

Inclusive Innovation in Romania's Economy using AI

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Abstract - This article aims to investigate whether the use of the internet and social networks contributes to or influences digital skills in Romania. The digitalization gap in Romania is calculated as the difference between internet access/use and digital skills, and has been compared with that of the European Union. A descriptive and comparative approach was used to analyze data from the European Commission, Statista, Datareportal, and Eurostat. This research sought to identify structural patterns between internet access, internet use, social media, and digital skills, and did not aim to present causal inferences. A quantitative approach was also applied in this study. As such, to reduce this digital gap and also bring innovation to Romania's economy, the article presents solutions in the field of artificial intelligence tools. The article's conclusions indicate that integrating tools based on AI and learning assistants supports the learning process and can reduce the digitalization gap.

Keywords: artificial intelligence, digital gap, digital skills, education, innovation, new economy

I. INTRODUCTION

The performance of activities on the labor market and integration into society is now conditioned by the possession of digital skills by those who participate in these activities. Given that artificial intelligence, robotics, and quantum technologies have undergone significant evolution and expansion, there is a growing need for digital skills. At the European Union level, programs and initiatives have been set up with the aim of developing digital skills. More specifically, by 2030, 80% of adults should have at least basic digital skills, and there should be 20 million ICT specialists employed, [1]. Furthermore, the Digital Education Action Plan has the following main objectives: developing and improving the digital skills and abilities needed for digital transformation, as well as developing and creating a digital education system that can deliver performance, [2]. Back in 2013, the European Commission introduced a framework to outline the digital skills that every individual

should possess, regardless of their level of proficiency in using digital tools. This framework was designed to be useful for decision-makers in all fields to develop digital skills. Since its launch, this framework, called the "Digital Competence Framework for Citizens" has been constantly updated to best fit the current technological and economic context, [3].

When it comes about the perspective that young people have about technology and social media they identify it effective for communication, information, and entertainment. In general, they consider themselves digitally competent and use technology primarily because it is useful when it comes to applications and platforms. They believe that technology can help them improve themselves and their skills, [4].

There are differences in digital skills even among young people known as "digital natives." Although they grow up and develop in a technology-dominated environment, their digital skills vary from one age group to another. For example, older age groups have more developed digital skills. However, the constant exposure to technology and using social media does not necessarily correspond to advanced digital skills, [5].

As far as Romania is concerned, according to the latest report entitled Digital Decade Country Report - Romania, only 27.7% of Romanians have basic digital skills. This percentage is also the lowest in Europe, with the European average being 54%. Romania is also below the European average when it comes to the proportion of ICT specialists employed in Romania. In 2024, the percentage of employees in this sector will be between 2.6% and 2.8%, compared to the European average of 5%, [6].

According to the study, Internet consumption in Romania has increased in all categories, but activities are predominantly consumption-related, such as social media use or entertainment, [7].

Romania also has shortcomings in terms of digital and data literacy. The fact that the population has low levels of digital skills has unfavorable effects on employment, social participation, and even access to modern health services, [8].

There is a great need among adults in Romania to develop digital skills to grow and remain competitive in a digital economy, [9].

This article aims to explore the relationship between the usage of the internet by the population, social media, and digital skills

and abilities. And at the same time, the ways that social media usage is described in relation to digital empowerment. The article includes a calculation of Romania's digitalization gap based on data related to internet access, internet usage, social media usage, and data on digital skills. Another goal of the article is to come up with a bunch of solutions and suggestions to reduce the digitalization gap.

When discussing digital skills, the term "digital literacy" is addressed and researched in the specialized literature. This term has seen a rise in academic interest, but it also represents a fairly broad conceptual framework that is not limited to a technical skill that one must possess, but also encompasses critical, ethical, creative, and innovative thinking, [10].

In Romania, digitization and social media can contribute to empowerment by expanding access to information and platforms. This digital empowerment has led to notable transformations in terms of participation and expression, [11]. However, research shows that equal access to the internet for the population, together with the same duration of use, does not necessarily correspond to educational, economic, and social benefits or informational autonomy. These depend greatly on digital skills, the socio-economic environment, digital literacy, and even motivation, [12].

Providing access to the internet or technology alone is not enough to reduce digital inequalities. Access must be accompanied by digital literacy, as well as access to infrastructure and applications alongside hardware, [13].

This paper aims to explore concepts related to digital literacy, artificial intelligence, computers, and the application of artificial intelligence (AI) in education. This study highlights an indicator called the digitalization gap, calculated for Romania in comparison with the European Union average. At the same time, it demonstrates that, in Romania's case, access to and use of the internet by the population does not necessarily coincide with the high levels of digital skills. The article also adds value by proposing solutions in this field that are designed to improve digital skills and reduce the digital divide.

The article is structured as follows: Section 2 presents the literature and the current state of knowledge, Section 3 contains information on the data used and the methodology used in the article, Section 4 includes the results obtained from the analysis and calculations performed in Section 3, Section 5 presents the interpreted results, Section 6 proposes AI solutions for increasing digital empowerment, and Section 7 formulates the conclusions of the article.

II. RELATED WORK

According to studies conducted in recent years, digitalization is gaining more and more speed and is starting to be part of the lives of all people, regardless of age, which is associated with an increasing need for people to have digital skills.

We can divide digital competences into two categories, namely basic digital competences and advanced digital competences. When we refer to basic digital competences, we can think of the minimum level of knowledge and skills that a person must have to use the internet and digital technologies in the safest, most efficient, and responsible way, [14].

These basic competences are those that help users identify whether an information source on the internet is safe, how they should behave online, and how they should protect their personal data from possible attackers in the online environment. Without these basic competencies, internet users are prone to more risks in the online environment and cannot navigate effectively through information, [14].

For advanced digital skills, we can say that these are complex activities and advanced knowledge that are no longer aimed at safe surfing on the internet, and how a person should behave in the online environment. In the case of these skills, it is about using the internet and digital technologies to achieve creative creations, solutions to technical or software problems that are complicated, and, more recently, the understanding and effective use of systems based on artificial intelligence, [14].

DigComp 3.0 is the fifth version and the latest framework available. It covers all levels of competence and aims to present what is needed to be digitally competent regardless of age, [15]. This new version focuses on recognizing the very rapid development of technology by integrating competencies related to Artificial Intelligence. According to statements from the European Commission, the so-called "learning outcomes" have also been introduced, more precisely over 500 in number, which aim to detail what an individual should know, related to all levels of digital competence, [15].

Given the way society has evolved technologically to date, people need to develop their digital skills. Simply by using the internet more frequently, they can learn how to search for and locate relevant information and analyze it critically. Another benefit is that using the Internet after a person has learned how to find and filter information can be associated with learning new digital skills. These digital skills include content creation, more effective communication in the online environment, using digital resources collaboratively, and many other skills, [16].

In Romania, access to technology and specifically to the internet has increased in recent years, but the development of digital skills is an area that requires ongoing improvement and attention. For this reason, we can argue that digital access is complementary to the term digital skills. The lack of digital skills can lead to an imbalance, even in environments where access to technology exists, [17].

Figure 1 below provides an overview of the global adoption of information and communication technologies (ICT), which is influenced by citizens' ability to incorporate digital tools into practical tasks such as communication, consumption, learning, and work, [18].

Given the rapid expansion of information and communication technologies over the last two decades, the way society deals with accessing information, how it interacts, how it transmits information, and conducts its economic activities has been redefined. There are several stages in which ICT adoption was made: at first, fixed telephone lines appeared and spread, then more frequent internet subscriptions and the rapid increase in the level of use of mobile (smart) phones. Currently, the main way to communicate, access information, and use online services, with over 8 billion active subscribers in 2024, are mobile technologies, [19].

Adoption of communication technologies, World

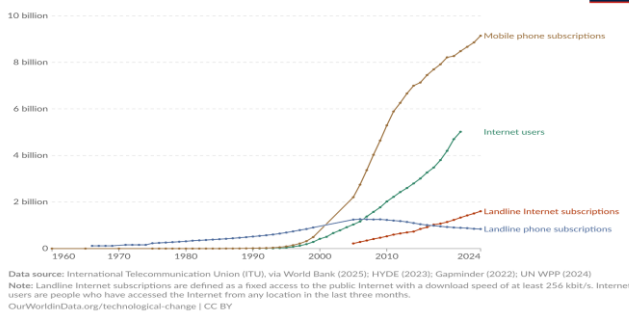


Fig. 1: The evolution over time of the adoption of communication technologies at a global level

Source: [19]

Further in 2025, challenges emerge in the field of technology that appear in the form of trends. To the same extent, technologies that are intended to impact the ICT adoption environment also appear. For important advances, the following are worth mentioning: the increase in demand for computing power, which includes quantum computing, the adoption of methods based on artificial intelligence together with agentic AI and the expansion of autonomous systems, [20].

In Europe, ICT adoption is closely linked to strategic policy frameworks such as the Digital Decade 2030, setting harmonized targets and objectives for digital skills for the population, public services, and business digitalization across the European Union, [21].

In this context, Romania is the country that still faces difficulties related to structural weaknesses. Specifically, based on data from the European Union, Romania is among the leaders in the EU with fixed connectivity (related to internet infrastructure) even in not very populated areas. Nevertheless, at the level of the entire country Romania shows deficiencies related to basic digital skills. The country demonstrates limited ambition in its contribution to the Digital Decade. According to Figure 2 there are 11 national targets set, of which only 36% align with the EU 2030 targets, [22].

Digital Decade KPI ⁽¹⁾	Romania			EU			Digital Decade target by 2030	
	DESI 2023	DESI 2024	Annual progress	DESI 2024 (year 2023)	Annual progress	RO	EU	
Fixed Very High-Capacity Network (VHCN)	95.6%	95.0%	-0.6%	78.8%	7.4%	99%	100%	
Fibre to the Premises (FTTP) coverage	95.6%	95.0%	-0.6%	64.0%	13.5%	99%	-	
Overall 5G coverage	26.8%	32.8%	22.4%	89.3%	9.8%	62%	100%	
Semiconductors		NA						
Edge Nodes		5		1 186		113	10 000	
SMEs with at least a basic level of digital intensity	22.2%	26.8%	9.9%	57.7%	2.6%	75%	90%	
Cloud	11.3%	15.5%	17.1%	38.9%	7.0%	40%	75%	
Artificial intelligence	1.4%	1.5%	3.5%	8.0%	2.6%	10%	75%	
Data analytics	NA	21.9%	NA	33.2%	NA	15%	75%	
AI or Cloud or Data analytics	NA	28.7%	NA	54.6%	NA		75%	
Unicorns	0			263		x	500	
At least basic digital skills	27.8%	27.7%	-0.2%	55.6%	1.5%	50%	80%	
ICT specialists	2.8%	2.6%	-7.1%	4.8%	4.3%	4%	~10%	
e ID scheme notification		No						
Digital public services for citizens	47.6	52.2	9.7%	79.4	8.1%	100	100	
Digital public services for businesses	44.6	50.0	12.1%	85.4	2.0%	100	100	
Access to e-Health records	57.1	58.6	2.7%	79.1	10.6%	x	100	

⁽¹⁾ See the methodological note for the description of the indicators and other descriptive metrics

⁽²⁾ Last measure used is for 2023

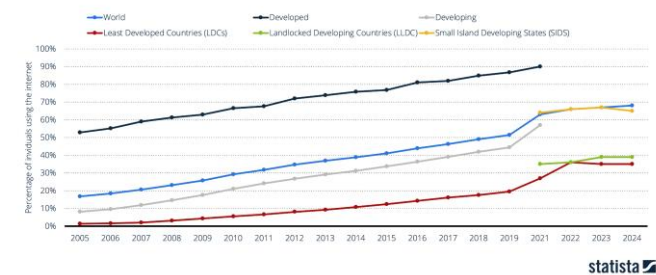
Fig. 2: Data on digital decade KPIs in Romania and Europe

Source: [22]

Internet access is the foundation for digital inclusion. Worldwide, the average level of internet access reached +68% in 2024, [23], [24]. That said, the most developed countries and regions with mature markets are the places where internet access is concentrated as we can see in Figure 3.

Percentage of global population accessing the internet from 2005 to 2024, by market maturity

Global internet access rate 2005-2024, by market maturity



statista

Fig. 3: The associated data are presented in Figure 4 and Figure 5

Source: [24]

At the global level, regions with more advanced economic and institutional development, like Europe and North America, also record high internet usage rates for both genders, generally above 85–90%. Europe, in particular, shows near parity between female and male users, indicating that internet access has transitioned primarily from a selective resource to a standard public benefit. The date is represented in Figure 4 and Figure 5.

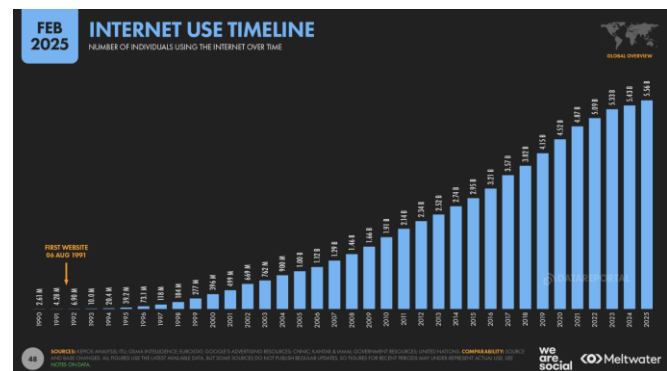


Fig. 4: Number of individuals that are using the internet by February 2025

Source: [25]

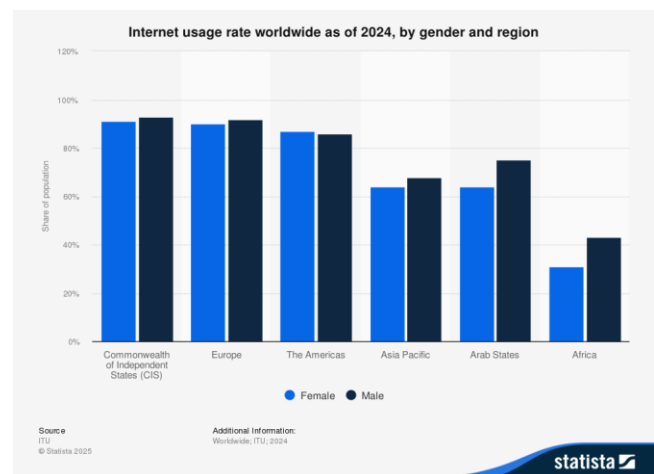


Fig. 5: Internet usage worldwide in 2024 in percentage (by gender and region)

Source: [26]

In Romania, the number of internet users has shown a favorable annual growth since 2017. At the end of 2024, we had 18.06 million internet users, representing more than 91% of the total population who had access to the internet, [23], [25]. Moreover, at the end of 2024, the National Authority for Management and Regulation in Communications (ro ANCOM) reported 21.3 million active mobile internet connections, indicating a high level of mobile usage of the internet. Notably, a substantial majority of these connections, around 85%, equivalent to 18.1 million subscriptions, support 4G and/or 5G technologies, [27].

At the infrastructure level, Romania has a very high level of internet access, but more importantly, there are questions about who uses the internet, how often, and what the reason for using it is.

Worldwide

According to Statista, in 2024, internet users at the global level spent an average of 143 minutes on social networking platforms, [23]. Age remains the strongest determinant of internet usage worldwide, as well as in Europe and Romania, [28].

Figure 6 shows the year 2024 where internet use by individuals aged 15 to 24 was almost universal in high-income countries, with 99% of this demographic online. In these countries, internet access among those aged 25 and over was lower at 93%. This indicates a small and persistent generation gap. Upper-middle-income economies had 97% usage among younger people. In contrast, low-income countries had much lower internet use. Specifically, only 43% of young people aged 15-24 had internet access.

Age distribution of internet users worldwide as of 2024, by country income level

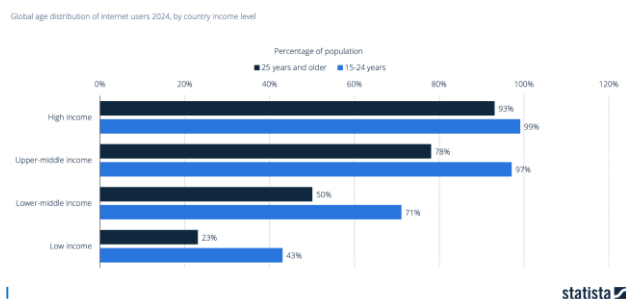


Fig. 6: Worldwide internet usage in percentages by age distribution in 2024 (by country income)

Source: [29]

Overall, the average daily time spent using the internet by age and gender reveals that age is the dominant variable, as gender differences remain marginal regarding the use of the internet in general, [23].

According to the data presented in Figure 7, the highest levels of internet use are on average greater than 7 hours per day for people aged 16-24. Of these, those who spend more time on the internet are women compared to men. The same pattern was observed to apply to people aged 25 to 34. Also for this category of people, daily internet use is over seven hours for both women and men, which leads to the conclusion that digital technologies are integrated into those activities related to work, social

interaction and entertainment. A decrease in daily internet use time to approximately 6 hours was recorded in the age groups 35-44 and 45-54, [23].

The most significant decrease in internet use is observed among individuals aged 55-64, whose average daily usage is slightly above five hours. This decline becomes more pronounced in the +65 group, where overall internet use is substantially lower, especially among men. Women aged 65 and above remain somewhat more active online than men in the same age group, which may indicate a greater reliance on digital communication to maintain social connections, [23].

Average daily time spent using the internet by 3rd quarter 2024, by age and gender (in hours, minutes)

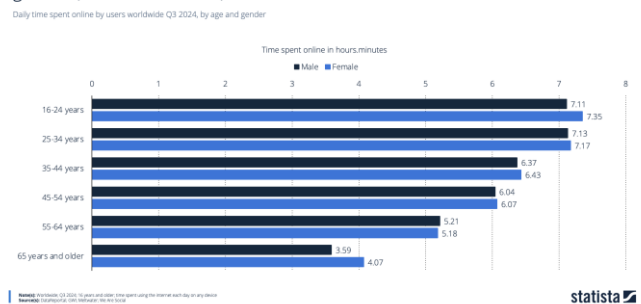


Fig. 7: Average daily time spent using the internet by the 3rd quarter of 2024 (by age and gender)

Source: [30]

Europe & Romania

Nearly all Europeans aged 16-34 are daily internet users, while adoption drops significantly among adults aged 55 and above, [25]. According to Eurostat, in the EU, 94% of households have internet access (+80% since 2014). At the EU level, 88% of all individuals aged 16-74 years old use the internet daily, [31]. Over 97% of young people aged 16 to 29 report daily internet use and show significantly higher engagement in social networking activities than the general population. Social media platforms now serve as the primary source of information on political and social issues for this demographic. For topics such as politics and social issues, social media applications are the information tools. A study conducted in 2025 by Flash Eurobarometer showed that 65% of the people participating in the survey stated that they use social media as the main source of information. It is also worth noting that 88% of those aged 16-29 actively use social networks compared to 65% of the EU population.

In the case of Romania, internet use demonstrates a sustained generational divide. Figure 8 shows that the degree of internet adoption reached a percentage of 99% for Generation Z in 2023. This is suggesting a broadly universal connectivity. As a parallel, Generation X, which also includes groups of parents and grandparents of Generation Z, has a usage value of less than 81%. The data, however, highlights a progressive convergence; the internet penetration rate among Generation X reached 74% in 2021, suggesting that the intergenerational disparity, although still present, is diminishing at a notable pace, [23].

Internet usage rate in Romania from 2016 to 2023, by age group

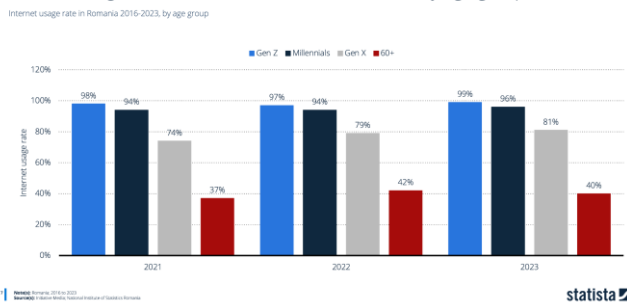


Fig. 8: Internet utilisation rate in Romania, 2016 to 2023 (by age group)

Source: [32]

The number of registered users in Romania in January 2025 is 17.8 million. This value represents 94% of the total population. According to [25], in the 3rd quarter of 2024 the internet is accessed using a mobile phone by 99% of users in Romania aged 16 and older. At the same time the internet is used to connect to social networks by 95.9%, for online press by 77% and further 69.9% used the internet to listen to podcasts and 62% used it for music streaming applications. Moreover, Romania recorded an average daily internet usage of over six hours, 16 years old users and above, surpassing all traditional media formats. Digital environments serve as the primary ecosystem for information, communication, and entertainment. Figure 9 illustrates share of the internet users in Romania for every region in the country.

Share of internet users in Romania in 2024, by region

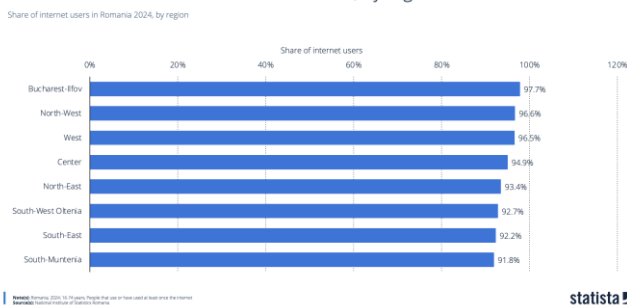


Fig. 9: Share of internet users in Romania (by region)

Source: [33]

One of the main elements that contribute to shaping digital consumption patterns is represented by mobile devices. The most time is spent on the internet on mobile phones with over 3.5 hours per day. In contrast, the time allocated to accessing the internet on laptops, desktops or tablets is much less, which indicates a transition towards a more personalized, continuous and flexible digital consumption that depends on the context.

For Romanian teens, use of the internet means spending a lot of time on social media platform apps. For the cohort aged between 13 and 7 TikTok is the most used app. According to WHO information, the application where adolescents spend the

most time is social media. The content accessed varies from graphic and visual formats to entertainment (TikToks, Reels, Stories).

In the WHO/HBSC report, which is carried out by the European Regional Office on adolescents, it showed an increase in problematic use of social networks from 7% to 11% in recent years. The report also notes gender differences and associations with well-being concerns. 18 countries and regions reported a significant increase in problematic social media use (SMU) among teens, both boys and girls, though substantial variation was observed across countries and regions. Among European countries, Romania is the country with the highest prevalence of problematic social media use. Data shows that in 2024, 22% of adolescents are categorized as problematic users due to the large amount of time spent on social media, [25].

The consumption of social networking applications is increasingly widespread and has been integrated into daily activities around the world. According to data from January 2025, an estimated 5.24 billion people frequently used social media tools. This number of people corresponds to a percentage of approximately 63.9% of the global population, [27].

Social media platforms currently represent the predominant form of engagement in the digital environment, with their users outnumbering non-users by a ratio of approximately two to one. Specifically, 94.2% of people who use the internet also use social networks. Worldwide, 6 out of 10 individuals have a presence on social networks. When it comes to age groups, the adoption of social networks is universal, with 86.6% of people aged 18 and over using them every day. The average number of social platforms that users interact with monthly is 6 to 7.

The time spent by people around the world on social media is 12 billion hours in 2024 which is similar to 1.38 million years. This means that on average individuals spend 2 hours and 20 minutes per day on social media. In a study conducted by Statista, the social media applications in 2024 have the highest number of users each month and are active are:

- The Facebook application remains the #1 most widely used social media application worldwide with 3.06 billion monthly active users.
- The YouTube application is in second place, used both for social media and as a video platform, and reaches 2.5 billion active users every month.
- The use of WhatsApp and Instagram by 2 billion active users each each month is a sign that the area of online messaging and interactions that have as their main element visual still prevails. In 2025, Instagram reported a growth of 5.5%.
- TikTok is the fastest growing platform worldwide with approximately 1.5 billion monthly active users. Comparing Instagram and TikTok in terms of user growth, TikTok is the slower app with only 2% growth.

- Platform X (formerly known as Twitter) remains a platform with a recognized impact in strange instabilities and has approximately 611 million active users.
- The Pinterest application maintains or grows steadily for information in the area of visual and inspirational content, with 498 million monthly active users.
- Facebook's Messenger app proves, with its billion monthly active users, that it has been continuously and consistently adopted within the Meta ecosystem.
- The Telegram application has managed to have 900 million monthly users, which leads to the conclusion that it is a demand for encrypted and private communication.
- Snapchat's strength is that its users are a young group. Its number of monthly active users is 800 million, [25].

Across the globe, social media is used equally by both genders (women and men). The only remaining variables are platform-level differences and age. According to [25], and Figure 10 in Q3 2024, globally, Instagram is the preferred social media platform among younger users (16–34), for both women and men, with preference declining steadily as age increases. TikTok follows a similar age-driven pattern, performing strongest among younger audiences and losing relevance among older age groups.

As users get older, WhatsApp and Facebook become the dominant favorite platforms, particularly among those aged 45–64, reflecting a shift toward communication, utility, and familiarity rather than entertainment or trend-driven content, [25]. WhatsApp is powerful across both genders in older segments.

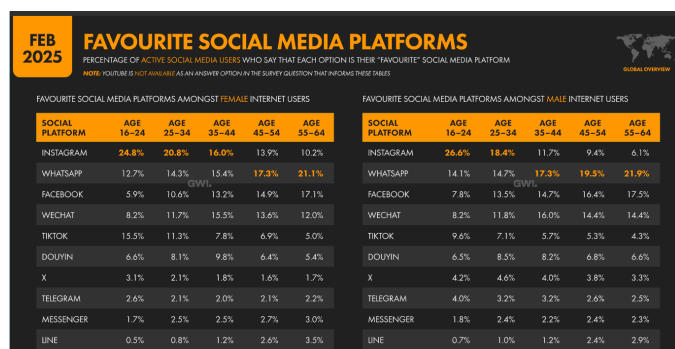


Fig. 10: Favourite social media platforms

Source: [25]

The process by which people gain not only access to technology but also the skills needed to work with it is called Digital Empowerment. This is a multi-stage process, through which people gradually learn everything they need to know to be able to cope in a society focused on digitalization, [34].

When we think about empowerment, we can say that there is a very strong connection between it and the internet and social networks. The two, over time, have given a new meaning to communication, collaboration, and expression of people

regardless of age. Social networks have had a great impact on people and have motivated many people to develop their digital skills. This is because using social networks, there is the possibility of very easily overcoming many barriers, including the geographical one, which allows very easy communication with people from different regions of the planet, [35].

If in the past the digital gap was more common due to the fact that people did not have access to the internet and were not connected to the digital world, over time internet access became increasingly accessible and new technologies were increasingly common in people's lives. However, over time, access to the internet and new technologies began to appear in the lives of more and more people. However, at this moment, even though the internet and new technologies are more easily accessible, the digital gap is given by the different levels of digital competence that users have, [36].

The way in which the internet is used can help us understand where the digital gap exists. A group of people who use the internet to carry out simple activities has no way to develop their digital skills, like a group of people who carry out complex processes on the internet or who explore all the functionalities of this tool to learn as much as possible, [36].

In the current context, we can say that the term empowerment is made up of several factors. A first factor is access to digital resources such as the internet or social networks. The use of these tools is another important and necessary factor. If these networks are used correctly, digital skills, which are the third factor in the term "empowerment", can improve considerably. Users can learn to navigate faster and more efficiently through information, they can learn to filter information and choose what they need much more easily, they can communicate much more effectively, and they can even create their own digital content, [37].

Artificial Intelligence is an agent that plays an important role in the development of digital skills. When it comes to adaptive learning and personalized content, we can say that AI brings the possibility of explaining any concept regarding digitalization, in the understanding of each individual. In short, regardless of the degree of digital skill that an individual has, through adaptive learning, they can learn complex concepts that can be explained in their understanding, [38].

AI systems can determine, following interaction with a user, at what level of digital competence they are and can suggest content that is useful to them. That content can be intended to correct gaps or can help the individual learn new information and develop new skills, [39]

Currently, the educational environment uses the Artificial Intelligence component to develop the digital skills of students. This is also happening at the level of Romania, thus students are guided towards well-developed knowledge and skills in the field of digitalization. However, Artificial Intelligence is a useful learning tool for any individual, regardless of their age or background. Each user has access to content that is modeled on their needs. Therefore, adaptive learning is a concept that does not just represent static personalization; it aims to adapt information dissemination strategies through constant analysis of the individual's profile and progress, [40].

Artificial Intelligence helps to increase the efficiency of the learning process, but there are also some possible risks that should not be neglected. One of them is the possible addiction that this tool can give, which can lead to a reduction in critical thinking. One of the most useful digital skills is to know how to correctly use the information obtained with the help of Artificial Intelligence, [41].

UNESCO argues that technologies that include artificial intelligence can develop users' digital skills through several intelligent tools, such as chatbots or learning analytics. At the same time, it highlights the fact that important aspects must be taken into account when using these tools. These are the ethical challenges that arise when users have access to a lot of information that they can use without going through the train of thought, [42].

III. DATA AND METHODOLOGY

The main methodology used for this research is descriptive-comparative, suitable for the analysis of statistical data sets from various European and international sources, [43]. Another methodology was also applied for this research, a quantitative one. The descriptive framework adopted in this study aimed to illustrate the use of the internet, social media, and differences in digital skills in Romania. The results of the present analysis should be interpreted as exploratory rather than causal or inferential.

The methodology was chosen so as to be suitable for analyzing data taken from Eurostat, [44], Datareportal, Statista, the European Commission, and for assessing and calculating the difference between internet and social media use by the population, and their level of digital skills.

Internet usage and the level of internet access

Eurostat is the source of the data on internet usage (indicator tin00091) and includes information on the percentage of individuals who use the internet frequently. By frequently we mean almost every day or at least once a week in 2024.

With regard to data on internet access (indicator isoc_ci_in_h), Eurostat was also used to obtain this information, which presents more specifically the households in Romania that have internet access at home. The data presented includes all forms of internet use, [44].

For this research, only data from 2024 for Romania and the European Union countries will be presented, [31].

Data from 2024 for Romania shows that 90.44% of the population aged 16-74 use the internet regularly, which means almost every day or at least once a week in the last 3 months. With this data, we can observe a situation regarding active individuals, not just accessing. At the European Union level, the corresponding rate is 91.67%, [31].

The percentage of households (indicator isoc_ci_in_h) that had access to the internet in Romania in 2024 is 94.57%. At the same time, the percentage for the entire European Union was 94.19%. The data indicate that Romania's infrastructure aligns with European standards, [28].

Given the data and information presented above, it can be said that there are no longer any barriers when it comes to internet

access and use. We can therefore turn our attention to other indicators such as digital skills and the digitalization gap. All of this data helps to provide further explanations and at the same time a solid topic to address and perform the calculation regarding the digitalization gap.

The usage of social media (by brand and age) in 2024 in Romania

Romania is part of this global trend, while also presenting a pronounced intergenerational disparity, while distinct ecosystems of social media platforms configure the local digital landscape. Romania is a representative case in this regard. Although the degree of presence of social networks is high, usage patterns show certain differences compared to global trends.

In January 2025, 17.8 million people were active on the internet daily. This represents 94% of the total population between January 2024 and January 2025. In January 2025, approximately 13 million Romanians used social media, or almost 69% of the population. However, some of these accounts may belong to the same person, so the actual number of users may be lower. While the methodology aims to “de-duplicate” social media identities across platforms, a certain level of overlap remains possible as a typical limitation of social media reporting tools.

According to the data presented in Figure 11, the number of social media users in Romania is expected to grow by 2.8 million between 2024 and 2029, which represents an increase of 18.75%. It is thus estimated that by 2029, the total user base will reach approximately 17.69 million. This growth, however, is not expected to be linear, [23].

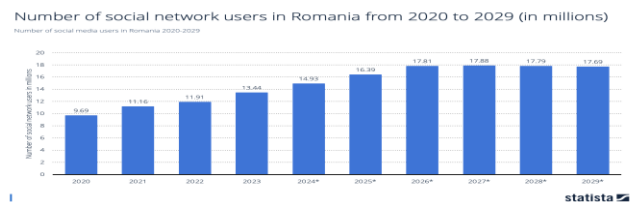


Fig. 11: Number of social network users in Romania from 2020 to 2029 (in millions)

Source: [45]

Over time, social media usage in Romania has fluctuated around 13 million active users yearly. The percentages fluctuations are illustrated in Figure 12.

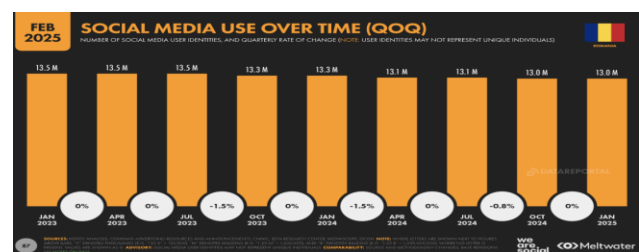


Fig. 12: Number of social media user identities (quarterly, 2023–2024)

Source: [46]

At that time, 50,8% of Romania's social media user identities were female, while 49,2% were male. The country's urban online population is highly engaged: surveys indicate that about 80% of urban Romanians use a social platform daily, [46].

Advertising tools across major platforms (Meta, Google) reveal that 11,6 million adults (18+) were active social media users at the start of 2025, accounting for 75.5% of the country's adult population.

According to the data in Figure 13, in 2024, 59% of Romanians spend more than four hours online daily, and 30% between two and four hours, indicating a high level of engagement in the digital environment. These results attest to the early and sustained integration of digital platforms into daily life, generating relevant concerns regarding the consolidation of usage patterns, the allocation of attentional resources, and the long-term consequences on the development of digital skills, as well as on individual well-being.

Daily online time distribution in Romania in 2024, by consumer segments

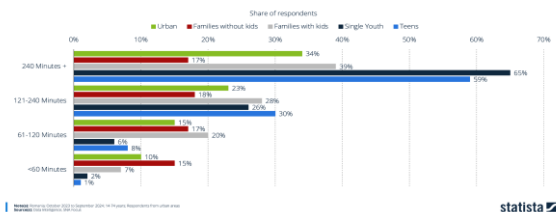


Fig. 13: Daily online time distribution in Romania in 2024 (by consumer segments)

Source: [47]

Time spent online is not evenly distributed and is strongly conditioned by life stage and social role. The high degree of digital exposure among young people does not necessarily imply the development of superior digital skills, but rather constitutes a sustained immersion in ecosystems oriented primarily towards passive consumption. Reduced digital exposure among the older population limits opportunities for skills acquisition, deepening existing digital divides. Facebook, Instagram, YouTube and TikTok are the central platforms of daily use for users over 16 registered in the third quarter of 2024, with notable variations across age groups, illustrated in Figure 14.

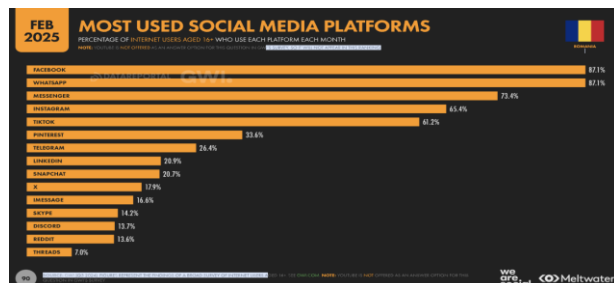


Fig. 14: Most used social media platforms

Source: [46]

Figure 15 shows the distribution of social media use across platforms in Europe, highlighting the fact that there is an extreme concentration of this on Facebook, [48].

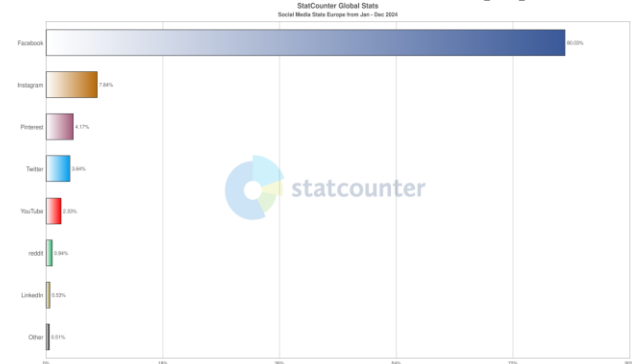


Fig. 15 - Use of social media platforms in Europe in 2024

Source: [48]

Figure 16 presents a graph from January to December 2024 with the distribution of social media in Romania. The data for both Romania and Europe were obtained from Statcounter. What can be observed from both graphs is that Facebook dominates the market with approximately 80% of usage. This is the main platform both in Romania and in Europe. At the European level, approximately 80% of total accesses to social media platforms in 2024 came from Facebook, [49].

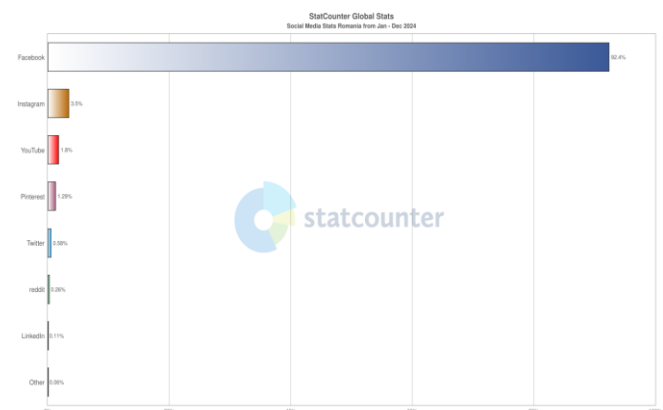


Fig. 16 - Use of social media platforms in Romania (2024)

Source: [49]

The data presented in the two figures will be used to calculate the Internet Usage indicator.

Facebook

According to Meta and Figure 17, there are 12,7 mil users in Romania, with approximately 9,90 million active users every day. Facebook stands out as the most popular platform both globally and in Romania. It continues to function as the country's largest cross-generational network, reaching 85% of all users. Its influence, however, erodes in younger cohorts, where Gen Z adoption drops to 71%, reflecting a shift in attention and cultural belonging.

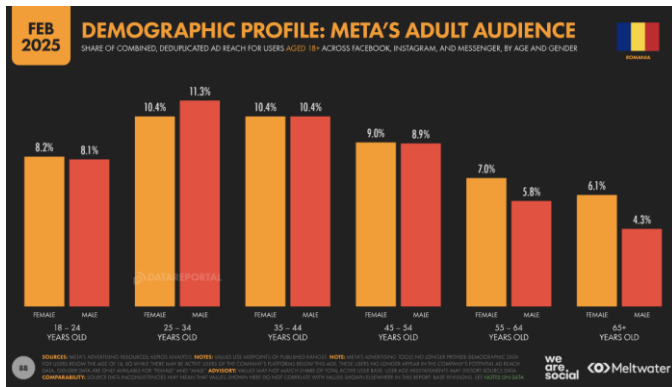


Fig. 17: Meta's adult audience

Source: [46]

TikTok

TikTok dominates Generation Z preferences, with a penetration rate of 71%. Figure 18 highlights fluctuations in downloads during 2021–2024, with a peak of 5.61 million in 2023, confirming the platform's growth in the Romanian market. As of January 2025, TikTok data indicates 8.51 million adult users in Romania, [25].

Number of TikTok app downloads in Romania from 2021 to 2024 (in millions)

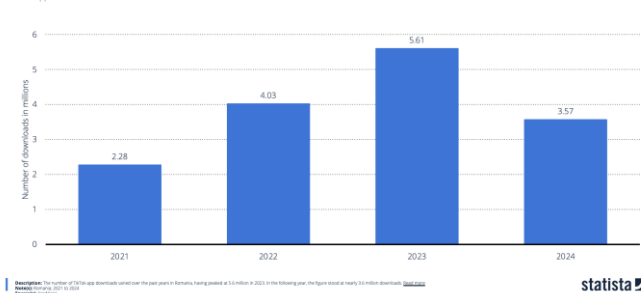


Fig. 18: TikTok app downloads in Romania (2021–2024)

Source: [50]

Based on the analysis of the most popular TikTok pages, we can observe that influencer campaign awareness on TikTok in Romania has shown steady growth across almost all content categories, with music, gastronomy, tourism, and beauty & fashion emerging as the most highly recognized themes. In addition, educational, lifestyle/entertainment, and sustainability-related content display consistent upward trends, indicating a gradual expansion of TikTok's role beyond purely entertainment-focused use, [25].

Instagram

Instagram is widely popular among younger and middle-aged users, particularly Millennials. In the third quarter of 2024, 33.2% of individuals aged +13 years old and above in Romania reported using Instagram within the past 12 months. During the same period, 35.5% of those over the age of 18 used Instagram.

From a gender perspective, the adult advertising audience in Romania was 53.2% female and 46.8% male. Figure 19 highlights a steady increase in the number of Instagram app downloads in Romania between 2021–2024, with a record high in 2023.

Number of Instagram app downloads in Romania from 2021 to 2024 (in millions)

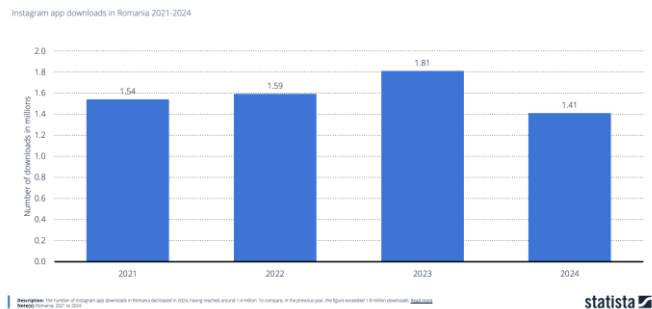


Fig. 19: Evolution of Instagram app downloads in Romania (2021–2024)

Source: [51]

Youtube

Google data indicates approximately 13 million YouTube users in Romania in 2024. Unlike other platforms, YouTube presents a uniform transgenerational reach, operating predominantly as a media infrastructure, not as a traditional social network. According to Datareportal, the Digital 2025 Report, YouTube ads reached 73.0 percent of Romania's total internet user base (regardless of age) in January 2025. YouTube is the only platform that registered a slight decrease of -2.3% of usage in Romania.

LinkedIn

LinkedIn, although used by only 21% of the total population, becomes extremely strong in professional cohorts, surpassing 25% among Millennials and Gen X. More specifically, 38% of LinkedIn users are 25-34 years old, and 30% are between 35-54 years old. Only 2.9% of LinkedIn Romanian users are +55 years old or older.

Facebook's dominance, coupled with the growing adoption of Instagram and TikTok, suggests a layered use of platforms, rather than a substitution of them. Romanian users have not abandoned established platforms, but are expanding their digital presence, resorting to different platforms for distinct social, informational, and entertainment purposes. This trend suggests that the proliferation of platforms does not necessarily redistribute digital skills, but rather reorganizes attention and consumption patterns across multiple media.

Motivations for social media use

Global digital trend reports indicate that individuals cite multiple motivations for social media use. Maintaining social ties and entertainment are the most prevalent reasons, whereas

news and information-seeking are important but secondary motivations, [25].

Examining search patterns and popular content on social media platforms can highlight divergence between stated motivations and actual digital consumption behaviors, especially in the Romanian context.

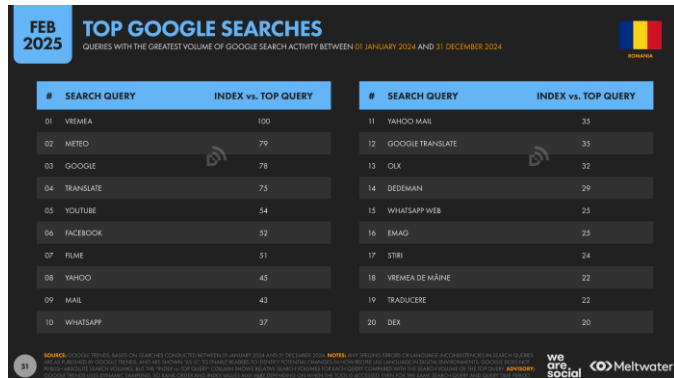


Fig. 20: Queries with the greatest volume of Google Search activity between 01 January 2024 and 31 December 2024

Source: [46]

Thus, the data presented in Figure 20 indicates that the most frequently searched terms on Google are predominantly functional in nature, oriented towards navigation and consumption, rather than towards education or skills development. High-ranking queries include basic utilities such as weather information (“Vremea”, “Meteo”), access to platforms (Google, YouTube, Facebook, Yahoo, WhatsApp), translation tools (Translate, Google Translate, Translation) and entertainment content (Movies, News). These patterns reflect routine information needs, media consumption and platform navigation, rather than complex problem-solving, learning or advanced information seeking behaviors.

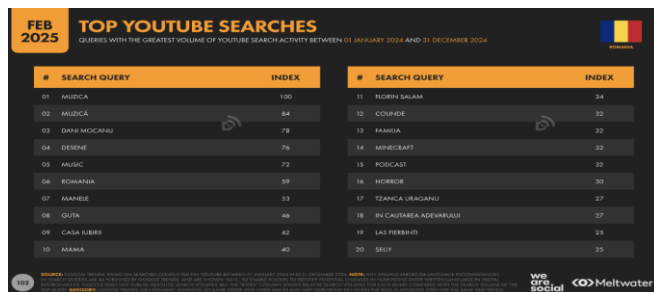


Fig. 21: Queries with the greatest volume of YouTube Search activity between 01 January 2024 and 31 December 2024

Source: [46]

YouTube search patterns in Romania from January to December 2024, shown in Figure 21, confirm the consumption-oriented nature of digital behavior identified in this study. The most frequent queries target *music content, entertainment personalities, television shows, games and related content*, with minimal representation of educational or skills-building topics. The analysis of the applications with the highest number of downloads, illustrated in Figure 22, reveals that Duolingo is the

only educational application, while GPT emerges as the most popular artificial intelligence tool. Other frequently downloaded applications focus on entertainment, socializing, dating services, streaming and gaming.

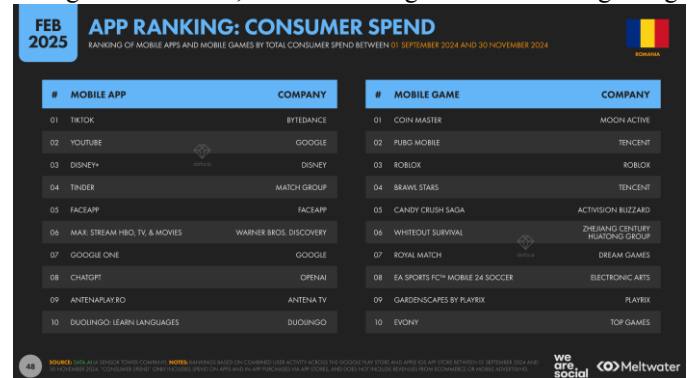


Fig. 22: Ranking of mobile apps and games by consumer spending (September-November 2024)

Source: [46]

Regarding video content types, watched entertainment content is the most used according to Figure 23. Only 27% of individuals watched a tutorial, and only 22% an educational content video on social media.

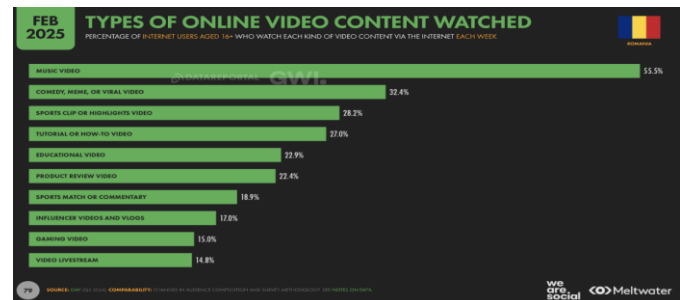


Fig. 23: Types of online video content watched

Source: [46]

According to Statista data, 67% of users said they use the social media platform to research their development, highlighting a generalized dependence on digital social media in the process of searching for information about products, services or companies. The distribution of the types of accounts followed by users over the age of 16 in Romania, illustrated in Figure 24, reveals a clear hierarchy of digital attention, in which personal relationships and entertainment content are prioritized over professional, informative or expertise-based sources.

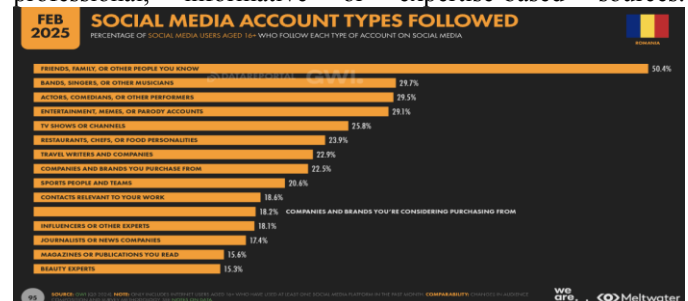


Fig. 24: Social media account types followed

Source: [46]

Digital skills indicators

Data on digital skills in Romania and at the European Union level for 2024 were only found in the Digital Decade Report. As presented in the report, 27.7% of the Romanian population has a basic level of digital skills. We compare this value with the European level, which is 55.6%. In interpreting the percentage of the population in Romania that has basic digital skills, we make a comparison with the Digital Decade target for 2023 in the report, which is 50%, [22].

Formula for the Digitalization Gap

By introducing the concept of the digitalization gap in Romania, we wanted to highlight the difference between internet, social media usage, and the level of digital skills among the population. Current studies in the field have brought to light the fact that, more recently, digital differences are observed in the relation between internet access and digital skills, [12]. In Romania's case, based on the data presented above, there are clear indications of a digitalization gap.

The calculation of the digitalization gap (DG) in Romania was based on a formula containing composite indicators used to measure the digital divide and multidimensional gaps. This approach is in line with the practices and methodologies found in the specialized literature. Specifically, the DG was obtained as the difference between two composite indices: the Usage Index (UI) and the Digital Empowerment Index (DEI), [52], [53].

The formula used to calculate the digitalization gap is shown below and is denoted by (1). It contains the two composite indicators: UI and DEI.

$$DG = UI - DEI \quad (1)$$

Next, we will define each composite indicator separately.

The Usage Index (UI) is an indicator that shows the intensity of internet use, household access to the internet, and social media use. Values for internet use, household access to the internet, and social media use were presented in the previous sections. To obtain the index value, an arithmetic mean was calculated based on the values.

The two indicators were constructed following the OECD & European Commission JRC model for composite indicators. At the same time, the construction methodology is in line with the EU approach, which summarizes national digital performance through a framework for the indicator DESI, [54], [55].

Specialized studies related to the digital divide refer distinctly to access and use, and the results we obtain from them. Therefore, to better represent the level of digital inequality, composite calculations were made for use through the usage index (UI) and composite calculation for the digital empowerment index (DEI), [56], [57].

All values used in calculating composite indicators were normalized in the range [0,1] to ensure comparability between variables expressed on different scales. This procedure is frequently used when indicators are expressed as percentages. Specifically, all values related to internet usage, household level of internet access, and digital skills were converted into

values by dividing them by 100. The aim was to ensure comparability across variables.

Using the values presented in Table 1, the Usage Index (UI) was calculated using the following formula, (2):

$$UI = \frac{\text{Internet usage} + \text{Households level of internet access} + \text{Social media usage}}{3} \quad (2)$$

The value associated with social media usage for both Romania and Europe in 2024 was calculated by normalizing the percentage of users present on the main social media platforms, such as Facebook, Instagram, Pinterest, Twitter, YouTube, Reddit, LinkedIn, and other platforms.

The data we have on social media, presented in the graphs in Figure 15 and Figure 16, show the market share percentages for each social media platform. These values were first normalized in the range [0,1] by dividing them by 100. Furthermore, the indicator expressing social media usage was calculated as an arithmetic mean of the normalized values for each platform. The method applied aimed to represent the average use of social media in order to avoid the dominance of a single platform and, at the same time, ensured that the data specific to the use of each platform contributed equally to this indicator, [54].

The percentage of 12.5% for Romania and 12.49% for Europe represents the normalized average level of social media platform usage calculated based on the distribution of usage shares among platforms. Data presented in Figure 15 and Figure 16.

The values of 12.5% for Romania and 12.49% for the EU are interpreted for this article as an aggregate indicator, normalized to represent social media usage from market structure data. These values are the result of the calculations and methodologies applied above and were not chosen randomly or predefined.

According to the methodologies for constructing composite indicators, the arithmetic mean is used for normalized values. Also, the literature on the digital divide considers social networks as an indicator of basic digital interaction and online engagement, [58], [59].

Applying the formula (2) for Romania, the value obtained for UI is 0.65837, meaning 65.84%.

Given the level of digital skills in Romania of 27.7%, i.e., a value of 0.277, this means that the value for DEI is 0.277.

Furthermore, using (1) to calculate the *digitalization gap* in Romania, we obtained the value 0.38138, meaning 38.14%.

To calculate the indicators and digitalization gap for Europe, we applied the same formulas (1) and (2) using the values in the table.

Therefore, the value of the UI indicator is 0.66117, meaning 66.12%. The value for the DEI indicator is 0.556, considering the level of digital skills in Europe. Next, the two values were applied in formula (1), and the value of 0.1052 was obtained. This means that the *digitalization gap* in Europe is 10.52%.

IV. RESULTS

To present the values used for each composite indicator, Table 1 was created.

Table 1 - Data used for Romania and Europe in 2024 used in calculating composite indices

Indicator	Romania	EU
Internet usage	90.44%	91.67%
Households level of internet access	94.57%	94.19%
Social media	12.5%	12.49 %
Digital skills	27.7%	55.6%

Source: created by the authors

Social Media Consumption Patterns

The analysis of the average time spent on social media apps in Romania, illustrated in Figure 25, reveals a deeply unequal distribution of digital attention, with a significant focus on short and medium-length video content oriented towards entertainment.

TikTok dominates the use of social media platforms by a considerable margin, with Romanian users allocating an average of 42 hours and 19 minutes per month to this platform. This value places TikTok well ahead of other applications, confirming its central role in structuring daily digital routines, especially among younger age segments. The platform's algorithmic architecture, fundamental to continuous content discovery and rapid feedback loops, favors prolonged engagement and passive consumption.

YouTube ranks second, with an average monthly usage of 29 hours and 15 minutes per user, reinforcing its position as Romania's primary long-form video and entertainment infrastructure, [23]. Despite YouTube's potential for educational content and informal learning, its high usage in Romania must be interpreted in conjunction with search behavior data, which show that dominant consumption patterns remain entertainment-driven rather than learning-oriented.

Consumption Motives

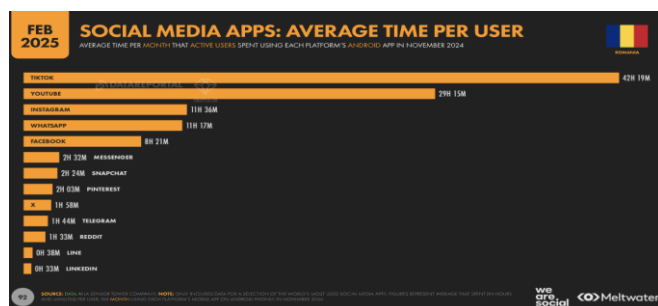


Fig. 25: Average time per month that active users spent using each platform's Android app in November 2024

Source: [46]

According to Statista data, over 60% of internet users globally identify information as their main motivation for use. Communication is the second most frequent motivation, including keeping in touch with friends and family via social media. Taken together, these patterns highlight the central role of the internet in the cognitive, information-oriented, as well as the social and relational dimensions of everyday life.

At the global level, Figure 26 indicates that information seeking represents the primary motivation for using the internet, with more than 60% of global internet users identifying it as their main purpose. Communication-related activities, including staying in contact with friends and family through social media platforms, represent the second most common motivation. Together, these patterns confirm the central role of the internet in both informational and social dimensions of everyday life.

Most popular reasons for using the internet worldwide as of 2nd quarter 2025

Global main reasons for using the internet Q2 2025

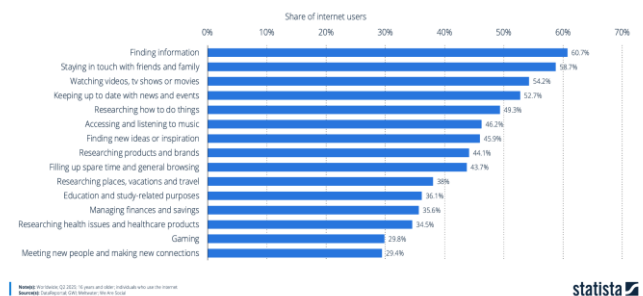


Fig. 26: Most popular reasons for using the internet worldwide as of the 2nd quarter 2025

Source: [60]

The data presented in Figure 27 indicates that, between Q3 2022 and Q3 2024, the share of social media users aged 16 and over who required platform declaration for professional purposes fluctuated within a narrow range of approximately 37% to 39%. This stability suggests that, globally, social media continues to play a significant role as a tool to support professional activities, despite the continued expansion of its adoption base and available functionalities.

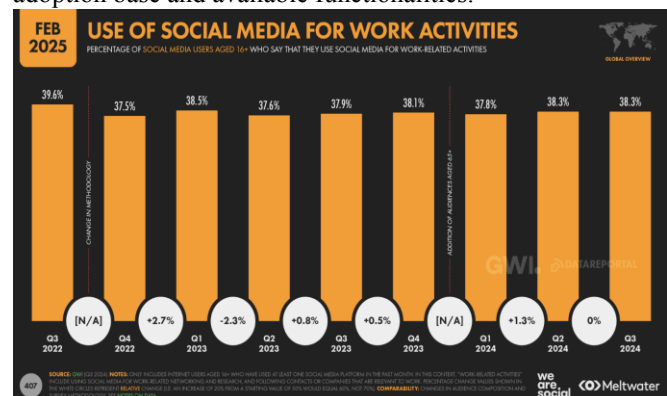


Fig. 27: Use of social media for professional purposes (quarterly, Q3 2022-Q3 2024)

Source: [25]

According to the data illustrated in Figure 28, Romania ranks below the global average and behind several comparable European and non-European countries in terms of the use of social networks for professional purposes. The relatively low use of social media for work-related activities has direct implications for digital skills development. Professional use of social platforms typically involves higher-order digital competences, such as strategic communication, information evaluation and credibility assessment, professional content creation, network-building, and digital identity management.

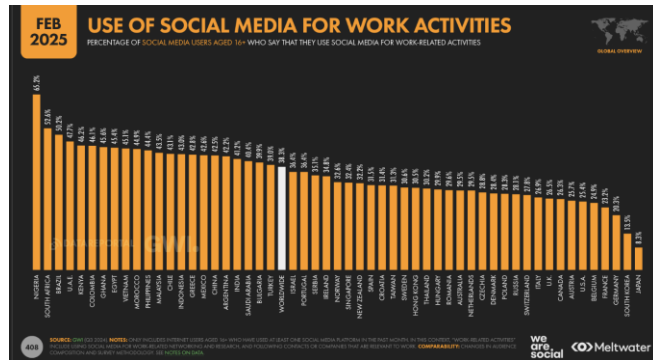


Fig. 28: Use of social media for work activities (per country)

Source: [25]

The data presented in Figure 29 indicate that a significant proportion of people aged 16 to 74 in Europe use the internet to access information, in particular to consult news, newspapers and magazines online, as well as to find information about goods and services. In contrast, Romania ranks among the European countries with low performances on this dimension. Although the majority of Romanian users access information online, the overall rate remains significantly below the EU average and considerably behind the high-performing European economies.

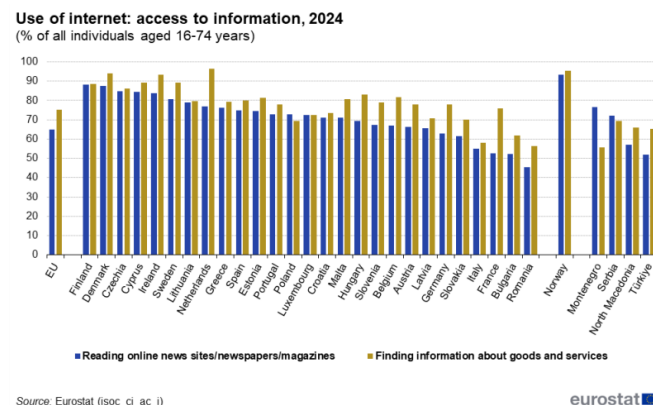


Fig. 29: Use of the internet: access to information in 2024

Source: [61]

In contrast, internet use for entertainment purposes, especially video consumption through sharing platforms, video-on-demand services, and streamed television, exhibits a more uniform pattern across Europe. The percentage of individuals is shown in Figure 30.

Numerous countries, including Romania, demonstrate significant engagement in entertainment-related digital activities. Romania is notable for the relatively high intensity of entertainment consumption compared to informational use. Although informational activities remain below the European average, entertainment use aligns more closely with the EU median. This suggests that Romanian users dedicate a larger proportion of their digital time to passive consumption rather than to knowledge acquisition.

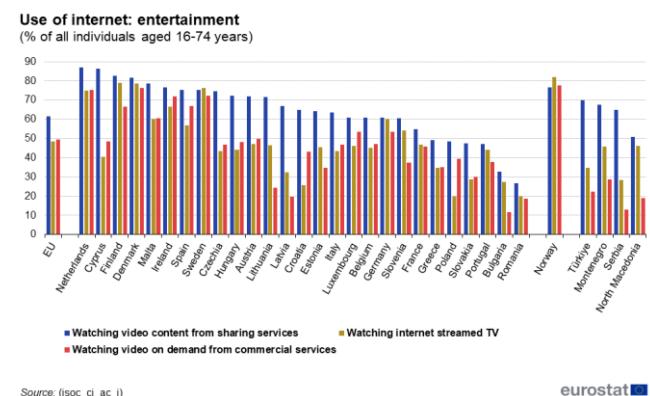


Fig. 30: Use of the internet: entertainment

Source: [61]

The analysis presented in Figure 31 on the use of the Internet for educational purposes in European countries in 2024 reveals substantial disparities in terms of digital engagement for learning. Romania ranks among the countries with the lowest levels of educational use of the Internet, which is particularly significant in relation to the high rates of Internet access and the high frequency of online activity. Despite widespread connectivity, digital practices for learning remain marginal, indicating that the Internet is not systematically exploited as an educational or skills development tool for significant segments of the population.

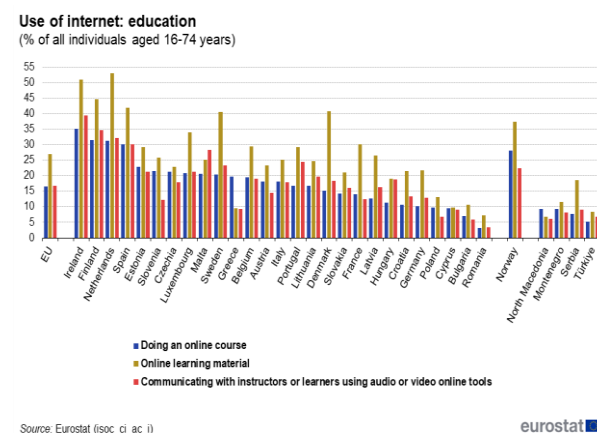


Fig. 31: Use of internet: Education

Source: [61]

V. DISCUSSION

As calculated and presented in Section IV, there is a significant digitalization gap in Romania of 38.14% compared to the value for Europe of 10.52%. This digitalization gap in Romania has been highlighted by the low level of digital skills in Romania compared to the high level of internet use. The results obtained in this case are also in line with theories in the literature, such as that proposed by [62], which states that in societies where there is homogeneous access to technology, inequalities consist in the level of digital skills and the results obtained from the use of technology, rather than in the frequency of use or the level of access.

Referring to the theoretical perspective, the results obtained in this study are part of the third level of the digital divide because the results among users matter in terms of the results and benefits they obtain from using digital technology. As presented by [63], although individuals' access to the internet may be the same, and even if they use it equally, each person obtains something different. These results depend on skills, digital capital, and socio-educational contexts.

What we have identified in Romania is a digital profile where widespread access to the internet and frequent use of it do not coincide with an increase in digital skills. This can be summarized under the concept of "high use - low skills". This is supported by [13], who refers to the same phenomenon in which users spend more time online but without having informational or cognitive skills. The author of [12], calls this phenomenon digital disconnect.

The digital gap we find in Romania does not stem from infrastructure limitations, but rather reflects a shortage of human capital with digital skills. This argument is supported by other studies showing that investments in infrastructure are not the solution to reducing digital inequalities. It is therefore necessary to introduce solutions that intervene in the development of digital skills and digital capital, [64].

Another conclusion from the results obtained is that acquiring and possessing digital skills does not align with intensive use of social media and digital platforms. This is supported by the fact that activities carried out on the internet consist largely of entertainment and socialising, which do not necessarily help to develop advanced information skills, [65].

To reduce the digitalization gap, this research also proposes solutions to be implemented. These solutions come from the field of artificial intelligence and adaptive learning tools. They can help reduce the digitalization gap by personalizing learning processes and developing digital skills.

Therefore, the digitization of the educational environment and the integration of artificial intelligence pave the way for the use of innovative tools that can adjust the content and level of educational content in real time for participants in education. Furthermore, not only are technical skills stimulated, but also the ability to browse information, evaluate, and select data that are part of the digital literacy process.

In order to train digitally competent citizens who are able to use digital technologies, education based on artificial intelligence is needed, [66].

VI. PROPOSED SOLUTIONS

The term AI literacy is very important for a person who operates in a world open to digitalization. AI literacy represents a base of skills and knowledge that allows those who master it to interact correctly with artificial intelligence systems. In order to be able to use AI to its full potential, an individual must also be very familiar with the limitations that Artificial Intelligence has. The development of this literacy in the field of AI is necessary for all individuals to be able to participate actively and responsibly in the activities of contemporary society, [67].

Artificial Intelligence is making its presence felt in most areas of contemporary society. For this reason, professionals from various fields must adapt to working with this tool. Given that digitalization is advancing rapidly, those who want to perform in their field of activity must develop digital skills and understand the importance of AI literacy, [68].

In all professional sectors, Artificial Intelligence has begun to appear over time. However, the degree of use differs from one sector to another. The integration of Artificial Intelligence systems into work practices is most common in the IT field, but over time, the industrial and service sectors have also begun to use these systems frequently, [69].

For a critical and productive use of Artificial Intelligence, it is very important that an individual can formulate appropriate requests; this is called prompting. Without clear requests for what we want, these tools may not accurately provide us with the necessary information, [70].

Three types of models can be defined that underlie adaptive learning. A first model is the rule-based model that works on the basis of well-established rules, which follow structures such as "if - then". Another model is the one based on machine learning that analyzes the behavior of learners and can establish and capture certain patterns. And data-driven, which is the third model, helps to achieve real-time personalization of content, depending on the user's profile that is constantly updated, [71]. The development of digital skills is facilitated by content personalization because the interaction is active and allows users to be exposed to information tailored to their needs. In addition, monitoring the progress that users have made helps them understand that they still have much more work to do and accumulate knowledge, [72].

VII. CONCLUSION

The article scope is to analyze for Romania the relationship between access to and use of the internet and social media and digital skills. This was highlighted by calculating a digitalization gap for 2024, which was compared with the European level.

To calculate the digitalization gap (DG), two composite indicators were defined as follows: UI (the Usage Index), which includes data on household internet access, internet use, and social media use; DEI (Digital Empowerment Index), which consists of the population's level of digital skills. Based on data extracted from sources such as Eurostat, the Digital Decade Report, and the calculated digitalization gap, it can be said that high levels of internet access and use, along with social media use, are not connected with digital empowerment for citizens.

Romania has a significantly lower level of digital skills compared to the European Union as a whole.

The results presented in this study must be interpreted and considered taking into account certain methodological limitations inherent in the sources used. More specifically, the data on digital skills taken from the Digital Decade Report refer to basic skills and do not include advanced skills (which consist of cognitive searches, critical filtering of information, or the use of AI and digital tools for efficiency). The authors of the data used (i.e., the European Commission) acknowledge the above limitations, specifically noting that the values express the situation at a general or macro level. Thus, the interpretation of the data is based on the population level rather than specific groups, [73].

Based on the study results, we conclude that there is a need for paradigm shifts towards policies focused on digital skills development and digital empowerment rather than access policies. This is reinforced by the fact that, in order to achieve the 2030 targets, the European Commission explicitly states the importance of investing in digital skills and human capital, [74].

The main contribution of the article is that it operationalizes the digitalization gap using composite indicators representing the difference between internet use and digital skills.

Another significant contribution is that the research highlights solutions for reducing this gap based on artificial intelligence and adaptive learning tools that support the development of digital skills.

A conclusion would be that in order to achieve the objectives set by the European Union regarding digital skills and training individuals to cope in today's society, as well as to increase the level of innovation and digitization, powerful tools such as artificial intelligence with generative technologies are needed. Developing digital skills by personalizing educational processes can transform passive internet use into digital empowerment with direct effects on education, the economy, and digital inclusion.

Artificial intelligence is the one that makes decisions and can analyze data, adaptive learning is the one that changes the content according to the needs of each individual, and the cognitive search part is the way to find the right information for each. All of these together form solutions with a high potential for success, which are focused on the needs of the subjects to whom they are proposed, [72].

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