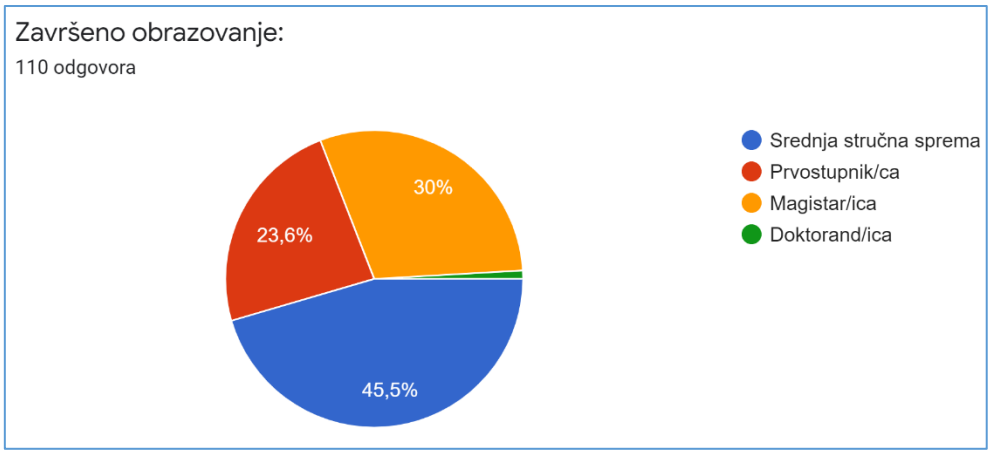
Third question in the survey was about the employment status of participants, with the possible answers: unemployed student, unemployed, employed, self-employed and an employed student. Figure 28 illustrates that 45.5% (50) of participants are employed people, 30% (33) are unemployed students, while there was a split of 5.5% (6) of people being unemployed and also self-employed.




*Source: Author's work*

**Figure 28:** Participants' employment status

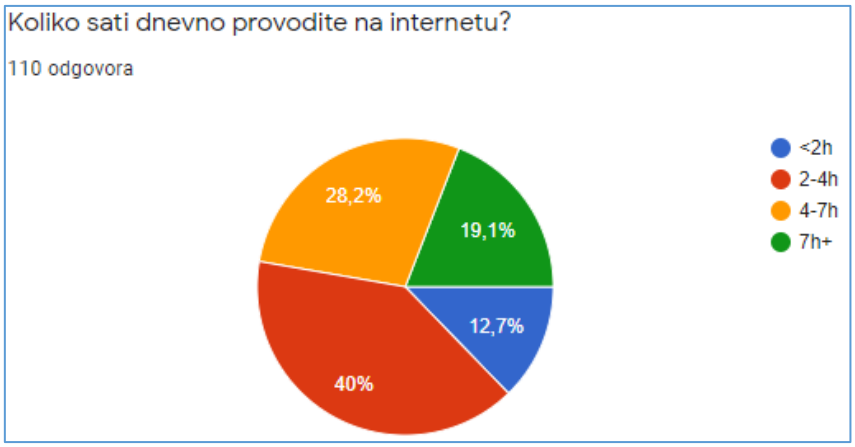
The final question in the first section was about the level of education of participants in the survey. The results shown in Figure 29 suggest that 45.5% (50) of participants have high school education, 30% (33) of them have a master's degree, 23.6% (26) of participants have a bachelor's degree and only 1 person (0.9%) has achieved the level of PhD education.




*Source: Author's work*

**Figure 29:** Participants' education level

In the next section of the survey participants were asked questions about their internet usage patterns, digital tools used and were asked to value their own skill level in particular tools. So the fifth question of the survey was about how many hours do the participants spend on internet. Figure 30 reveals that 40% (44) of participants selected the 2-4h range, 28.2% (31) of them spends 4 to 7 hours each day on the internet, while 12.7% (14) of people tend to spend less than 2 hours on the internet daily. 19.1% (21) of all participants spend up to more than 7 hours each day on the internet.




*Source: Author's work*

**Figure 30:** Participants' daily internet usage (hours)

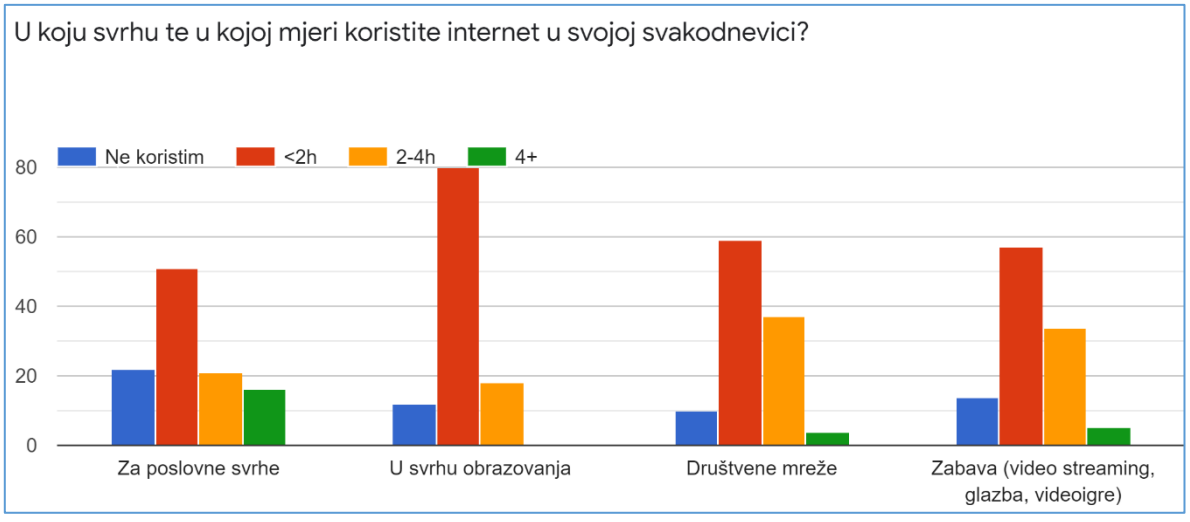
Question number 7 had an intention to find out the actual internet usage pattern of the participants. Hence, Figure 31 reveals that 51 participants spend less than 2 hours on the internet each day for work-related purposes, while 22 and 21 of them, respectively, either do

not use internet for work-related purposes at all, or use it for a period between 2 to 4 hours daily. Only 16 people have stated that their work-related internet usage lasts more than 4 hours per day on average.

Further findings reveal that 80 participants use internet for educational purposes for less than 2 hours each day, 12 of them do not use it at all and 18 people spend between 2 to 4 hours each day to educate themselves on the internet. Interestingly enough, not a single participant marked that their daily internet usage for the educational purposes lasts for 4 hours or more.

Furthermore, 59 participants claim that they use internet for social media and spend less than 2 hours on it each day, whereas 37 of them spends 2 to 4 hours on it daily, 4 of them invest more than 4 hours into social media activities each day, while 10 people claim they do not use social media at all.

Final part of this question was related to internet usage for entertainment purposes (video streaming, music player, video games). 57 respondents state that their daily usage does not exceed 2 hours, whereas 34 of them engage with it for a periof of 2 to 4 hours, and 5 participants tend to spend more than 4 hours on entertainment content each day. 14 respondents claim that they do not use internet at all for any type of entertainment.




*Source: Author's work*

**Figure 31:** Participants' daily internet usage pattern

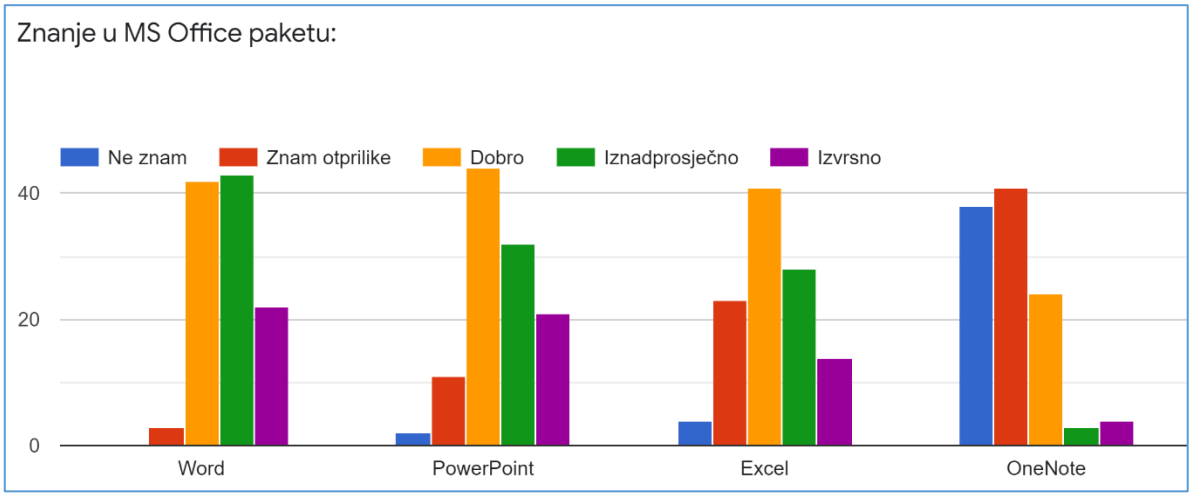
Goal of the next question was to determine the skill level of each individual respondent within a Microsoft Office package (Word, PowerPoint, Excel, OneNote). The results were pretty much expected to turn out like this. Namely, in Figure 32 we can observe that 85 respondents

have good or above average skills in MS Word, while 22 people claim their MS Office knowledge is exceptional.

76 people stated that they know how to use MS PowerPoint either good or above average. 21 respondent claimed their knowledge is exceptional, while 2 people have admitted that they do not know how to use MS PowerPoint as a tool.

In the MS Excel section we observe 41 respondents with good knowledge of it, 28 with the above average score and 23 with somewhat skillful opinion. 14 people claim their knowledge of MS Excel is exceptional, while 4 of the respondents stated they do not know how to use it.

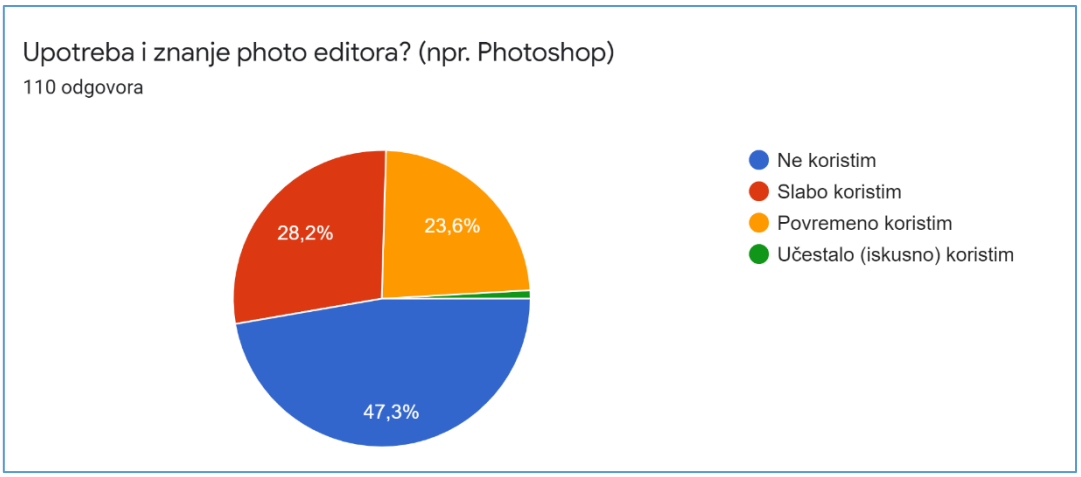
The final tool which was being asked about was MS OneNote. Only 4 people claimed their knowledge of the application was exceptional, and only 3 other respondents stated they have above average skill level of usage. 24 respondents opted for the option of having good knowledge, while 41 of them said they somewhat know how to use the tool. Up to 38 participants fairly admitted they do not know how to use this application.




*Source: Author's work*

**Figure 32:** Participants' skill level in MS Office

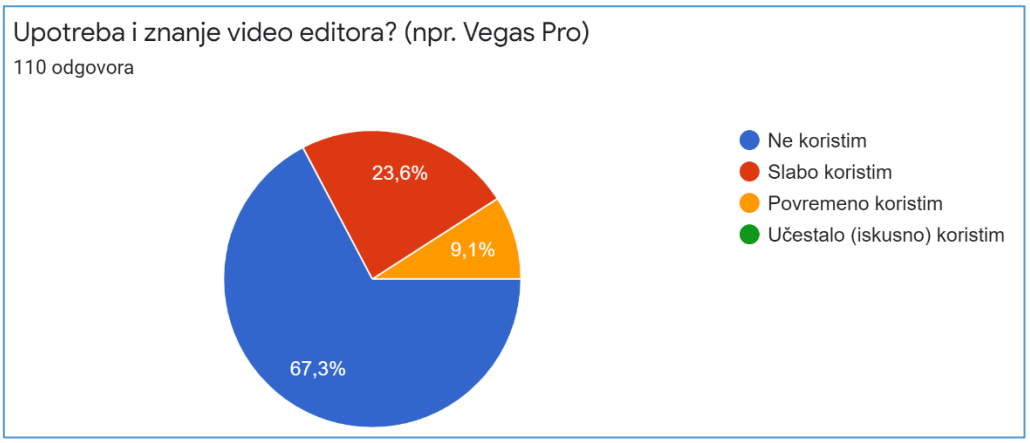
Question presented in Figure 33 was about the usage of photo-editing tools. 47.3% (52) of respondents stated they do not use this type of a tool at all. 28.2% (31) of people said they use the tool very rarely, and 23.6% (26) of people reported occasional tool usage. Only 1 (0.9%) person stated they use photo-editing tools all the time, almost profesionally.




*Source: Author's work*

**Figure 33:** Participants' usage of photo-editing tools

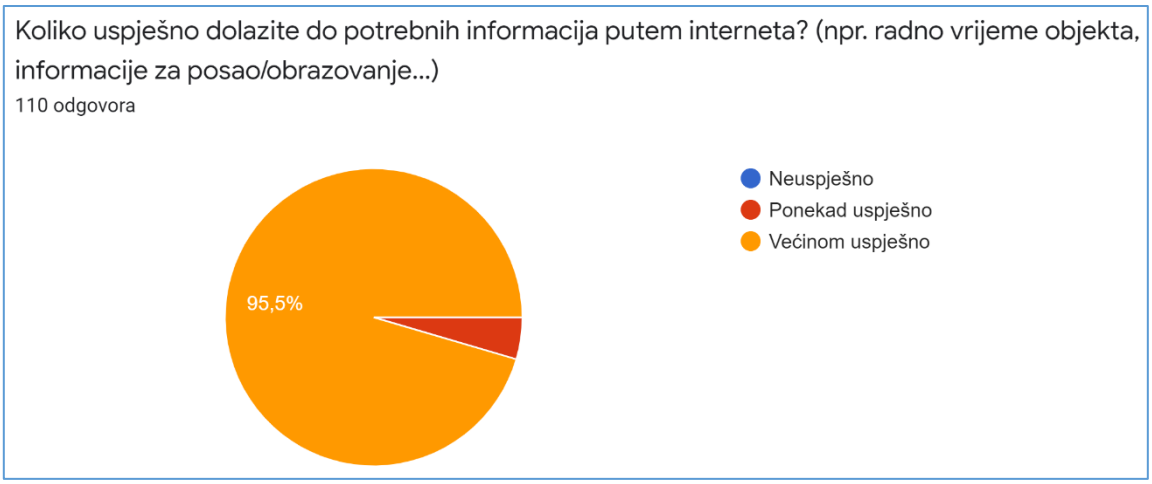
Figure 34 shows the responses on the question of participants' usage of video-editing tools. Up to 67.3% (74) of respondents claimed they don't use tools of that type at all, while 23.6% (26) reported very rare usage of the tool. 9.1% (10) of participants said they use this type of tools sometimes, while none recorded frequent usage.




*Source: Author's work*

**Figure 34:** Participants' usage of video-editing tools

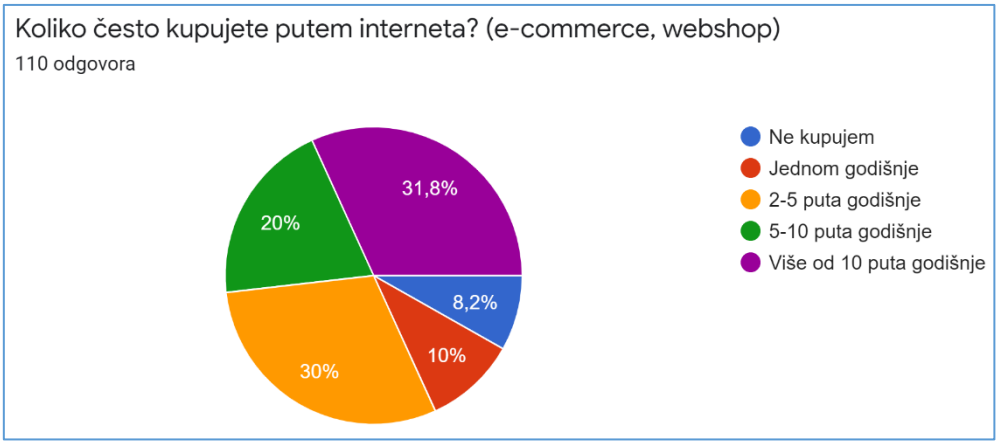
In Figure 35 we are able to notice that 95.5% (105) of survey respondents successfully browse and navigate through web browser interface to acquire necessary information, while only 4.5% (5) of them admitted they tend to experience some minor difficulties from time to time.




*Source: Author's work*

**Figure 35:** Participants' skill of browsing and navigating web

Question number 11 referred to survey participants' e-commerce usage habits, more precisely they were asked about how frequently they shop online during a year. The results are pretty scattered (Figure 36) – 31.8% (35) of people shop online more than 10 times throughout the year. 30% (33) of them go online shopping only between 2 and 5 times per year, while 20% (22) of respondents do online shopping between 5 and 10 times every year. 10% (11) of survey participants stated they shop via webshop only once a year, and 8.2% (9) of respondents clearly stated that they do not engage in online shopping at all.

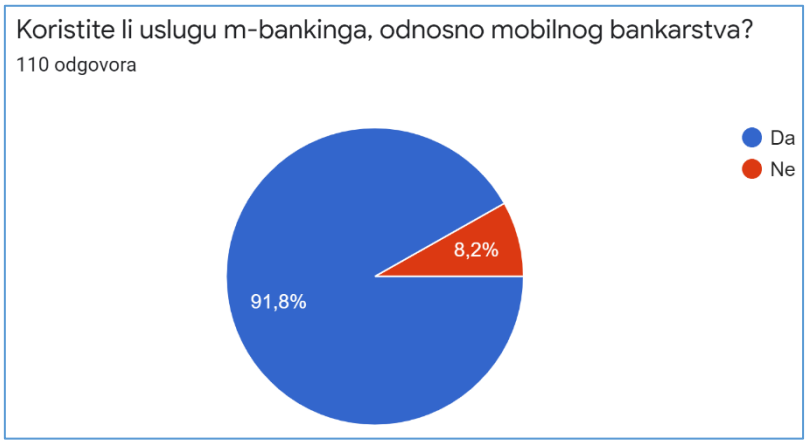



*Source: Author's work*

**Figure 36:** Participants' e-commerce usage habits

The final question of the second section is concerned with the usage of m-banking technology among survey participants. Hence, in Figure 37 we observe that 91.8% (101) of respondents

in fact do use the technology, while the remainder of 9 people stated they do not use the service.




*Source: Author's work*

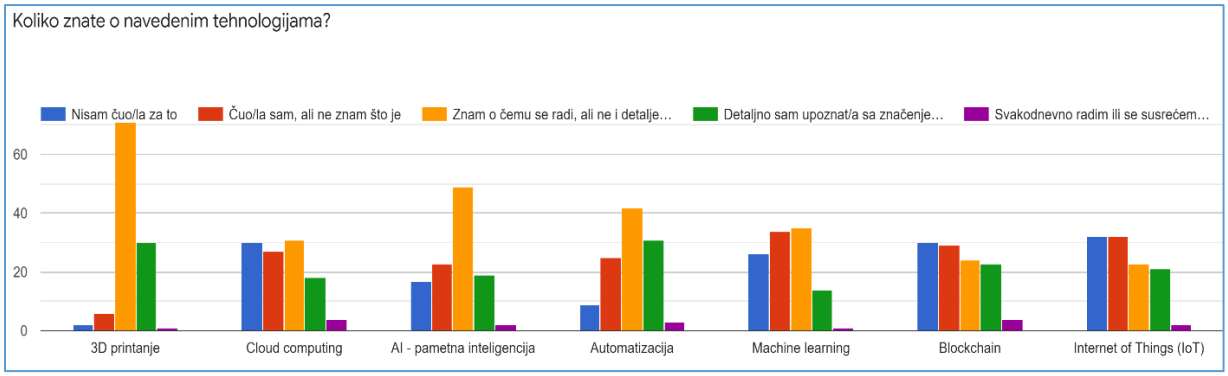
**Figure 37:** Participants' usage of m-banking technology

Finally, in the last question of the survey, which was part of the third section, participants were said to choose the level of familiarity across 6 listed advanced digital technologies. Hence, we can observe in Figure 38 that the results are as follows:

- 3D printing: 71 people knew about the technology, but didn't know much about the applications of the technology. 30 respondents was very familiar with the technology, 6 of them have only heard about it and 2 people had never heard about the technology. Only 1 person stated that they use 3D printing technology in their everyday life.
- Cloud computing: 31 people stated that they know about the technology, but not so much about its application. 30 people admitted they have never heard of it, while 27 have only just heard about it. 18 participants claimed they are very familiar with the technology, while other 4 had stated that they use it in their everyday life.
- AI – artificial intelligence: 49 participants stated they knew about the technology, but didn't know much about the applications of it. 23 people have said they have only heard about it, while 17 confessed they had never heard of it. 19 people claimed they are familiar with the AI, and only 2 seem to work with it every day.
- Automation: 42 respondents claim they know about the technology, but not so much about its application. 31 people stated they are very familiar with it, while 3 reported

everyday encounters with it. 25 people have only heard about automation, but 9 had never even heard about it.

- Machine learning: 35 respondents know about the technology, but not so much about its application. 14 people stated they are very familiar with it and only 1 person works with it every day. 34 people heard about the technology, and 26 people didn't.
- Blockchain: 24 respondents know about the technology, but not so much about its application. 23 participants stated they are very familiar with it and 4 people use it every day. 30 respondents had never heard about this technology, while 29 participants only did hear about it.
- IoT – Internet of Things: 23 participants stated they knew about the technology, but didn't know much about the applications of it. 21 people stated they are very familiar with it and only 2 people use it every day. Equal number of people - 32 had never heard about IoT, and 32 others had only heard about the existence of the technology.




*Source: Author's work*

**Figure 38:** Participants' familiarity with advanced technologies

## 8.3 Discussion of results and practical implications

Simply put, results of the survey appear to be according to the author's personal expectations. Basic digital literacy across all age groups seems to be fairly good or above average, and the usage of basic digital tools seems to be pretty evenly distributed. Respondents seem to have better knowledge about mainstream applications, which they probably use more frequently in their everyday activites (education and work-related). One thing in particular stands out though, it seems that none of the 100 participants frequently spends more than 4 hours per day

studying either for formal education or for themselves, informally. This could prove to be worrisome in relation to fostering digital entrepreneurship culture, driving innovation and encouraging life-long learning. Two limitations are obvious from the beginning, though. The fact that only 110 people participated in the survey in the first place, and secondly, if nobody out of 110 stated that they study for more than 4 hours online it does not mean they do not study far longer from conventional books. Also, it does not necessarily mean that people in general do not educate tehmselves enough because some respondents may study each day for almost 4 hours, but not quite exactly so.

Another obvious finding is actually seen in the results of the final question. People tend to at least know some bits about technologies which have been around us for years, yet not everybody had the chance to experience them first-hand. On the flipside, technologies whose mentioning has only recently began gaining momentum in the mainstream media such as (machine learning, blockchain and IoT) are definitely not being talked about enough because people seem to be less informed about them, in general. Upon closer inspection of the results, there are not really that much of differences across younger or middle-aged adults in terms of familiarity with these advanced technologies. This just confirms that it is all about exposure to different concepts and ideas, that is, more focus should be put onto consciously making the society more digitally aware and knowledgeable.

Low levels of familiarity with new emerging technologies indicates that Croatian population is currently not ready for an „overnight“ switch to all-digital environment if it would to happen. There is a lot more to learn about in the field of technology among Croatian citizens before a bit more significant digital adoption starts to take place across SMEs and startups.

## 8.4 Critical reflection and discussion

The results obtained from the survey should only be observed in a suggestive manner.

The survey sample of 110 people cannot be considered as representative.

Views from the subheading 8.3 are my own and they do not reflect completely objective or unbiased critical thinking.

# 9 Conclusion and directions for future growth

## 9.1 Final verdict on the position of Croatia as a Digital Challenger

Interestingly, Croatia's position as a Digital Challenger in terms of digitalization across most sectors is surprisingly well balanced. Namely, Croatia records average levels of digitalization across sectors such as utilities, professional, scientific and technical services, and trade.

Slightly higher average values are being recorded in areas like transportation and warehousing, and finance and insurance. Two domains in which our country is located shamefully low, far below average are public administration and manufacturing.

As stated previously in this paper, digitalization of public services is the key prerequisite for successful digital entrepreneurship results. Government should enhance its public e-services in order to make whole ecosystem more efficient.

Another concern for Croatian population is that the rate of basic digital skills is comparable to other digitally advanced countries, but the level of advanced digital skills is alarmingly low across the country. A useful method for tackling this issue could be by developing a new C-level figure which would be in charge of the digitalization across the enterprise – Chief Digital Officer. Indicators are also showing that Croatian people are significantly slower in adoption of internet services in comparison to other European countries.

Digital entrepreneurs should standardize the habit of reskilling or upskilling their employees, and should also embrace a pro-digital organizational culture. Efforts of some notable Croatian digital entrepreneurs were recognized on the global scale. Enterprises such as Nanobit, Infobip and Rimac Automobili have all been praised for their tremendous success in ICT and automotive industry.

## 9.2 Opportunities for further development of digital entrepreneurship in Croatia

Croatia's incredible combination of natural resources and environment, industrial tradition and favorable geostrategic location puts the country into a very convenient position for digital adoption and development. The primary objective should be to digitalize Croatia thoroughly which would contribute to the growth in productivity, competitiveness, employment and GDP contribution. Participation of the republic of Croatia in the world digital economy and catching up with the latest technological trends requires immense focus towards strategic development of digital infrastructure and digital transformation. Technological advancement which is a byproduct of smart investments into the creation of digital ecosystems is based upon:

- New regulatory framework
- Emphasizing of life-long learning due to digital adoption
- Sustainable development

- Social inclusivity of all prosperous entrepreneurs
- Systematic development of intellectual property rights
- Encouraging experimentation and innovation

On the other hand, Croatia has got some unique potential due to their national characteristics which may prove to be very favorable for further development of digital entrepreneurship. Some of the concrete guidelines for prosperity in the view of digital entrepreneurship are:

- Forming an organization which would complement the development of digital nomad culture by offering accomodation services;
- Increasing access to equity finance for innovative small and medium enterprises and startups that develop and adopt green technology sustainable solutions;
- Embedding digital entrepreneurship module in curricula, especially in STEM subjects;
- Supporting collaboration between enterprises and universities;
- Active participation in the development of smart cities.

Digital technologies offer enormous potential for growth. COVID-19 pandemic has shown us the importance of transitioning to all-digital enterprise solutions. It has become more evident than ever before how quickly analog data can prove useless so it shall be on every entrepreneur's and every manager's agenda to invest more time and financial resources in learning about contemporary and emerging digital technologies because they could greatly leverage its potential and turn it into substantial economic benefits while public mass adoption is still far away from occuring.

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