

## DIGITALIZATION. GLOBAL CHALLENGES AND ECONOMIC PROSPERITY. EXAMPLE: ROMANIA

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### **Abstract**

*Digitalization has a proven impact on the economy and society by reducing unemployment, improving quality of life, and boosting access to knowledge and other public services. This paper highlights the concept of digitization along with the social economic and ecological benefits of digitization of knowledge and information. At a general level, the extent of a country's digitization can be measured across six key attributes: ubiquity (the level of access to digital services and applications), affordability (pricing), reliability (the quality of connection), speed (the rate of data throughput), usability (the ease with which people can get online and use applications available there), and skill (the ability of users to incorporate digital services into their lives and businesses). We analyze the two main indicators of digitalization – the Digital Economy and Society Index (DESI) and the European Investment Bank Survey Digitalization Index (EIBIS) – and highlight the overlapping and different components. While DESI measures digitalization based on five dimensions – connectivity, human capital, use of the internet, integration of digital technology and digital public services – EIBIS comprises five components – digital intensity, digital infrastructure, investment in software and data, investments in organizational and business process improvements, and strategic monitoring system. Based on the two indicators, we examine the current status of digitalization in Romania by scanning the most important reports on digitalization from institutions such as the European Commission. The evidence reveals that Romania is lagging behind the other EU member states in many relevant aspects, such as digital public services, the internet coverage in rural areas, the digital skills of the population, and the use of digital technologies by businesses, to name a few. In this negative context, we also found some positive aspects, among which the high level of online interaction between public authorities and citizens is the most noteworthy. We finish with an overview of the EU strategies towards a digital society and a brief roadmap for Romania to close the digitalization gap concerning the other EU member states.*

### **Keywords**

*Digitalization; future economy; Romania digitalization; digital services; concept of digitalization*

### **Introduction**

Digitalization represents the conversion process of the analogical information in digital format. In a broader approach, digitalization is defined by the social transformation stimulated by the adoption of digital technologies to generate, process and transaction the information. When talking about digitalization, we include e-governance services, e-commerce, social networks, on-line banking, on-line education and training, etc. (Friederici & Graham, 2018).

The literature links entrepreneurial intent to subjective norms, attitudes and perceived behavior, and other contextual variables (Nowiński & Haddoud, 2019). Some studies focus on how the entrepreneurship intention is handled by universities and higher education institutions and show the critical role of higher education for entrepreneurship. This stream of work investigates the effects of different education

policies on the development of entrepreneurial intent within a targeted population but these findings need to be linked to the digitalization of the economy and its potential impacts (Ben Youssefa et al., 2020).

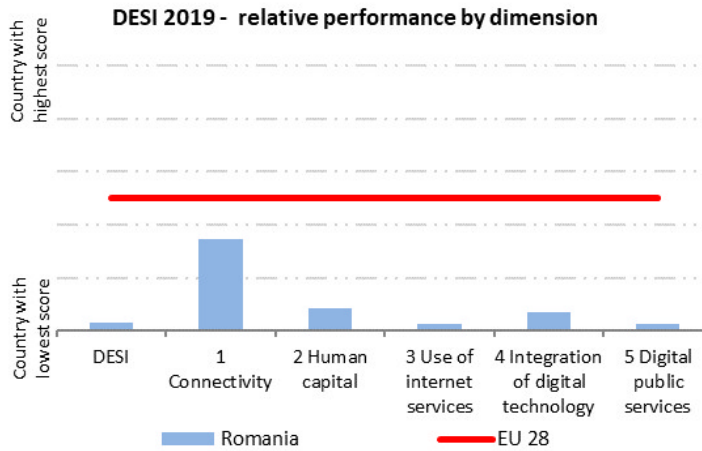
This year, more than anytime, when Covid19 pandemics spread in the whole world and countries had to react to limit the damages in many areas such as health, economy, social, business environment, the limited performance of our country in terms of digitalization drag the economy and limit a country's possibilities to adapt and react.

Production fundamentally impacts economic structure at global, regional, national, and local levels, affecting the level and nature of employment, and is inextricable nowadays from environmental and sustainability concerns, considerations, and initiatives. Collectively, the sectors of production have been the source of economic growth in developed and developing nations alike, a major source of employment for a rapidly evolving and increasingly skilled workforce, and they continue to be the dominant focus of innovation and development efforts in most countries (Balsmeier & Woerter, 2019). The transformative potential of technology in production systems is widely recognized, even while the precise configuration and extent of the possible transformation remain unknown. Trends towards higher levels of automation promise greater speed and precision of production as well as reduced exposure to dangerous tasks for employees. New production technologies could help overcome the stagnant productivity of recent decades and make way for more value-added activity. The extent of automation is, however, causing significant anxiety about issues of employment and inequality.

### **Assessment of the main indicators of digitalization: DESI (Digital Economy and Society Index), EIBIS (European Investment Bank Investment Survey Digitalization Index)**

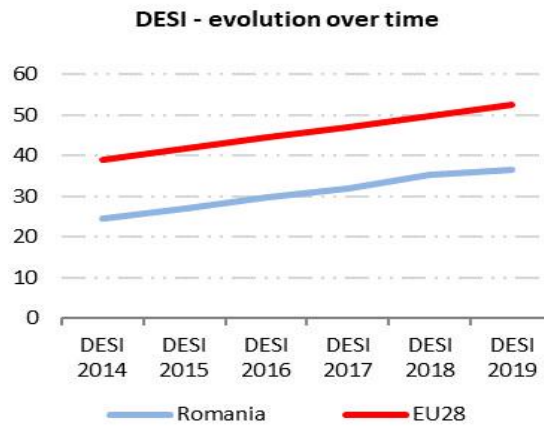
It is difficult to keep pace with what is called Artificial Intelligence (machine intelligence, intelligence demonstrated by machines, in contrast to the natural intelligence displayed by humans and animals) and the Internet of Things (a system of interrelated computing devices, mechanical and digital machines provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction) when only 29% of the individuals aged 16-74 have at least basic digital skills, 21% of the individuals never used the internet, the use of banking and shopping online is 10 % and 26% respectively.

One of the most relevant indicators is a composite indicator called Digital Economy and Society Index (DESI), that summarizes relevant indicators on Europe's digital performance and tracks the progress of EU Member States in digital competitiveness. It is calculated as a weighted average of five main dimensions: Connectivity (25%), Human Capital (25%), Use of Internet (15%), Integration of Digital Technology (20%), and Digital Public Services (15%). According to DESI 2019 Country report prepared by the European Commission (2019), Romania ranks 27th out of the 28 EU Member States with a score of 36.5, followed only by Bulgaria. Although the index has improved in the latest years (from 32.0 in 2017 and 35.4 in 2018), Romania still lags behind the EU average of 52.5 in 2019.



**Figure 1. Digital Economy and Society Index (DESI) 2019 - related performance by dimensions**

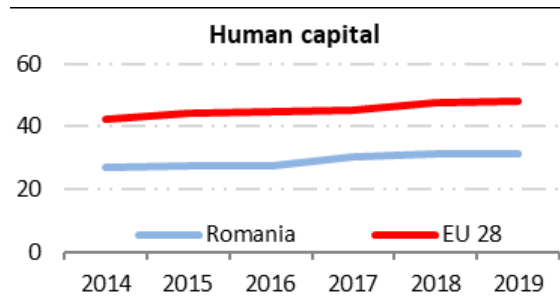
Source: Data from Country report 2019 Romania, European Commission (2019a)



**Figure 2. Digital Economy and Society Index (DESI) 2019 - evolution over time**

Source: Data from Country reports 2014-2019 for Romania, European Commission (2019a)

In an in-depth analysis of DESI's components, it can be observed that Romania is performing well in Connectivity, with 87% coverage of fixed broadband, 77% of 4G coverage, 76% coverage of fast broadband (download speed of at least 100Mbps), and 75% of ultrafast broadband (in the last one surpassing the EU average of 60% and reflecting the strong infrastructure-based competition in Romania, mainly in urban areas). With all these, Romania ranks 22nd in the Connectivity dimension. Fixed broadband coverage stagnated at around 87 % of households covered (10 percentage points less than the EU average) and still lags behind most Member States, ranking 26 in EU. However, Romania's urban-rural digital divide is illustrated by the figures for ultrafast broadband coverage, where 39 % of rural areas are covered (although above the EU average of 29 %). With 77%, Romania lags behind on 4G coverage, as compared to the EU average of 94 %.



**Figure 3. Human capital (DESI) 2019 – evolution over time**

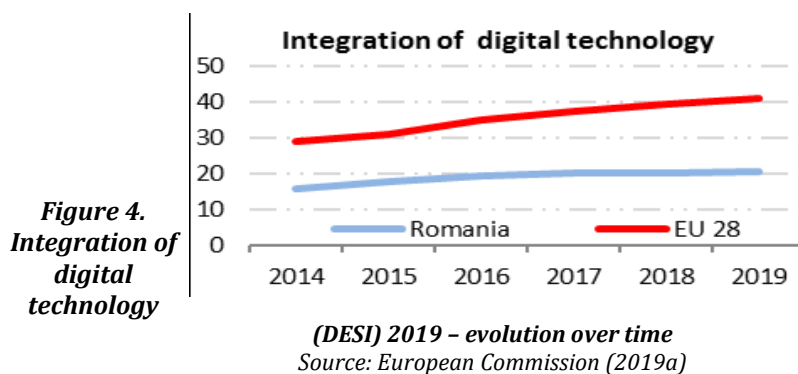
Source: European Commission (2019a)

As regards the Human capital component, Romania ranks 27th, well below the EU average. Only 29% of the individuals aged 16-74 have at least basic digital skills (well below the EU average of 57%) and only 10% of the individuals have above basic digital skills (more than 20 percentage points below the EU average, European Commission, 2020c) ranking Romania the last among MS. 32% of the individuals have at least basic software skills in comparison to an EU average of 60%. Despite the increase in the percentage of ICT specialists from last year, they represent a lower proportion of the workforce (only 2.1%) by comparison with the EU average (3.7 %). When referring to the ICT graduates, Romania ranks 6th in the EU, with a share of 4.9% (1.4 percentage points higher than the EU average).

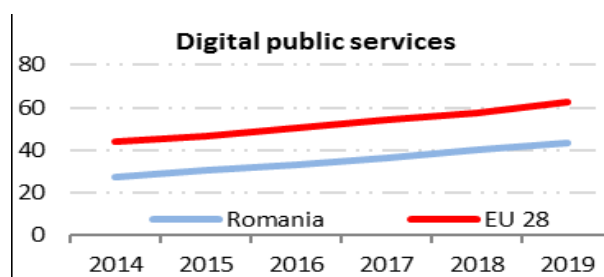
To develop digital skills, within the framework plan for secondary education, the subjects of IT and ICT have for the first time been introduced to the common core curriculum, starting with the 2017-2018 school year, with one hour's teaching per week. As part of the "Internet in Your School" project, 2,446 schools from rural areas and small towns were connected to broadband internet services, with 714,339 pupils and 56,203 teachers being the direct beneficiaries.

When talking about the use of internet services, 21% of the individuals have never used the internet (beyond the EU average of 11%). Even if the coverage of the internet users has increased from 2018 to 68% it is still much below the EU average of 83%, ranking Romania 27th. Only 5 % of the internet users have done an online course (as compared to 9% at the EU level) and 5% used online consultations and voting (in comparison to 10% EU average). Unfortunately, the use of banking, shopping as well as selling online (10 %, 26 % and 5% respectively) is below the EU average (64%, 69% and 23% respectively), mainly due to a lack of trust in digital technology. Overall, the use of internet services in Romania continues to be the lowest among the EU Member States.

There has been dynamic growth in the area of information technology and communications in Romania, especially in the latest years, highlighting that the foundations are therefore in place for Romania to make an active and substantive contribution to the realization of the EU Agenda for the creation of a Digital Single Market, but still much has to be done (European Commission, 2020b). Stimulating, in particular, the digital economy and investment in industries which are at the more profitable end of the value chain, which utilize the results of national efforts in the area of research, development and innovation, and which target stable and growing markets.



On the Integration of digital technology by businesses, Romania ranks 27th, well below the EU average. Romania's ranking remained stable in this dimension compared to the last two years. There was almost no change in any of the indicators. Romanian enterprises are taking advantage of the possibilities offered by big data analysis (11 % versus 12 % EU average). 9 % of Romanian enterprises are using social media as compared to an EU average of 21 %. Only 8 % of total SMEs are selling online (against an EU average of 17%), while 2 % of them are selling online cross-border (versus 8 % EU average, European Commission, 2019).



As regards Digital public services, Romania's rank decreased, ranking the country last among the EU. Nonetheless, the country performs relatively well regarding certain indicators. There is a high level of online interaction between public authorities and citizens, as Romania ranks 7th regarding e-government users, with 82% of internet users as compared to 64% EU average. This contrasts with the low scores for pre-filled forms and online service completion, which could indicate a systemic problem with the quality and usability of the services offered. Overall, the national administration's IT system is fragmented, which represents an administrative burden for citizens and businesses. The level of interoperability between the public administration services is generally low, as each public institution focused on its own digital public service.

Identifying and implementing solutions to encourage the digitalization of the Romanian economy by introducing digital technologies in public administration and the field of financial and banking services should represent a priority for the future development of

the country. Even if in Romania there can be developed initiatives in the area of cybersecurity, specialists in the area are lacking. Unfortunately, the main obstacle in the development of cybersecurity technology is the lack of specialized human resources. All in all, in Romania, digitization of the economy is lagging behind, more than 20% of Romanians have never used the internet, and less than 30% have basic digital skills. When we're talking about digital public services, Romania has the lowest performance among the Member States, despite the large share of e-government users (7th in the EU). On the other hand, 45 % of Romanian homes subscribe to ultrafast broadband, which is the 3rd highest rank in the EU. As regards female ICT specialists, Romania is well-positioned as it ranks 16th, with 1.3 % of Romanian women in employment (European Commission, 2019a).

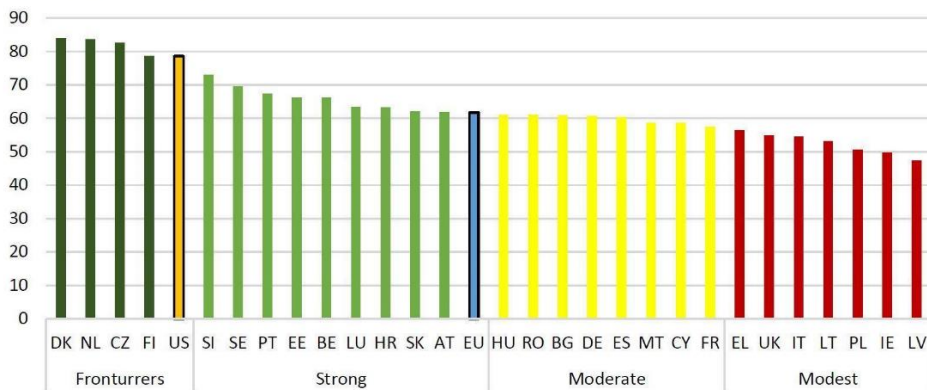
### European Investment Bank Investment Survey Digitalization Index (EIBIS)

EIBIS Digitalization Index is a composed index that summarizes indicators on firms' digital technology adoption as well as firms' assessment of digital infrastructure and investments. It is based on firm-level data collected by EIB Survey in 2019. It includes five components: digital intensity, digital infrastructure, investment in software and data, investments in organizational and business process improvements, and strategic monitoring system.

EIBIS Digitalization Index differs from DESI, due to the followings: EIBIS is based on firms' assessment of digitalization, EIBIS captures more recent digital developments in digitalization and e-commerce, EIBIS captures how often firms see digital infrastructure as an obstacle to their investment activities while DESI captures connectivity by broadband market developments in the EU.

EIBIS does not capture Human Capital and Digital Public Services. It captures whether firms have strategic business monitoring systems in place, an indicator for management practice. EIBIS is a survey dedicated to firms, so it is unable to capture citizens' use of internet services and online transactions.

**EIB Digitalisation Index**



**Figure 6. EIB Digitalization Index (level by countries)**

Source: European Investment Bank (2020)

With an EIBIS DI (EIB Investment Survey Digitalization Index) score of around 60 points, Romania ranks 15th, in the moderate digitalization country group, together with countries like Hungary, Bulgaria, Germany, Spain, Malta, Cyprus, and France. Frontrunners in the EU are Denmark, Netherlands, Czech Republic, and Finland, all exceeding even the US index (which has always performed better than the EU average).

Related to Romania's position in this field, we can conclude that the adoption rate of single technologies is above the EU and US average for platforms in the services sector. Digital adoption rates in Romania are above the EU average for the services sector and almost 65% of digital firms report having increased the number of employees in the last three years, compared to 48% of non-digital firms. The median wage per employee is rather similar for digital and non-digital firms, although median labor productivity is slightly higher among digital companies compared to non-digital ones in Romania.

Among the reported obstacles to investment, 'lack of availability of staff with the right skills' is the most cited, followed by 'labor market regulations'.

### **European vision - Strategies and initiatives**

A high level of skills mismatches in companies' workforces limits their capacity to innovate and capitalize on innovation. Increasing the number of Romanian ICT specialists, ensuring the necessary training of teachers for education supply to meet the high demand, but also re-skilling the labor force is of high importance if Romania wants to fully benefit from the digital economy opportunities.

Ensuring the digitalization of the health system and implicitly the elimination of documents and records printed on paper, to increase the efficiency of and facilitate medical interventions, thereby ensuring the population's rapid access to quality medical services, treatment and medication, and the efficient monitoring of needs is essential after this year's pandemic spread.

Digital technologies and data accessibility represent the key factors for a transition to a more productive and green economy. They are changing the way we communicate, live, and work. The changing dynamics brought about by the digital transformation require additional ambition at EU and national levels in terms of increased investment, innovation-conducive regulation, effective reforms and a human-centric approach based on European values.

According to the European approach (European Commission, 2020b), based on three main pillars, ensure that Europe seizes the opportunity and gives its citizens, businesses, and governments control over digital transformation.

### ***Technology that works for the people***

The aim is to invest in digital competencies for all Europeans, to protect people from cyber threats (hacking, ransomware, identity theft). The focus is also oriented to ensure that Artificial Intelligence is developed in ways that respect people's rights and earn their trust. The acceleration of the roll-out of ultra-fast broadband for homes, schools, and hospitals throughout the EU and the expansion of Europe's super-computing

capacity to develop innovative solutions for medicine, transport and the environment are also included in the agenda.

### ***A fair and competitive digital economy***

The digital strategy will enable a vibrant community of innovative and fast-growing start-ups and SMEs to access finance and to expand. It is also intended to propose a Digital Services Act to strengthen the responsibility of online platforms and clarify rules for online services and make sure that EU rules are fit for purpose in the digital economy. It will also ensure that all companies compete in Europe on fair terms access to high-quality data can be increased while ensuring that personal and sensitive data is safeguarded.

### ***An open, democratic, and sustainable society***

EU digital strategy is intended to support the use of technology to help Europe become climate-neutral by 2050 and to reduce the digital sector's carbon emissions. Especially during these difficult times, the creation of a European health data space to foster targeted research, diagnosis, and treatment is crucial. Also fighting disinformation online and fostering diverse and reliable media content has to be tackled.

Beyond an ambitious process of digitalization and intensive capacity-building initiatives for all stakeholders, it is necessary to put in place a more robust single market governance infrastructure at the EU and national levels. This would entail the proactive involvement of citizens, consumers, and businesses, to develop simplified, user-friendly designs and timely, transparent and efficient implementation and application of the single market rules as a basis for a successful transition to a digital, efficient, balanced, and sustainable EU in economic, environmental and social terms.

Data and Artificial Intelligence are major drivers for innovation that can help us to find solutions to societal challenges, from health to farming and food production, from security to manufacturing. In the current Covid19 context big data, AI, 5G, and other techs have been deployed to prevent contagion, treat patients and shorten crisis. As a recent example, China "New infrastructure" planning focuses on 7 areas: smart manufacturing, smart port, smart medical, smart, power grid, smart education, internet of vehicles, and 4k/8k live broadcast.

In the current context a new European initiative, REACT-EU, will provide a top-up for cohesion support to MS, with a budget of €55 billion. It will be available from 2020 and be distributed according to a new allocation key taking into account the impact of the crisis. This will ensure there is no interruption in funding for key crisis repair measures and support to the most deprived. It will support workers and SMEs, health systems, and the green and digital transitions and be available across sectors – from tourism to culture.

## **Conclusions**

Beyond strategies, visions, budgets, programs it is important not to lose the momentum, and all the stakeholders - business environment, public sector, and individuals - have to



react to the requirements and rapid changes brought by the fast-moving and challenging environment of the fourth industrial revolution based on intelligence, digitalization, and innovation technology.

This research may serve as a guide for future policy developments in the digital domain. We also suggest that countries may benefit from a detailed analysis of their digital performances which can help them to create innovative strategies and future plans for digital development. Finally, we propose a potential explanation of why countries should consider digital transformation as one of the biggest challenges in today's economy. Impacts on value creation and capture can be considered across several economic dimensions (e.g. productivity, value-added, employment, income, and trade), for different actors (workers, micro, small and medium-sized enterprises (MSMEs), platforms and governments), and different components of the digital economy (core, narrow and broad in scope).

In combination with a decrease in jobs for low-skilled workers, inequality within the population is likely to increase. From an economic perspective, it is thus crucial to develop and apply instruments that minimize potential negative impacts while nurturing positive effects. As long as medium and low-skilled workers can be trained to learn new skills that enable them to take over new tasks created in the wake of the digitalization process, the promotion of such professional training programs could be very helpful for the affected individuals and the economy alike. Professional training and educational attainment programs should not be seen as an all-purpose medicine, however, since physical or mental limitations may constrain their effective usage. In such cases, different instruments need to be provided, and digital technologies themselves might actually offer a solution. Collaborative artificial intelligence, for instance, might enable medium and low-skilled workers to focus on tasks where they have a comparative advantage over machines (e.g. any work that requires personal emotional interaction), while machines substitute for personal weakness (e.g. in predicting prices and recognizing patterns). This would increase the individual productivity of medium and low-skilled workers, which should in turn create new job opportunities (Wamda, 2013). If such efforts fail, inequality among workers is likely to rise, which poses a great challenge for public institutions and policymakers.

There are three main objectives that policymakers could pursue to address these challenges. First, it is of utmost importance for the competitiveness of a technologically advanced country to ensure that skilled labor is efficiently allocated to growing, productive sectors. This implies flexible labor markets and workable product market competition to provide incentives to invest in innovation and the adoption of new technologies. For small countries, in particular, the worldwide free movement of talent must be guaranteed, and the hiring process is accompanied by low administrative costs. Second, training and continuing professional development are necessary to improve the match between skills and job requirements (Michaels et al, 2014). This includes training not only in technical skills but also soft skills and emotional skills to manage the digital transition of labor markets. Since the ability to learn and retain skills is positively correlated with educational attainment, governments should increase the attractiveness of tertiary education. Third, some parts of society might not be able (or willing) to successfully manage the transition to a digital age. This could be addressed by the development of collaborative artificial intelligence as mentioned above or innovative social measures such as an unconditional basic income.

Meanwhile, several policy challenges may be more effectively addressed at the regional or international level. This applies, for example, to data protection and security, cross-border data flows, competition, taxation and trade. Finding adequate solutions requires greater international collaboration and policy dialogue, with the full involvement of developing countries. Any consensus will need to incorporate significant flexibilities to enable all countries to participate.

Given the complexity and novelty of the issues at stake and the continued rapid pace of technological change, policy experimentation will be necessary to assess the benefits and disadvantages of different options. The use of regulatory sandboxes could be the first step before moving to fully national, regional, or global solutions.

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