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**REPORT ON REGULATIONS AND DIRECTIVES ON COMBINING DIGITIZATION AND SKILLS IN
ROMANIA**

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INTRODUCTION

In the historical period we are experiencing, digitalization and related skills constitute a fundamental strategic axis for the social and economic growth of the country. Digital skills are key to achieving digital citizenship, ensuring digital inclusion, and accessing and participating in the knowledge society with full awareness in this area.

Digital skills are therefore a priority for the economic and social development of the country and in Romania there is still much to do. Suffice it to recall the data of the *Digital Economy and Society Index* (DESI) 2022 report, in which Romania is in last position for the Human Capital area as more than half of the population does not possess at least a basic level of digital skills.

Therefore, in this paper we will analyze how important transversal skills and digitization policies are nowadays referring to the current European and Romanian context. Subsequently, the digitalization of skills in both the private and public sectors will be discussed, indicating the related priorities, lines of intervention and ongoing initiatives. To conclude, the risks will be identified together with the opportunities, incentives and good practices implemented by digitalization.



I. THE IMPORTANCE OF SOFT SKILLS AND DIGITIZATION POLICIES

The intense and continuous digitalization of companies and industry, of the Public Administration and of today's society, a process that has also accelerated with the Covid-19 pandemic, requires that workers and citizens, in general, acquire technological knowledge and are competent in the management of new information and communication technologies, as well as of the various IT or artificial intelligence systems that It is necessary to know how to use it to carry out almost any type of management or work or social activity, both in the private and in the public sector. However, several studies highlight the shortage of skilled workers with the technical and digital skills needed to fill many of the emerging positions in today's labor market.

It is therefore easy to understand the importance of acquiring new digital skills, which translate into a strategic element both for the worker who owns them, and for the company that benefits from them. In this sense, the Recommendation of the European Parliament and of the Council of the European Union of 18 December 2006 (subsequently taken up in 2018) on key competences for lifelong learning lists "digital competence" among the eight key competences for personal fulfilment and development, as well as for promoting active citizenship, aimed at social inclusion and job creation.

For this reason, companies, in concert with governments and public institutions, must implement policies of continuous training of personnel, and of every person in general, throughout their lives, to be able to face the unstoppable technological innovation and make the most of its possibilities for development and wealth creation. Thus, the Council of Europe Recommendation of 22 May 2018 on key competences for lifelong learning highlights the need to raise and improve the level of digital competences at all stages of education and training for all segments of the population.



From Europe to Romania

Digital competence first appeared in the new framework of key competences for lifelong learning in the 2006 Council Recommendation of the European Union and subsequently taken up in 2018, as a transversal skill for life, reflecting an understanding of digital knowledge that goes beyond strictly technical and procedural notions that characterize previous European approaches. As opposed to the mere conceptualization of ICT (*Information and Communication Technologies*) skills, the updated concept now incorporates aspects such as critical evaluation of online information or the creative practices of digital content production. The DigComp Framework is a fundamental tool that has been developed by the European Union to address the challenge of digital transformation by investing our lives and workplaces. DigComp was first published in 2013, and then revised and updated. Its latest version, DigComp 2.1, dates back to 2017 and offers a description of the skills that are needed today to use digital technologies in a safe, critical, collaborative and creative way to carry out activities and achieve goals related to work, learning, leisure, inclusion and participation in our digital society. This framework is the main reference in Europe today, for the development and strategic planning of digital competence initiatives.

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The DigComp Framework includes five dimensions:

1. Five areas of expertise identified as part of digital competence: information and data literacy; Communication and collaboration; Digital content creation; Safety; Troubleshooting.
2. Twenty-one descriptors of relevant skills and qualifications for each area.
3. Eight levels for each competency, namely Basic > Level 1 and Level 2; Intermediate > Level 3 and Level 4; Advanced > Level 5 and Level 6; Highly specialized > Level 7 and Level 8.
4. Knowledge, skills, and attitudes applicable to each competence.
5. Examples of use, on the applicability of competence to different purposes.



Copper work is flexible enough to be used in different industries, where digital competence is increasingly important:

- In the education and training sector where, digital competence is relevant at all levels of the education system (including school and higher education) for several reasons, ranging from active citizenship to the use of Information and Communication Technologies (ICT), for learning purposes, to job search.
- In the area of lifelong learning and social inclusion, digital competence is also important in everyday life and the lack of digital competence can increase the risk of social exclusion of already disadvantaged people (e.g. disabled, migrants, elderly people, etc.).
- In the employment and workplace sector, digital competence is now needed in the workplace, at different levels (more general or more specialised), as an increasing number of job profiles require mastery of digital skills.

In these fields, DigComp has been used for a variety of purposes that are of interest to understanding its role in adult education, specifically as a tool for:

- Analyze the digital skills requirements of the various jobs and to define the related professional digital profiles;
- Assess and certify digital skills levels;
- Design, develop and deliver digital skills training programs.

A relevant field of interest for adult education trainers in digital competence focuses on adults at risk of social exclusion; In particular it is aimed at people on the margins and older people who need to develop digital skills to maintain their social relationships and train their cognitive abilities in a digital world.

In 2019, the European Commission's Directorate-General for Employment, Social Affairs and Inclusion published "*Inspirational practices for tomorrow's inclusive digital world*", which describes examples of good practice in the area of 'digital skills for all'. In general, these examples indicate increasing levels of citizen participation in the democratic life of our societies (e.g. co-producing



digital and inclusive public services for all) or training specific segments of the population, including older people, migrants, young people with disabilities and NEETs (neither in the world of work nor in education or training), to make them digitally literate.

In 2017, the European Commission - DG CONNECT published the results of the study “*ICT for Work: Digital skills in the workplace*”, aimed at investigating the transformation of jobs in the EU's digital economy, the extent to which digital technologies have penetrated the workplace and the digital skills required today by employers and the labour market. The study highlights how the digitalisation of the economy is contributing to the polarisation of the labour market. Digitalisation has led, on the one hand, to an increased demand for highly qualified people able to use new technologies to carry out their professional tasks, and on the other hand, to a decrease in the demand for low-skilled workers. In this respect, automation based on intelligent technologies replacing humans has led, in some cases, to job losses. At the same time, however, the digitalization process is favoring the emergence of new jobs that require cognitive and interactive skills complementary to computer work. Digitalization is also leading to the transformation of existing jobs, reshaping job tasks and, consequently, the skills needed to perform certain jobs.

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Recent data on digital skills and the labour market indicate the growing mismatch between digital skills needed on the labour demand side and digital skills currently available on the supply side. More specifically, according to 2017 statistics, 85% of jobs in the EU need basic digital skills, while 43% of the EU population do not have a sufficient level of digital skills.

According to 2016 Eurostat data, people with low levels of education or low incomes continue to be at risk of digital exclusion, while the number of people with a low level of digital skills increases with age. For example, while 96% of young people aged 16 to 24 living in the European Union use the Internet at least once a week, only 57% of people aged 55 to 74 do. Some progress has been made in recent years, but the situation still needs to be improved to support and encourage citizens' participation in the social, political, and economic life of contemporary societies.



As highlighted in several EU documents and literature on digital inequalities, digital competence is a driver for the social advancement of those at risk of marginalisation. The European Union has undertaken several initiatives in the related area of “e-inclusion”, a term that refers to actions aimed at creating “an information society for all”. From the Riga Ministerial Declaration of 2006 to the *Digital Agenda for Europe 2010-2020*, digital inclusion or *e-inclusion* was seen as a necessary condition to ensure equity and social justice as the lack of access to digital information resources and opportunities in the information society represents a heavy factor of discrimination.

In this changing situation, DigComp was used to analyse the competence requirements of professions and the definition of professional digital profiles distinguishing between the following sectors:

- Existing professions such as administrative clerk in the public administration, primary school and early childhood teacher, etc.;
- General business functions such as industrial operations and services, marketing and sales, etc.;
- General working conditions such as entrepreneur, virtual employee, consultant for the Third Sector, employment services personnel;
- New IT-intensive jobs in different economic sectors (Industry 4.0 jobs in production, new digital jobs in museums) and distinct IT specialist job profiles.

The categories mentioned above need to develop different levels of digital competence in different areas. For example, based on case studies documented in *“DigComp at Work. The EU's digital competence framework in action on the labor market: a selection of case studies”*, employment services staff need intermediate and advanced levels of digital competence in all areas, while for primary and early childhood teachers the relevance is limited to certain areas such as content development or device protection. Of course, for digital professions such as digital collection curator or online community manager, a high level of digital competence is transversal to several examples given in the document.



With some adaptations, DigComp has also been used as a self-assessment and/or certification tool and/or to design the training offer. For example, in 2012 the government of the Basque Country promoted the “Ikanos” project to build a learning support platform for the digital competence needs of citizens, workers and/or the unemployed. DigComp was used to develop a set of tools, including a self-assessment test for both career guidance and training and to increase the employability of the unemployed, fifteen digital professional profiles, the Ikanos “*Personal Learning Environment*” (MEWP) for the continuous development of digital competence and the new BAIT digital skills certification system. From an education and training perspective, the idea of an MEWP is particularly interesting as an MEWP is a system that helps learners take control and manage their own learning. This includes providing support to students to set their own learning goals and manage their learning, manage both the content and the process, communicate with others in the learning process, and then achieve learning goals. Important concepts in MEWPs include integrating episodes of both formal and informal learning into a single experience, the use of social networks that can cross institutional boundaries, and the use of network protocols (Peer-to-Peer, web services, syndication) to connect a range of resources and systems within a personally managed space. As the digital world is constantly changing, learning digital technologies cannot be realized once and for all as continuous learning and learning is required to learn within self-managed and personalized learning spaces.

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In Romania, the digitalization of the education and training system has been a priority theme since 2016, with the launch by the presidential administration of the national project “*Educated Romania*”. Between 2016 and 2018, the presidential administration conducted a broad public debate on education in Romania, starting from a projection of the future and imagining the challenges for today's society.

So far, the result has been a national vision, with the related objectives on education and research in Romania until 2030, as well as a series of public policy proposals on the following topics, considered as priorities: teaching career, equity of the education system, professionalization of educational management, vocational education, internationalization and quality in higher education, in-depth training, evaluation of pupils and students.



Romania does not have a national strategy for the digitalisation of the education and training system. The European Commission's DESI report for Romania 2020 states that *“the extent to which Romania has achieved the commitments set out in the strategy (National Strategy on the Digital Agenda for Romania 2020) is unknown; It is also unclear whether Romania intends to assess the implementation of the strategy and whether it intends to submit a report on the current situation.”* Although it is the best performing country in terms of connectivity, thanks to the high use of very high-speed broadband and the wide availability of very high-capacity fixed networks, especially in urban areas, Romania ranks 26th out of 28 EU Member States in the Digital Economy and Society Index (DESI) for 2020.

Based on pre-pandemic data, Romania's performance was identical in four of the five DESI dimensions measured. Romania has performed poorly in the digitisation of businesses, digital public services, and digital skills. *“This situation is caused by the slow progress made in general, but also by political developments, as there have been four different governments in Romania in the last three years.”*

Similarly, to Member States, in Romania, as of March 2020, the “Covid-19” crisis has reconfigured educational practices from face-to-face interaction to the online environment. This challenge highlighted the role of digital education as a key objective for high-quality, accessible, and inclusive teaching and learning assessment, as well as the need for a high-quality, accessible, and inclusive strategic approach to the acquisition of permanent digital skills for all stakeholders.

Currently, the integrated approach to all aspects of the digitalisation of public services, including in the field of education, is ensured by the provisions of the National Strategy for the Digital Agenda Romania 2020. Although Romania has extensive internet connectivity coverage, measures are still needed to ensure all resources and an integrated framework for access to quality education in the digital age.



II. THE IMPORTANCE OF SKILLS DIGITIZATION IN ROMANIA

On 26 October 2020, the Ministry of Education and Research launched the development process of the Strategy on the digitization of education in Romania 2021-2027, called SMART.Edu, focusing on the key concept concerning the modern and accessible school, based on digital resources and technologies.

In line with the European Agenda on adapting education and training systems to the Covid-19 crisis, respectively to ensure sustainable competitiveness, social fairness and resilience, this approach is a call to action for closer cooperation of all stakeholders at national level, starting with the following priorities:

- *Accessibility* - ensuring digital infrastructure and emerging technologies for access to inclusive and quality education;
- *Connectivity* - developing digital skills for the digital transition towards a competitive society focused on sustainable development, social equity and resilience; digital literacy and the fight against disinformation; the use of open educational resources;
- *Community* - consultation and involvement of interested parties;
- *Digital learning ecosystem* - creation of a high-performance digital educational environment in compliance with digital ethics, personal data protection, cybersecurity, data analysis, etc.;
- *Innovation* - use all digital/emerging resources and technologies, stimulating entrepreneurial creativity;
- *Sustainability* - ensuring predictability in the medium and long term, through cross-sectoral cooperation, for quality education and a green and digital economy.



About the directions of action proposed in the SMART.Edu project, e.g. They target the following areas of interest:

- Development of digital skills of pupils and students;
- School curriculum for emerging professions;
- Lifelong digital learning;
- Initial and in-service teacher training for digital education;
- Digital infrastructures and technological resources;
- Connectivity;
- Creation of Open Educational Resources (OER);
- Cybersecurity, data protection, online security and cyber ethics.

One of the prerequisites for the successful implementation of follow-up measures in the areas of interest is the increase in the administrative and institutional capacity of the Ministry of Education and Research and all institutions and units under its coordination.

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The objectives of the SMART.Edu strategy derive from the priorities of the education and training system in Romania mentioned above:

- Digital literacy of 90% of the Romanian population;
- Infrastructure and technological resources suitable for all educational institutions in Romania;
- Integration into the labor market of 82% of the population aged between 20 and 34 for emerging professions.



Private sector

From the Eurobarometer statistics of the first half of 2020, Romania ranks at the bottom of the European ranking in terms of the percentage of SMEs (Small and Medium Enterprises) that have a plan or strategy to digitize their business.

The fact that Romanian SMEs are at the bottom of the ranking, both in terms of the adoption of basic technologies (such as e-mail, websites) and in terms of advanced technologies, shows that the lack of a digitalisation strategy is symptomatic of more serious problems, structural, ecosystem and entrepreneurial culture problems which prevent the success of digitization in Romanian SMEs compared to the other European Member States.

According to statistics, despite being at the bottom of the digitization ranking, Romanian SMEs are overall more open and willing to digitize than those of the more advanced countries, but they are taking few concrete steps in this direction. The main cause is obstacles to digitalisation or uncertainty about future digital standards, lack of financial resources, regulatory barriers, lack of skills, including managerial skills, cybersecurity issues, lack of IT infrastructure and internal resistance to change.

Romanian SMEs are below the European average in their conception of the existence of obstacles to digitization. Specifically, Romanian SMEs that perceive the existence of barriers to digitization, represent only 53% of the total, almost 10% less than the European average. Although more than half, this position below the European average must be interpreted in the context of the baseline data on the digitisation of SMEs (DESI index) and the relative desirability of digitalization.

From this correlation, the hypothesis of the digital immaturity of an important part of Romanian SMEs, which, while not rejecting digitization per se, do not actually have any strategy or identify obstacles to their digitization. More specifically, a significant proportion of Romanian SMEs do not have a robust analysis of the need for digitalization.

The financial factor, which is also very important at European level, is the main obstacle to digitalisation for Romanian SMEs, but it needs to be examined in context together with the other obstacles identified.



In terms of regulatory and legislative obstacles, SMEs in Romania are close to the European average. This aspect is important for state action and public policy in general, and is perhaps easier to identify and address through concrete measures. However, it does not seem to be a key element for Romanian SMEs, although the fact that it is in a higher position than other neighbouring countries with similar administrative capacities would indicate that it is not a problem for Romanian SMEs. The importance of the relative perception of this aspect in the economic field and in relation to digitalization.

Extremely interesting, for SMEs in Romania, the topic of IT security is one of the least important from the point of view of the adoption of digitization in the company. This can be attributed with sufficient certainty to the lack of digitalization and lack of concrete experience in relation to data security and business processes in a highly digitized environment.

The very important aspect of digital skills and management skills in relation to the digitisation process is very little identified as an obstacle to digitalisation by SMEs in Romania.

According to DESI statistics, Romania ranks second to last in the European ranking, with just over 30% of the population having digital skills above the basic level.

The problem of digitalization in Romania is structural and is linked to the prerequisites for digitization itself. Many SMEs are aware of the problems that only arise when the digitization process begins.

In terms of IT infrastructure and Internet connection, this factor obviously depends on the SME's ability to understand its IT infrastructure needs, its position in the division of Internet access between rural and urban areas and the degree of evolution of technological needs.

While Romania's situation can be partly understood from the point of view of high-speed Internet access (although the geographical distribution of SMEs is predominantly urban), it is difficult to understand why Romanian SMEs do not consider the lack of IT infrastructure to be an important obstacle.



The hypothesis relating to the predominance of primary needs that would have already been satisfied is difficult to reconcile with the stringent need for financing, highlighted above. More likely, again, is the lack of precise identification of infrastructure needs, due to amerced digital backwardness.

And as for resistance to change is concerned, Romanian SMEs believe that, although it may be an obstacle, it is not significant. Here too, it is possible that, once the actual digitization processes have begun, this perception could change radically and in a relatively short period of time.

To try to understand more clearly and precisely the situation of digitization of SMEs in Romania, we will analyze Eurobarometer data on micro-enterprises, an important segment of SMEs in Romania and where, given the great financial barrier, the digital transformation process is probably seen as a greater challenge than medium-sized enterprises.

According to the data, in fact, Romanian micro-enterprises are among those that least identify digitalization as a problem. Although it does not identify digitalization as a gap, according to DESI 2020, Romanian companies are among the European companies with the lowest rate of integration of digital technologies into their business. As such, and even more so for micro-enterprises, the fact that they do not identify digitalisation as a problem mainly corresponds to the fact that they do not consider it a necessary effort to be made and therefore do not address it directly. The conclusion of these data is that the aspect of digitalization and its key role in transforming business into business and even the managerial function is extremely poorly understood among micro-enterprises in Romania.

In line with the identification of the problem of digitalisation, few micro-enterprises (5%) in Romania have a strategy or action plan for digitalization. In addition, Romanian micro-enterprises are the least interested in the effective implementation of digitalization in the European Union. Less than 50% of them believe they need or have already started to adopt some digital technologies. This result is alarming because it shows that there is not even awareness of the importance of digitization, with more than half of micro-enterprises in Romania not even identifying it as a desirable aspect. Going into detail, 27% of Romanian micro-enterprises say they have adopted or intend to adopt basic digital technologies (such as e-mail or website creation), but have not adopted advanced technologies.



However, even in this situation, the Romanian country is still at the bottom of the European ranking. Romania, in fact, ranks last in terms of advanced digital technologies, with only 7% of micro-enterprises having already started adopting them.

The data confirm that few micro-enterprises are really interested in advanced digital technologies. However, it can be said that, among those who identify advanced digitalisation as desirable, but difficult to implement due to the obstacles posed by lack of knowledge, skills or financial resources, Romanian micro-enterprises are not among the least affected.

Romanian micro-enterprises are very likely to suffer from the same effect as SMEs in general, i.e. an abstract desire for digital technologies, often without playing a concrete role. This effect is probably associated with a lack of information in the least developed countries in this area.

In conclusion, for the private sector, digital barriers are mainly those related to human capital (low e-skills of the workforce, specific digital skills for business management poorly presented in the SME sector). To a lesser extent, but still important, the lack of funding for the adoption of advanced digital technologies accompanied by support (expertise/advice) is also seen as an obstacle. The lack of clarity and the lack of coherent evolution of e-government tools are an impediment to the digital transformation of businesses.



Public sector

In Romania, although in recent years there has been an evolution in the use of e-government tools, the electronic public services sector remains underdeveloped, as evidenced by the various international rankings that use specific criteria to assess the evolution of this sector.

It is important to note that, at the time of the initiation of this public policy, there was no government-wide inventory of all public services made available to private citizens and legal entities with which an assessment and monitoring of the provision of public policy. electronic platforms open to interaction with beneficiaries.

The preparation of an inventory or register of all public services (provided by the central and local public administration) and the analysis of their current degree of digital sophistication are necessary for the correct quantification of the digitization gap of the Romanian public administration compared to successful international models in the sector and the monitoring of progress over time.

The list of themes reported in the National Digital Agenda Strategy for Romania 2020 (SNADR) is coherent and relevant from the point of view of the likely socio-economic impact, but it is insufficient compared to the multitude of interactions that define the relationship between public administration – citizens/private legal entities and that involve the development of two-way administrative procedures.

The efforts of recent years have focused on the digitization of electronic public services, in line with the issues highlighted in the SNADR 2020, together with further initiatives aimed at the development of these services by certain local public bodies.

Therefore, the main problem that best defines the situation about e-government at national level is the insufficient development of electronic public services in Romania. This problem affects the whole country, both in the public and private sectors, and despite the developments recorded, it places the Romania at the bottom of the international rankings.



The insufficient development of electronic public services can be reflected more concretely by the limited number of electronic public services exceeding level 2 of digital sophistication made available by the institutions and public authorities in Romania.

Although the provision of public services in Romania is largely ensured by the control of data from different public authorities or institutions, now the digitization of systems is not yet complete. Among other things, there are still antiquated systems that are completely isolated as they are not designed for digitization.

In turn, this situation is amplified not only by the technical difficulties in ensuring genuine digitalisation, but also by the poor quality and incompleteness of some data registers, as well as by the lack of cooperation of public administration employees to rely on the latest IT systems. eliminating the classic paper documents signed and stamped by hand.

Below are the causes and effects of the picture that emerged:

- Lack of an efficient and effective IT system for the overall management of electronic public services.

This is the sum of gaps, shortcomings, and inconsistencies both of a technical nature (due to the need for IT structures at national level) and of an institutional and administrative nature. To facilitate interaction between public administration institutions and the sharing of information between different databases, it is necessary to develop a framework and protocol for sharing information in a secure and reliable way. Digitalisation will increase the interconnection between citizens, public administrations and businesses with ICT (Information and Communication Technologies) systems. Therefore, the government has a key role in creating a legislative framework for the protection of infrastructures that depend on ICT systems and for the protection of ICT systems themselves.



➤ Lack of IT systems needed by central public institutions to operate electronic public services.

About 17% of the topics covered by SNADR 2020 can be compared to level 4 of the digitization system. This situation stems specifically from the lack of information systems necessary for the institutions or central public authorities to make the associated electronic public services operational. In view of this situation, however, some institutions or public authorities have developed various computer systems used in the provision of electronic public services, but which are nevertheless insufficient, mainly due to a lack of specific requirements linked to a good level of digitization and in terms of online interaction with beneficiaries.

➤ Insufficient e-government and human resources specialists in the IT departments of institutions and public authorities together with the skills needed for the development and maintenance of electronic public services.

At the national level, several studies in the field of employment show that there is a significant shortage of IT specialists for the private sector due to the creation of development and innovation centers on the ground, in various areas of the country (for example, in Cluj County). There are no such estimates in the public administration or public sector, but qualitative analyses carried out for public policy formulation have indicated that, in general, the size of IT staff in dedicated structures is not sufficiently adequate for organizational needs for the development of efficient electronic public services. In addition, these employees do not benefit from specialized training programs that help them acquire the basic technical and management skills needed to implement complex and strategic national information systems. There is a lack of human resources strategies aimed at developing the IT technical skills needed for the e-government sector.

➤ Lack of a unified and effective legislative and procedural framework to support e-public services.

National legislation that generally concerns the field of e-government or has significant implications in that area, shows important shortcomings that have contributed, together with



the above causes, to the slow and fragmented evolution of electronic public services in Romania.

Digital public services continue to be a challenge for Romania. The country is performing well below the European average on all indicators, including the availability of digital public services for citizens (44% compared to the European average of 75%) and for businesses (42% compared to the European average of 82%). Digital interaction between public authorities is also low as only 17% of Internet users use e-government services. The large share of digital investments dedicated to this sector in Romania's NRP provides an opportunity to improve current performance. The timely implementation of these measures will help to achieve, by 2030, the goal set of the Digital Decade of fully providing the main online public services for European citizens and businesses.

Currently no electronic identification system is available in Romania. Making available, for example, electronic identity cards and digital signatures would be essential to facilitate interactions between public and private bodies.



III. OPPORTUNITIES AND RISKS OF DIGITIZATION

If on the one hand the Digital Transition is accelerating the acquisition of new skills, on the other it seems that the adult population is still lacking in qualifications and professional skills with which to grow professionally. Therefore, if Digital and Technological Transformation is a priority, it is also true that many adults' risks not finding work and falling behind due to the lack of adequate skills and skills, especially digital.

According to the *“Digital Economy and Society Index”* (DESI) 2022, Romania ranks 27th out of 27 Member States of the European Union. In terms of human capital, Romania ranks 2nd to 7th, scoring below average in most indicators. Although the country has a high number of ICT graduates (4th place), the shortage of ICT specialists limits the country's ability to innovate and reap the benefits of digital transformation. In terms of connectivity, progress in fixed broadband coverage continued in 2020, but broadband adoption took place at a slower pace. However, Romania ranks 7th due to high broadband penetration of at least 100 Mbps (57%). Connectivity in Romania could be further improved by focusing on bridging the digital divide between urban and rural areas, simplifying licensing procedures, updating the broadband strategy to reflect the 2005 gigabit targets, and transposing the regulatory framework in line with EU legislation.

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Romanian companies do not take full advantage of digital technologies (electronic exchange of information, social communication platforms, Big Data and Cloud), except for artificial intelligence. In terms of digital public services, Romania ranks last when it comes to key indicators such as digital public services for citizens and businesses and e-government users.

The projects aimed at meeting the various digital priorities are included in the *“National Investment and Economic Recovery Plan”* launched by the Romanian government in July 2020, with a budget allocation of 100 million euros from European Union and national funds, for the period 2021-2030.

The protracted Covid-19 pandemic in 2021 and frequent changes of government (five governments in the last four years) represent a particular challenge for this country. The pandemic triggered the



increased use and demand for digital public services and accelerated the digital transformation of the Ministry of Home Affairs, which worked to develop and implement various ICT systems quickly and securely. In December 2020, the new government established the Ministry of Research, Innovation and Digitization, which reports to the Romanian Digitization Authority (ADR). Continuity in the development and implementation of digitalisation measures would contribute to a stable increase in Romania's performance in all dimensions of DESI. This will involve reducing the shortage of ICT specialists, enhancing the digitalization of businesses, and modernizing public administration to provide more and better digital public services, which could improve Romania's performance.

Also, according to DESI 2022, in terms of human capital, Romania is well below the European Union average. The country faces a lack of basic digital skills among the population. Less than a third of people aged 16-74 have basic digital skills (28% vs. 54% in the EU) and digital skills above basic level (9% vs. 26% in the EU); 41% of people in Romania have basic skills in digital content creation (below the European average of 66%). Although there has been a slight increase in the proportion of ICT specialists, they represent a much smaller share of the workforce than in the European Union as a whole (2.6% compared to an EU average of 4.5%). The number of companies offering ICT training to their employees is very low, at 6% (EU average 20%). In contrast, Romania performs very well in terms of the number of women ICT specialists, representing 26% of all ICT specialists, and in terms of the number of ICT graduates, ranking first among EU Member States with 6.7% of all graduates.

The gap between the situation of access to ICT in Romania and the rest of the European Union is significant. The importance attributed to digital skills by the strategies and policies of the European Union in this area, indicate that access to computers and the Internet are no longer seen as a luxury but as a necessity. The aim is to break down the digital *divide* in the country to give a vision of unity and inclusiveness that is not limited only to certain social categories, but which is aimed at guaranteeing access to ICT and digital skills to all social groups, especially the most vulnerable. As different vulnerable groups (Roma, elderly, disabled people, etc.) have different needs and barriers to access to ICT, each needs specific measures to increase digital inclusion. Moreover, most of the measures and objectives contained in the Romanian strategy papers concern only the sphere of compulsory education, often ignoring the situation of vulnerable social groups who are no longer in



school or have limited access to education. Moreover, while education is indeed the priority area for bridging the digital divide, mere access to ICT at school will not close the gap. A coherent strategy dedicated to the education of learners/adults is needed so that teaching and learning methods lead to a common level of knowledge and skills, including digital ones.

In conclusion, investing to increase skills and the use of ICT among the population will not only lead to limiting the digital divide and therefore in equality at national level, but will also increase employment, productivity, performance, and competitiveness of the economy by reducing the *digital divide* and economic disparities between Romania and other European Union countries. It is therefore necessary that equal access of all kinds to ICT for all categories of the population is a priority in the planning of development strategies for the coming years.



IV. DIGITIZATION INCENTIVES AND BEST PRACTICES

Digital Skills is the mantra of these years and is perhaps the most important game that Europe and member states have ever played. In addition to innovation and the growth of the continent's economies, equity, and the opportunity for everyone to carve out a slice of the labour market are also at stake. Not only PCs, tablets, and smartphones but also Data, Artificial Intelligence and Robotics. Digitalisation is undoubtedly a decisive phase for Europe and is requiring everyone's commitment, starting with citizens, businesses, and the public sector.

Therefore, observing basic Digital Skills is an important starting point but we need to introduce into the lives of all of us advanced skills and technologies that allow us to win the challenge of the Digital Transition and to be competitive with the rest of the world and it is more important to be able to include everyone and leave no one behind.

For these reasons, the European Digital Decade issued by the Commission in 2021 highlighted the need to introduce Advanced Technologies and provide everyone with the skills needed to adopt them.

Also in its 2021 Strategic Forecast Report, Europe underlines the importance of developing new skills and strengthening the capacity to use cutting-edge technologies to achieve global leadership by 2050.

According to the European Commission, the advanced technologies that will be decisive in the coming years and that will bring great changes in various fields, from the world of work to that of school, are:

- Cloud and Edge Computing, two key technologies in Europe's digital future. There are two parallel but different ways of storing data and ensuring interoperability. The first sees the existence of data centers that centralize information while the second provides a series of devices connected to each other and referring to the central one.



- Artificial Intelligence, now present in many of the daily actions carried out by man, from browsing social media to enjoying a streaming movie, up to the selection of a music playlist. An "AI" algorithm reconstructs human skills such as reasoning, learning (hence *Machine Learning technology*) and planning. For this reason, Europe believes in a profound regulation of this resource, so that it is adopted in an ethical way and for the benefit of people.
- Big Data is a particularly interesting area for the European Commission, as it aspires to a single market for data in Europe that makes it accessible to the economy and society. A common space for data and Digital Sovereignty not only contribute to achieving global leadership, but also bring real benefits to everyone's lives. A *data-driven* approach would make significant progress in health, transport, public service, and energy transition.
- 5G is one of the most promising emerging technologies because it virtually provides ultra-broadband with very low latency, ideal for connecting people and objects and for collecting and analyzing data in real time. This technology has applicability in different sectors, starting from the professional, health, safety, and Smart Cities.
- Quantum and Photonics are two of the most discussed and innovative technologies in Europe. On the one hand we find a quantum acceleration computer, capable of performing multiple calculations in parallel thanks to the quantum bit unit and a computing power that solves complex problems that would take years, in a few minutes. On the other hand, a system capable of generalizing and manipulating light particles, i.e. photons. This makes it possible to exponentially accelerate technological innovation on the continent, with practical applications in the world of surgery, lighting, personal computers, and automobiles.
- Robotics is a technology in which Member States strongly believe, especially for its usefulness in complex areas such as manufacturing, search and rescue, surgery, and healthcare. For these reasons, in support of the 2006 European Machinery Directive, Europe is working on a definitive strategy for robotics within the Digital Decade. The initiative will achieve true governance on the adoption of this technology and initiate strategic partnerships between the public and private sectors.



- Internet of Things, macaronically translated "Internet of Things", is the extension of the benefits of the Internet to objects. This allows a connection between man and the tools he uses, with the possibility of interacting with technological devices in a quick and personalized way.

Therefore, Europe's digital future is upon us, and it is now essential to acquire the Digital Skills needed to actively participate in society. Let's talk about *Digital Skills* for the adoption of *AI, IoT, Cloud, Data* and more. Technologies destined to revolutionize the lives of citizens, schools, businesses, and public administration.

In Romania, despite the significant progress made in 2021 in increasing fixed broadband coverage, the relatively slow pace of adoption and poor 5G spectrum coverage has not yet been addressed. However, Romania is on track to achieve the goals of the gigabit society and the digital decade 2030 with high coverage of VHCN networks, while the planned investments will ensure that the country will reach the European Union averages in the coming years. However, this requires ambitious and cross-cutting projects, to incentivize the use of higher capacity networks and bridge the gap between urban and rural areas. To facilitate the development of optical fibres, in particular to establish more efficient permit granting procedures, timely transposition of ECEC is essential. It is therefore important to adopt the draft law transposing ECEC in a timely manner and to relaunch the allocation of 5G spectrum, which is still at a low level. In addition, it would be useful for this alignment to take the form of an update of the broadband strategy to better reflect the gigabit society's goals for 2025 and those of the digital decade for 2030.

Romania lags most Member States of the European Union. The adoption of advanced technologies, such as Cloud, has reached only 11%, compared to the European average of 34%. As regards artificial intelligence, only 1% of companies have adopted such technologies (European average 8%). The processing share of Big Data ATA also remains relatively low, standing at 5% compared to the European average of 14%. There is a significant gap that needs to be closed by 2030 to reach the Digital Decade goal of 75% of companies using Cloud technology, Big Data and artificial intelligence.



Only the 68% share of companies with an average/high intensity of green actions through ICT is slightly higher than the European average of 66%.

The government's strategy "Developing the SME sector and improving the business environment in Romania towards the digital economy in the period 2021-2027" includes cross-cutting measures, such as:

- The development of the network of digital innovation hubs;
- The opportunity for SMEs to acquire the skills needed to benefit from new technologies;
- Being able to help SMEs easily switch digital service providers and take advantage of data portability, as required by the Free Flow of Non-Personal Data Regulation;
- Being able to raise awareness of security threats among SMEs and stimulate investment in cybersecurity.

Romanian companies do not take full advantage of advanced digital technologies obtaining a score below the European Union average; It is therefore encouraging to see the country's efforts to promote the digitalisation of businesses in a wide range of sectors, with state support.

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In Romania's National Recovery and Resilience Pillar, the integration of digital technologies is widely addressed in several components with the aim of modernising the current economy. The business support component proposes specific actions to create a sustainable and simplified environment to increase access to finance through the development of tools adapted to the needs of businesses, as well as the innovation capacity of the CSR system to create synergies between research and business, and to develop the necessary conditions for a sustainable reform of the country's companies.

The digital measures included in the plan should increase the country's competitiveness. Romania is expected to be able to improve the efficiency of the economy and make the most of its digitalization potential through:

- Accelerating the digitalization of both SMEs and large companies, including significant investment through support to the private sector, research and development and innovation;



- Adapting digital skills to labor market needs;
- The introduction of electronic forms in public procurement procedures.

About the digitalization of SMEs, to increase the innovation potential of companies, several funding schemes will be put in place that will focus not only on the adoption of existing digital technologies, but also on the development of advanced digital technologies such as Blockchain Technology, Quantum Technology, Cloud Computing and Artificial Intelligence.



CONCLUSIONS

The lack of digital skills in the various areas, for which Romania is among the European countries most in difficulty, is one of the main limitations for the social and economic development of the country and for its recovery from the current period of crisis, assuming the characteristics of priority. This is why it is necessary that the issue of digital skills becomes a strategic priority for Romania.

The development of the country, closely linked to digital transformation processes, will not be sustainable without an investment in human capital with specialized technological and application skills in the ICT sector. The lack of digital skills becomes one of the main factors negatively affecting development in Romania, becoming a priority.

It is therefore essential to develop and implement digitalization projects to fully benefit from the important initiatives already underway and covered by the measures envisaged in the National Restoration and Resilience Plan of Romania. This plan includes several measures largely linked to the digitalisation of companies and the use of advanced technologies. Reforms and investments should cover regulatory transparency, cutting red tape, simplifying procedures for businesses, and developing digital platforms for implementing regulatory transparency reforms and creating financial instruments together with support plans for the private sector.



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