# Digitalization and Innovation from Start-Up to Scale-Up. Comparative Analysis: Romania and Poland

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### Abstract

The economy is the basis of society and the economy of the 21<sup>st</sup> century is about digitalization. In other words, digitalization is the phenomenon that has penetrated every corner of the economic landscape. Today digital transformation is no longer an optional measure available to entrepreneurs but has become a key resource in achieving professional success. Starting from a simple idea and turning it into a business plan, small entrepreneurs take their first steps in the entrepreneurial environment. On this journey from start-up to scale-up, digitalization and innovation become fundamental stakes. This study is exploratory research based on the analysis of macroeconomic indicators on digital performance, highlighting the progress in digital competitiveness, as well as on the digital framework and systemic conditions for entrepreneurship. To this end, consideration was given to the processing and systematization of secondary data taken from official reports prepared and published by the European Commission. Thus, we refer to the reports of the Digital Economy and Society Index (DESI) and the European Digital Entrepreneurship Systems Index (EIDES). The work is structured in 3 sections. The first section presents the general aspects of digitalization and innovation. The term digitalization is defined here and the importance of digitalization and innovation in the entrepreneurial environment is set out. The second section contains an overview of the DESI components and values in the horizon of time 2018-2020 followed by the profile presentation of two countries, Poland and Romania. In section 3 we propose an overview of the EIDES between 2018-2020 and the characterization of the progress made in this respect by the analyzed countries. Throughout this research, we set out to find answers to the following questions: 1. Which country has a higher level of digitalization in the economy and society? and 2. Which of the countries analyzed has a more digitalized entrepreneurial environment? The main conclusions resulting from the research are presented in the final section.

### Keywords

Digitalization; DESI; innovation; start-up; scale-up; entrepreneurial environment; digital competitiveness.

# Introduction

In the current context, innovation is what drives the business environment and society as a whole. Innovation, digitalization, and entrepreneurship together have created a powerful and dynamic engine that leads to economic growth worldwide. Each of these components has its imprint but together the effects are exponential. In fact, digitalization has become the new business environment based on information technologies, flexible models, networking, and online marketing (Satalkina & Steiner, 2020). Digitalization creates both opportunities for entrepreneurs and new challenges for entities that aim to strengthen their market position (Neamtu et al., 2019; Zhu & Lin, 2018). Also, it requires a new paradigm in developing the intellectual capital of universities (Bratianu, 2014; Bratianu & Pinzaru, 2015), and in designing the university education for students in management and business (Bratianu, Hadad, & Bejinaru, 2020; Bratianu & Vasilache, 2010).

For economic entities, digitalization is a challenge to meet the new online demands of its consumers. The aim of integrating digitalization into business is to meet the needs of consumers who are increasingly located in the online network. Businesses that have understood this tend to offer innovative products and services directly to the customer (Neamtu et al., 2020a; 2020b). Today, the business environment is characterized by continuous and large-scale technological development and growth (Prelipcean & Bejinaru, 2019; Ziółkowska, 2020). Thus, the desire to achieve international competitiveness is closely linked to the efficient management of innovation, technology, and the orientation towards change. At the moment, technology and innovation are two key components for development at any level, either business or sector (Levi et al., 2015). Nowadays the global business environment is marked by the dramatic transformations generated by the ICT sector and this transition is described in phrases like the online economy, digital economy, or innovation economy (Huđek et al., 2019). Since the end of the 20th century, when it started, the digital economy has taken over everyone, business and consumers alike (Moroz, 2017).

At this point appear various new opportunities that entrepreneurs could embrace and develop as their digital business. Digital entrepreneurship is based on ICT, using mostly digital devices, tools, and software. Also, the communication routine is totally different from the traditional one, being faster and more efficient both inside the organization and outside. Digital entrepreneurship incorporates many advantages offered by ICT developments, like costs reduction, efficiency increase, decision-making improvement, and competitiveness stimulation. In essence, information technology positively drives productivity, economic growth, job creation, and social development (Bejinaru, 2019; Herman, 2020; Neamtu & Bejinaru, 2020). Certainly, from now on, the digital economy represents the global framework for the advancement regarding innovation, employment, competitive advantage, and economic growth (Maiolini, 2016). The relationship of the business environment with the digital technologies is one of reciprocity because economic development leads to scientific and technological development, and vice versa, i.e. new creations of technology will produce more growth and more economic development. In this context of interdependencies, success will be achieved by those who know how to extract and use the resources useful for their development (Baesu & Bejinaru, 2020; Moroz, 2017). In terms of digital-based

entrepreneurship, defining it is still a dynamic process. The essential notions that we can focus on are the use of the digital, computer, and technical means in a large proportion to streamline business activities, predominantly in areas such as social media, crowdsourcing, e-trust, 3D printing, or big data (Steininger, 2019).

# Start-up and Scale-up as vectors of digitalization

As a recent approach, digitalization is the method by which any company can increase its chances for development and growth, moving from star-up to scale-up. However, the process becomes more complicated and even stressful at the level of large companies that fight for profit but also sustainability. In this sense, the fight is intense both for the rapid adaptation to the latest technologies and for the creation of their innovations to customize the sustainable development of their business (Hsieh & Wu, 2018; Tohanean et al., 2020).

To better understand the phenomena including the meanings of these concepts, we shall try to describe them. Thus, the start-up concept refers to an economic entity at an early stage, with large plans for further development. At the moment, the company is concerned with identifying a scalable business model. At this stage, the team is relatively small and directs its forces towards establishing the products and services sought on the market, identifying the customers to whom the products and services offered will be addressed. At this stage is being created a foundation for the future business (Skala, 2019).

The scale-up stage is the time when the company has consolidated its position in the entrepreneurial environment, validated its products offered on the market, as well as its business model. While in the start-up stage the company tries to determine its potential, to identify the presence of its products or services, in the scale-up stage the company has already identified its strengths. At this stage, the company is on its way directly to profitability by implementing already established programs and strategies. With the reach of this stage, the team is also enlarged, especially with specialists in distinct fields that the company needs (Picken, 2017).

Though there are certain differences between these 2 stages of a company's life cycle. At first, we are talking about the market-product relationship. Start-up companies are in a stage of experimentation with customer definition, customer purchase cost, product, and service characteristics. In the case of scale-up companies, we refer to a validated market position with a well-defined range of products and services that have already demonstrated that they are sustainable economic units. At the scale-up stage, companies have clear expectations of the results they will achieve from a financial investment. In the case of the contract, start-ups do not know how profitable the investment they make will be and whether it will be in general. At the moment, the resources they invest are directed towards identifying the profitable business model (Leipold & Petit-Boix, 2018).

Another issue that differs from one stage to another is the sources of funding. Usually, start-up companies have minimal financial resources, and raising funds is difficult. In the case of companies in the scale-up stage raising funds is easier, supported by a

company history, gained profit, clients portfolio, network, or a team of specialists. The team is another element that makes a difference. Start-up companies have a small team, with their members used to taking on multiple roles to cover several areas. With the "growth" of the company, it is important to delineate the roles of employees and delegate tasks. By hiring specialists in various fields, it ensures the correct and efficient performance of tasks (Prendes-Espinosa et al., 2021).

Attitude towards risk represents another differentiating element, but a defining one. In the case of the start-up stage with a small customer base or products that have not stated their market position, it is easier to risk a new idea than when you have a lot to lose in the event of a wrong investment, as would be for companies while scaling up (Piaskowska, Tippmann, & Monaghan, 2021).

# **Research methodology**

This research paper aims to analyze the process of digitization in the Romanian and Polish economies and, in particular, in the entrepreneurial environment. The importance of this research stems from the extension of the digitalization process to an increasing area of the economy. Today, turning the traditional business model into a digital one is an important step towards development and progress. Innovation is also in step with digitalization because entrepreneurship is seen as a process of transforming knowledge into new products and services (Costa & Monteiro, 2016; Kraus et al., 2019).

We used a qualitative research approach by performing a critical literature analysis on this topic and by performing a comparative analysis between Romania and Poland, based on official statistical data.

# **Results and discussions**

The European Commission oversees the digital development of the Member States of the European Union through the reports of the *Digital Economy and Society Index* (DESI). The reports present the countries' profiles from the specific indicators point of view based on the previous year's data. Data of the United Kingdom is still included in the current report and indicators are presented for the 28 states as EU members in 2019. To compare data and reflect the dynamic of indicators during a period, the indicators have been recalculated. The DESI 2020 report includes the analysis of connectivity skills, internet skills, digital skills, business digitalization, digitalization of public services, and cybersecurity. The previously enumerated are considered soft skills and are top-rated by employers (Bejinaru, 2018). Inside the document, we find a quantitative analysis of the indicators that are part of the index, showing its 5 dimensions, as in Figure 1.

According to data from DESI (2020) report Finland, Sweden, Denmark, and the Netherlands have the most digitalized economies within the European Union. They are followed by Malta, Ireland, and Estonia. Bulgaria, Greece, Romania, and Italy have the lowest values in the index (Figure 2).



Figure 1. Dimensions of the Digital Economy and Society Index (DESI) Source: adapted after DESI (2020)



Within the DESI, Romania ranks 26th among the 28 member states of the European Union, including the United Kingdom, as the figures refer to 2019, in Table 1.

Table 1. Digital	Economy and Society	<sup>,</sup> Index, Romania

	Rom	UE		
	place	score	score	
DESI 2018	26	35.1	46.5	
DESI 2019	26	36.5	49.4	
DESI 2020	26	40.0	52.6	

DESI, 2020

Connectivity is the DESI index with the best results for Romania. However, in 2020 Romania dropped 3 steps in the ranking of the 28 states analyzed, in Table 2.

Tuble 2. Dimens		- connectivit	y, nomuniu
Connectivity DESI 2018 DESI 2019 DESI 2020	Rom	UE	
connectivity	place	score	score
DESI 2018	6	48.8	39.9
DESI 2019	8	50.0	47.7
DESI 2020	11	56.2	50.1
DESI, 2020			

### Table 2. Dimension Evolution - Connectivity, Romania

The next dimension in the DESI Index is *Human Capital*. In this section, Romania ranks 27th out of the 28 countries analyzed, a position maintained for the last 2 years as

27th out of the 28 countries analyzed, a position maintained for the last 2 years, as highlighted in Table 3. Romania has the lowest level of use of internet services among EU member countries, which is linked to a low level of primary digital skills.

# Table 3. Evolution of the size of Human Capital, Romania

Human	Rom	ania	UE
capital	place	score	score
DESI 2018	28	31.5	47.6
DESI 2019	27	31.1	47.9
DESI 2020	27	33.2	49.3
DECL 2020			

DESI, 2020

According to Table 4, 18% of Romania's residents have never used internet services, while the EU average is only 9%. By contrast, on the other hand, Romania ranks among the countries using social networks (82% compared to the EU average of 65%) and video calls (67% compared to the EU average of 60%). Lack of credibility and confidence in digital technology has led to the use of internet banking services (11%), shopping (29%), online news tracking (55%), also videos, online games (63%) very low, i.e. the lowest services among the EU member countries.

#### Romania **UE 2020** Indices DESI 2018 DESI 2019 **DESI 2020** People who69% have never used the internet 27% 21% 18% 9% % the person Internet users 68% 61% 72% 85% % people News 69% 69% 55% 72% % internet users Music, video materials and games 67% 63% 63% 81% % internet users Video on request 6% 10% 10% 31% % internet users Video calls 53% 51% 67% 60% % internet users Social networks 82% 86% 82% 65% % internet users Following an online course 5% 5% 4% 11% % internet users **Banking services** 10% 11% 66% 11% % internet users

### Table 4. Dimension - Use of internet services, Romania

Shopping % internet users	23%	26%	29%	71%
Online sales % internet users	4%	5%	3%	23%

Only 23% of Romanian companies exchange information online, well below the EU average of 34%. At the same time, only 8% of businesses use social media platforms compared to 25% of the EU average. A pleasing aspect is a small increase in the share of SMEs carrying out E-Commerce, i.e. sales of products and services online. The value of the indicator increased from 8% to 11%, however, below the EU average of 18%. Overall, 6% of SMEs sell their products online abroad, compared to the EU average of 8%.

The last analyzed DESI dimension is Digital Public Services Romania which ranks 8th in the "e-government" section, with 82% of internet service users, while the EU average is 67%. This high value of interaction between citizens and public authorities refers only to internet users submitting forms. If we were to look at prefilled forms, we would see a reduced value of 10%. The systemic problem in terms of the quality and capacity to use the services offered creates difficulties for services performed exclusively online, which places Romania at the last place of the top. As for improvements in the field of digital public services for companies, in recent years they have not registered, which makes Romania the last place in this regard as well (Tocan et al., 2021).

In the DESI Index, Poland ranks 26th among the 28 Member States of the European Union, including the United Kingdom, as the figures refer to 2019, in table 4. Poland continues to have the highest mobile broadband use in the EU. High scores in the very high-capacity fixed network and 4G coverage improved their overall score in connectivity. The score in the field of digital public services has also improved. Poland has improved its performance in using prefilled forms, completing the online service, and is an open data user above the EU average.

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	Pol	and	UE
	place	score	score
DESI 2018	24	37.7	46.5
DESI 2019	25	40.7	49.4
DESI 2020	23	45.0	52.6
DECI 2020			

### Table 5. Digital Economy and Society Index, Poland

DESI, 2020

However, its performance is offset by lower scores in the integration of digital technology and the use of internet services, which remain the most challenging areas. Polish companies are in favor of using new technologies, a trend reflected in the increasing use of social networks, electronic exchange of information, and online sales. Looking ahead, with regard to the DESI indicators which are very important for the economic recovery after the COVID-19 crisis (Bratianu & Bejinaru, 2020), Poland is advanced in the commissioning of very high-capacity networks. On the other hand, Poland has not yet assigned any radio spectrum for 5G services. The state of basic

digital skills remains low compared to the EU average. Poland does not perform in the digitalization of business and public services (Wozniak & Zbuchea, 2021).

The first DESI dimension analyzed for Poland is Connectivity, Poland ranks 15th in connectivity. As in the case of Romania, this is the size with the best performance. Poland has made significant progress in covering very high-capacity fixed networks reaching 60% compared to 29% in 2019. For both the Use of fixed broadband services of at least 100 Mbps and the mobile broadband use indicator Poland achieved values higher than the European Union average. As for Mobile Broadband Use, Poland ranks first in the EU, with 176 subscriptions per 100 people. Poland is slightly above the EU average in 4G coverage (99% of the union average of 96%) but is significantly below the EU average in terms of high-speed broadband coverage (76% compared to 86% -EU average). Poland registers 0% in the 5G availability indicator. Poland adopted several regulatory measures in 2019 to facilitate the broadband launch and prepare for spectrum allocation for the deployment of 5G networks. However, 5G implementation may be delayed in non-urban areas. Poland continues to face difficulties in achieving the EU's 2020 targets, despite efforts. At least basic digital skills and above-basic digital skills remain below the European Union average. Only 44% of people aged 16 to 74 have at least basic digital skills, compared to the EU average of 58%. 21% of people have digital skills above the basic level than the union average of 33%. Poland registers a growing number of ICT experts but still does not reach the EU average. ICT experts represent less than 3% of the total working force in comparison to the EU average of 3.9% and the employment of ICT women experts is only 0.9%.

Polish businesses are increasingly taking advantage of the opportunities offered by online commerce: 13% of SMEs sell online, an increase from the previous year, but still below the EU average of 18%. Only 5% of all SMEs sell online across borders to other EU countries. 14% of businesses use social networks, compared to the EU average of 25%, 7% use cloud services, compared to the EU average of 18% and 8% analyze big data, compared to the EU average of 12%. Poland intends to progress and invest in digital technologies. In 2019, it launched several major initiatives, including the *Future Industry Platform Foundation*. The objective of the platform is to increase the competitiveness of entrepreneurs by supporting their digital transformation. The Platform will coordinate, standardize and support the activities implemented by Polish digital innovation hubs (Tocan et al., 2021).

# **European Digital Entrepreneurship Systems Index (EIDES)**

The European Digital Entrepreneurship Systems Index (EIDES) is a tool that allows, through a complex measurement, the understanding and appreciation of the scale of the digital entrepreneurial ecosystem. The EIDES study was published in 2018, 2019, and 2020. This index attempts to measure physical endowments and digital conditions for stand-up, start-up, and scale-up projects in EU and UK countries.

According to the accumulated score, states are grouped into four large, responsive categories: *leaders* with a score between 60 and 100; *followers* with a score between 45 and 60; *those who come from behind* (catchers-up) with a score between 35 and 45

and *the remaining behind* (laggards) - under 35. Looking at the data, we see that we identify eight countries that appear as leaders in the general sense and general framework conditions for entrepreneurship: Denmark, Sweden, the Netherlands, the Uk, Finland, Germany, Luxembourg, and Ireland. Of these, Denmark and Sweden are not only leaders in the overall score of the index, but also within each sub-index (stand-up, start-up, scale-up).

Regarding the last category of states (laggards), we note 7 states: Hungary, Latvia, Slovakia, Croatia, Romania, Greece, and Bulgaria. Even though we see a positive development between 2018-2020 with 7.8 EIDES points, Romania remains a state with weaknesses in all pillars. At the same time, during the 3 years, there is a decrease in the difference from the average of the Laggards group (2018 - 3.2 points, 2019 - 2.9 points, 2020-1.4 points). In terms of the sub-indices score, they all show a positive development.

The study of the European Commission's Joint Research Centre (JRC), on whose initiative the EIDES index was calculated, also proposed in the report drawn up a strategy for allocating resources to stimulate Romanian digital entrepreneurship. The main idea of this strategy is to focus attention on the pillars with the lowest values, as well as to adjust all scores so that a positive overall score dynamic can be recorded.

Figure 3 shows the JRC's vision of the distribution of resources needed to "unlock" digital entrepreneurship in Romania: As we see in the chart above, the main pillar on which it is proposed to intervene is *Human Capital and Talent*, both in the Stand-up stage and in Scale-up. In this chapter, we can say that the digital education of young people as potential future entrepreneurs is very important for any society that strives for development and progress. Thus, we can conclude that the education system has some gaps in the development of digital skills among the younger generation.

The next pillar requiring intervention is *Funding*. Here we can say that together with the need for traditional financial resources, entrepreneurship also needs other, more flexible financing instruments that will quickly meet the needs of economic operators, such as the products and services offered by Fintech companies. Another pillar that needs to be improved is *Market Conditions*. This area refers to the use of the Internet in commercial and marketing activities, including stimulating online commerce. If we refer to *Culture and informal institutions*, the authors of the report propose interventions both in general (risk appetite, attitude towards entrepreneurship, efficiency of legislation) and on digital aspects (internet use). The last pillar that needs small improvements is *The Creation of Knowledge and its dissemination*. The digital aspects of this pillar relate to the use of specialized software.



Figure 3. Stimulating Romania's digital entrepreneurship (%) (Autio et al., 2020)

In Poland, similar to Romania, the non-digital score has higher values than the digital one. As in Romanian society, we see those formal institutions *and the legal framework, market conditions, knowledge creation and dissemination,* funding are the pillars that have made positive changes over the years analyzed. On the opposite pole are *human capital and talent and networking and support* that shows changes in the sense of decreasing the total score on the pillar. In terms of the score on sub-indices, we see the same situation as in Romania, all showing a positive evolution. To improve digital entrepreneurship in Poland and increase the EIDES score by 10%, the Joint Research Centre proposed in figure 3.

As we see in Figure 4, the highest percentage of resource allocation is related to the *Culture pillar and informal institutions,* being the pillar with the lowest EIDES score. The digital aspect of this pillar is about internet accessibility, internet use, ownership of web pages by businesses. Formal institutions and the legal framework require a 17% input of resources to stimulate digital entrepreneurship. With the underdeveloped digital area, it is recommended to direct the government towards the online domain (e-government), online services, software. Human capital and talent is another pillar that requires intervention in all 3 stages of the life cycle: Start-up stage (15%), Scale-up (13%), Start-up (6%). It covers digital education, entrepreneurship education, digital skills, ICT specialists. In the case of Poland, the digital and non-digital sides have roughly the same values, which suggests an allocation of these resources for both accessibility to social networks, online conferencing, the use of professional software, and external support for start-ups. A final pillar with small improvements is Knowledge *Creation and its Dissemination*, with a 6% investment for the Scale-up stage and only 2% for Start-up. This pillar covers the skills of graduates, the quality of studies, the quality of research, and innovations.

C. Bratianu, A. Zbuchea, F. Anghel, & B. Hrib (Eds.)



Figure 4. Stimulating Poland's digital entrepreneurship (%) (Autio et al., 2020)

Digitalization is the phenomenon that expands its coverage every day, covering the entire economy and society as a whole. For its analysis, the Digital Economy and Society Index, in particular the country reports of Romania and Poland, was studied and the overall comparative situation is shown in Table 6. As we see, the only DESI dimension to which Romania surpasses Poland is Connectivity. This is due to the high use of very high-speed broadband and the wide availability of very high-capacity fixed networks, especially in urban areas. At the same time, the level of preparation for the use of 5G networks in Romania is 21% compared to 0% in Poland.

	Romania		Poland		
	place	score	place	Score	
Connectivity	11	56.2	15	51.3	
Human Capital	27	33.2	22	37.3	
Use of internet services	28	25.9	23	49.6	
Integrating digital technology	27	24.9	25	26.2	
Digital public services	28	48.4	20	54.9	
DESI 2020	26	35.1	23	45.0	

### Table 6. DESI 2020 index centralizing table

Authors' elaboration

In the other dimensions, Poland has a better situation than Romania. However, both countries still have a long way to go in terms of digitalization, at least until they reach the EU's average values. Overall, in 2020 Poland surpasses Romania by 10 DESI points.

			Romania		Poland		
	Categories	Pillar score	Non- digital score	Digital score	Pillar score	Non- digital score	Digital score
Framework	Culture and informal institutions	19.9	62.1	38.1	29.1	63.7	57.3
– general conditions	Formal institutions and legal framework	37.9	75.1	52.1	31.3	61.0	55.5
	Market conditions	19.4	79.1	33.7	52.9	91.3	60.6

### Table 7. EIDES 2020 Index Centralizing Table

	Physical infrastructure	58.7	60	81.7	46.0	75.7	62.4
	Human capital and talent	20.2	62.3	39.2	32.6	68.3	52.6
Framework – systemic	Creating knowledge and disseminating it	30.8	54.9	60.3	35.6	66.9	59.1
conditions	Financing	26.2	62	42	41.4	66.6	59.1
	Networking and support	28.5	69.9	54.4	39.8	63.5	64.4
SCOR EIDES		29.5	65.7	50.2	37.9	69.6	59.3
SUB-INDICES			SC	ORE ON S	UB-INDI	CES	
	Stand-up		30.1		37.3		
Sub-indices	Start-up		29.4		38.6		
	Scale-up		28.9			37.9	

Authors' elaboration

Following these results, we can provide a clear answer to the first question we set ourselves when the research was initiated: *"Which country has a higher level of digitization in the economy and society?"*. According to the analysis on DESI, the Polish economy has seen a more advanced level of digitalization penetration in the economic sectors. Under the influence of digitalization is also the entrepreneurial environment.

According to Table 7, Poland has a higher score of 37.9 EIDES points than Romania which equals 29.5 EIDES points. Looking at the structure, Romania has higher values only *at formal institutions and the legal framework* and *Physical Infrastructure*. In terms of digital and non-digital scores, Poland surpasses Romania by 9 points and 4 EIDES points respectively. The same is seen in the 3 sub-indices where Poland has a score of 7.2 higher for the Stand-up sub-index, with 9.2 points - Start-up and 9 points for Scale-up.

# Conclusions

Following these results, we can provide a clear answer to the second question: "Which of the countries analyzed has a more digitalized entrepreneurial environment?". According to the analysis on EIDES, we note that in this case, the Polish economy has also experienced a more advanced level of digitization of the entrepreneurial environment. Finally, we can say that the aim and objectives that we originally set have been achieved as a result of the research. At the same time, working assumptions have been validated. The indicators based on which the analysis was carried out allowed us to create a complex overview of the phenomenon of digitization in the economy and society, giving us relevant, certain, and clear data.

In conclusion, we are aware that digitalization is an important element contributing to business development, strengthening market position, achieving national competitiveness. At the same time, the ability of entrepreneurs to generate innovative ideas, new products, and services that will meet the needs of customers is another key element in achieving success.

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