The digital divide in later life: ICT education and digital skills of the elderly in the EU

Adrian-Victor VEVERA[1] , Ciprian IFTIMOAEI [1,2] , Ionuț-Cristian BACIU[3,4]

[1] National Institute for Research & Development in Informatics – ICI Bucharest, Bucharest, Romania

[2] "Petre Andrei" University of Iasi, Iasi, Romania

[3] "Al. I. Cuza" University of Iasi, Iasi, Romania

[4] County Directorate of Statistics, Iasi, Romania

ciprian.iftimoaei@gmail.com

Abstract: *The paper examines the digital divide at older ages in the European Union, with a focus on ICT education and the level of digital skills among older adults, in a context marked by the accelerated digitalisation of public services, education, and everyday life. The study conceptualises the age-related digital divide as a cumulative mechanism of social inequalities, with direct implications for social participation and digital citizenship. The methodology relies exclusively on secondary analysis of Eurostat data, using indicators related to ICT use, levels of digital skills, and participation in ICT education and training for the period 2013–2024. The analysis adopts a comparative perspective, focusing on the 65–74 age group in relation to the adult population, while taking into account differences across EU Member States and the influence of structural factors such as educational attainment, gender, and type of residence. The strategy combines descriptive analysis, the construction of composite indicators, and the identification of typologies of European Member States according to the degree of digital inclusion among older adults. This paper highlights the role of digital education as a key instrument for active ageing and social cohesion and formulates public policy recommendations regarding the integration of ICT education into lifelong learning and digital inclusion strategies targeted at seniors. The study aligns with the ICVL thematic framework through its critical and empirical approach to the use of digital technologies in education and training, offering a relevant comparative perspective for the design of public policies adapted to the digital society.*

Keywords: Digital divide, ICT education, Digital skills, Active ageing, Inclusion policy.

1. Introduction

The accelerated transformations generated by the digitisation of the economy, public services and everyday life have profoundly reconfigured the conditions of social participation, placing digital skills at the centre of contemporary citizenship. In this context, the digital divide can no longer be reduced to a simple problem of access to technology, but must be understood as a multidimensional phenomenon that reflects the unequal distribution of skills, uses and benefits associated with information and communication technologies (Eshet-

https://doi.org/10.58503/icvl-v21y202653

Alkalai, 2004; Ferrari, Punie & Redecker, 2012; Vuorikari et al., 2022; Kosse, et al., 2024). The literature emphasises that age is one of the most persistent lines of digital divide, with older people exposed to a cumulative risk of digital exclusion, fuelled by lower initial educational levels, limited opportunities for continuing education and reduced integration of technology into their professional careers (OECD, 2019; Schirmer et al., 2022; Iftimoaei & Vevera, 2024). At European level, recent strategies on the digital decade and digital education (European Commission, 2019; 2020; 2024) explicitly recognise the role of digital skills in promoting social inclusion and active ageing, but Eurostat and DESI data indicate that significant differences persist between Member States and between age cohorts. In this vein, the present study contributes to the debate on digital capital and lifelong learning, addressing the digital divide in older age as a structural mechanism of social inequalities, with direct implications for the autonomy, civic participation and quality of life of older people in the European Union.

2. Research methodology, indicators, data sources

The analysis carried out in this study is based on a set of harmonised European indicators provided by Eurostat, which allow for the assessment of internet use, digital skills and participation in education and training, with a focus on differences between age groups. The indicators are constructed on the basis of data collected through the EU survey on the use of Information and Communication Technologies (ICT) in households and by individuals and are comparable between European Union Member States. The age groups used in the analysis are defined in accordance with Eurostat's standard classifications, which differ depending on the policy area and target population of each dataset.

For all indicators, we will compare the working-age population aged 25 to 64 with the category of older people aged 65 to 74. This delimitation is justified both by data availability and conceptual considerations, as people under 25 are, for the most part, still engaged in formal education, while the 25-64 age group represents the core adult population targeted by lifelong learning and digital skills development policies. The 65–74 age group captures the transition to old age and is relevant for the analysis of digital inclusion, active ageing and the persistence of age-related digital divides.

Individuals who used the internet. The internet usage indicator measures the proportion of people who have used the internet at least once in the three months prior to the survey date. Internet use includes accessing the internet from any device (computer, mobile phone, tablet, etc.) and from any location (home, work, public spaces or mobile). The indicator is based on self-reported data collected through the Eurostat survey on the use of information and communication technologies.

Individuals – internet activities. The indicator reflects the percentage of individuals who have carried out various online activities in the three months prior to the survey. These activities include, for example, sending and receiving emails,

reading online news, participating in social networks, using online banking services, downloading or viewing multimedia content, searching for health information, online courses or learning materials, and other forms of digital interaction. The data allows for an analysis of how the population uses the internet for various purposes.

Individuals' level of digital skills. The indicator measures individuals' digital skills based on the activities they perform online in a variety of areas relevant to the use of digital technologies, including information and data management, communication and collaboration, digital content creation, online safety and problem solving. Based on these activities, individuals are classified into categories of digital skills (no skills, limited, low, basic and above basic), which allows for an assessment of the extent to which they possess essential or advanced digital skills.

Individuals' level of computer skills. The level of computer skills refers to the percentage of people who say they have basic computer skills, based on activities that are representative of general digital skills (e.g. using software, managing files, using the operating system, etc.).

Participation rate in education and training – last 12 months. The participation rate in education and training (in the last 12 months) represents the proportion of adults who have participated in formal or non-formal education and/or training activities in the last 12 months, relative to the total population in the same age group. The indicator is expressed as a percentage (%) and is used to assess the level of adult involvement in lifelong learning processes, based on data collected through the EU Labour Force Survey (EU-LFS). Formal education includes structured and institutionalised programmes, such as school, university or vocational training courses, while non-formal education refers to organised learning activities outside the formal education system, such as on-the-job training, seminars or specialist workshops.

3. Results and discussions

Eurostat data on internet use in the last three months show significant differences between the 25–64 and 65–74 age groups in the period 2013–2025. While the connection rate among adults (aged 25–64) was already high in 2013 (≈76% in the EU-27) and has grown steadily, older people (aged 65–74) started from much lower values (≈34%) and have seen significant growth, but the gap with adults persists in most countries.

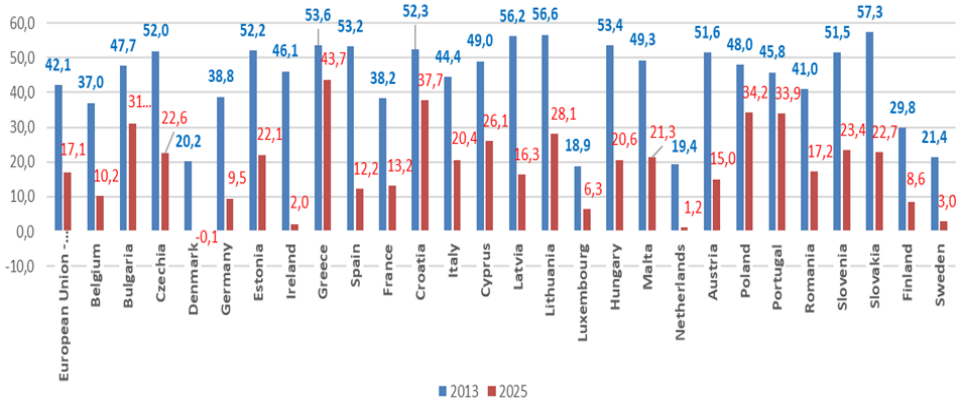

Figure 1. Evolution of the intergenerational gap in internet use in the EU: comparison between 2013 and 2025
(Source: own processing based on Eurostat data (2025))

Analysis of the intergenerational gap in internet use (see Figure 1), defined as the difference between the adult population (25–64 years) and the older population (65–74 years), reveals significant changes between 2013 and 2025, marked by a general trend towards convergence, but also by the persistence of structural disparities between European Union Member States. At EU-27 level, the average gap has narrowed substantially, from 42.1 percentage points in 2013 to 17.1 percentage points in 2025, indicating a considerable convergence between the two age groups. This development reflects the accelerated growth in internet use among older people, in the context of technological maturity and widespread expansion of digital access.

The smallest gaps in 2025 are found in the Nordic and Western European countries, which already had moderate differences in 2013. Denmark (20.2 → –0.1), the Netherlands (19.4 → 1.2), Ireland (46.1 → 2.0), Sweden (21.4 → 3.0), Luxembourg (18.9 → 6.3) and Finland (29.8 → 8.6) illustrate an almost total convergence between generations. In the case of Denmark, the negative gap suggests even higher internet use among people aged 65–74 compared to working-age adults, a rare but sociologically significant phenomenon. This development indicates that, in these countries, internet use has become a cross-cutting skill throughout the life course, supported by coherent public policies, high levels of digital education and high-performance technological infrastructures.

A second group of countries has seen a consistent reduction in the gap, without however eliminating it completely. Germany (38.8 → 9.5), Belgium (37.0 → 10.2), France (38.2 → 13.2), Spain (53.2 → 12.2), Austria (51.6 → 15.0) and Romania (41.0 → 17.2) fall into this category. Although generational differences persist, levels in 2025 are significantly lower than in 2013, indicating a gradual integration of older people into the digital environment. In these cases, convergence appears to be the combined result of younger cohorts entering the 65–

74 age group and increased access to essential digital services (e-government, banking, digital health), rather than policies dedicated exclusively to seniors. In contrast, several countries in Southern and Eastern Europe continue to show high intergenerational gaps in 2025, despite overall progress. Greece (53.6 → 43.7), Croatia (52.3 → 37.7), Poland (48.0 → 34.2), Portugal (45.8 → 33.9), Bulgaria (47.7 → 31.1) and Lithuania (56.6 → 28.1) are relevant examples in this regard. Although these countries have seen substantial increases in internet use among older people, the pace of adoption has been insufficient to significantly reduce the gap with the adult population. This suggests the existence of persistent structural barriers, such as lower levels of digital literacy, lower incomes, territorial disparities and limited access to training programmes tailored to the needs of older people.

An analysis of the activities carried out on the internet by people who have used this ICT resource in the last three months highlights significant differences both between Romania and the European Union average, and between the 25–64 and 65–74 age groups. Overall, the results indicate a lower level of diversity and intensity of internet use in Romania, especially among the elderly population, reflecting the persistence of a functional digital divide (Figure 2).

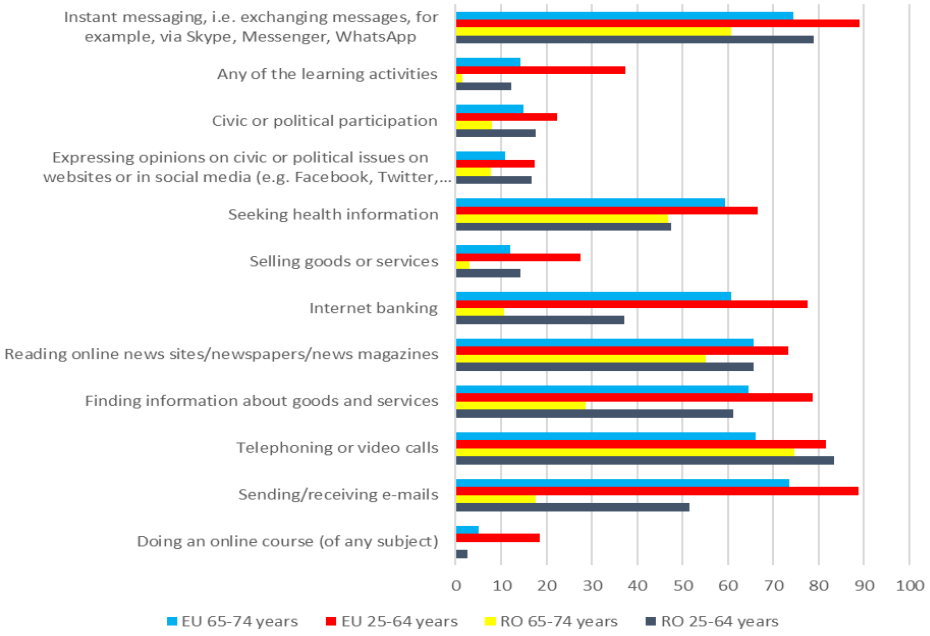

Figure 2. Online activities of internet users, by age group – Romania vs. EU in 2025 (*Source: own processing based on Eurostat data)*

Communication activities are the most common form of internet use in all categories analysed. Online phone or video calls are widespread, with very high values both in Romania (83.5% for the 25–64 age group and 74.6% for the 65–74 age group) and in the EU. The use of instant messaging applications is also

common, although levels in Romania remain below the European average, especially for the 65–74 age group. These results suggest that the internet is perceived primarily as a tool for interpersonal communication, including among older people.

In contrast, there are major differences between Romania and the EU in terms of economic and administrative activities. The use of internet banking services is significantly lower in Romania, both for adults aged 25–64 (37.1% compared to 77.7% in the EU) and especially for those aged 65–74 (10.6% compared to 60.7%). The same trend can be observed in the sale of goods or services online, where Romania's figures are well below the European average. These discrepancies indicate a low level of trust, skills or access to advanced digital services.

Searching for information is a relatively frequent use of the internet, but here too there is a consistent gap. Although over 60% of Romanians aged 25–64 search for information about goods and services online, the proportion drops sharply among those aged 65–74 (28.5%), well below the EU level. In contrast, searching for health information has comparable values between Romania and the EU for the 65-74 age group, suggesting that health-related needs can stimulate internet use even among people with limited digital skills.

Participation in online educational activities is extremely low in Romania, regardless of age. Only 2.5% of Romanian adults aged 25–64 and 0.2% of those aged 65–74 have taken an online course, compared to 18.5% and 5.1% respectively in the EU. Similarly, the aggregate indicator 'any of the learning activities' shows a marked gap, reflecting poor integration of the internet into lifelong learning processes. In terms of online civic and political participation, levels are low in both Romania and the EU, but Romanian values remain consistently below the European average, especially for the 65–74 age group. This suggests limited use of digital platforms as a space for civic engagement, especially among the elderly population.

Figure 3 highlights the differences in digital skills between Romania and the European Union, across two age groups (25–64 and 65–74), using the indicator Individuals with basic or above basic information and data literacy skills and its sub-components.

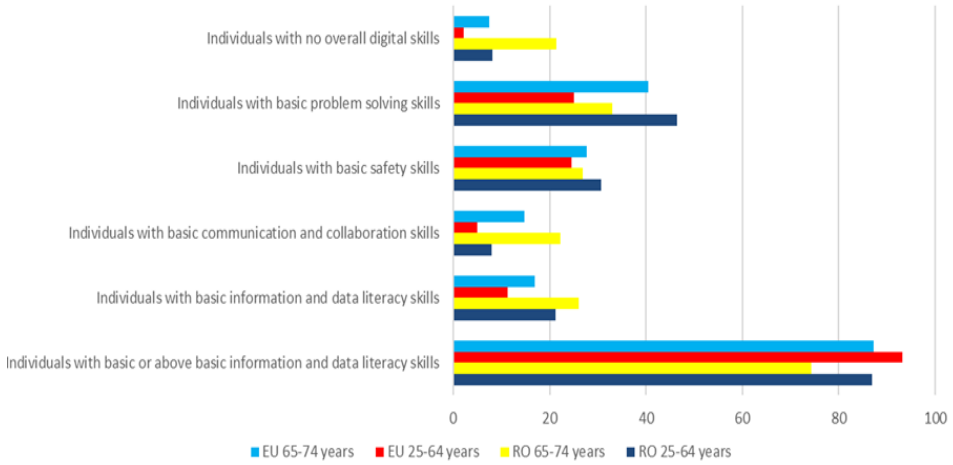

Figure 3. Age-related differences in digital skills in Romania and the European Union, 2025 (*Source: own processing based on Eurostat data)*

Both in Romania and at EU level, the proportion of individuals with basic or above basic digital skills is higher among the population aged 25–64 than among older people (aged 65–74). Romania has values of 86.9% for adults and 74.37% for older people, which is below the EU average (93.18% and 87.28% respectively), but still indicates partial convergence. This difference suggests that, although a large part of the population in Romania is exposed to basic digital skills, their intensity and diversity remain limited, especially among older people.

Information and communication skills. In Romania, the proportion of people with basic information skills is higher among older people (26.05%) than among adults (21.19%), which is the opposite of the EU average. This suggests that older people's use of technology is mainly focused on consuming information rather than on advanced uses. The differences are even more pronounced in the case of digital communication and collaboration skills. In Romania, only 7.88% of adults and 22.16% of older people have such skills, compared to 4.94% and 14.74% at EU level. This distribution indicates that digital use is concentrated on simple interactions, with a low level of integration into complex professional or collaborative contexts.

Safety and problem-solving skills. In terms of digital safety skills, the differences between Romania and the EU are smaller, and the values are relatively close between age groups. However, this result may reflect minimal awareness of digital risks rather than a high level of practical competence. The strongest contrast is in digital problem-solving skills. Romania has higher values for adults (46.44%) than the EU average (25%), but for older people the level drops significantly (32.96%), remaining below the European average (40.49%). This difference suggests that the transfer of complex digital skills between generations is incomplete, and that population ageing is associated with a reduction in the ability to adapt to new digital tasks.

A critical indicator is the proportion of individuals without general digital skills. In Romania, this reaches 21.4% among older people, compared to only 7.43% at EU level. Even for the adult population, Romania has a significantly higher value (8.18%) than the EU average (2.2%). These results confirm the existence of a hard core of digital exclusion, particularly among the elderly population, which is not described by internet usage indicators but becomes evident when actual skills are analysed. Overall, the data for 2025 show that Romania has made substantial progress in expanding basic digital skills, but their structure is unbalanced, being oriented more towards passive uses of technology. Compared to the EU average, the biggest differences are in complex skills and the proportion of people without digital skills, especially among older people. The results suggest that digitisation does not automatically guarantee functional digital literacy, and public policies should go beyond the goal of access and focus on developing advanced digital skills tailored to the life cycle.

The Individuals' level of computer skills indicator (see Figure 4) captures the practical dimension of digital skills, i.e. the ability of individuals to effectively use computers for functional and productive tasks. Unlike declarative digital literacy, this set of variables reflects the actual level of digital autonomy. A comparative analysis for Romania and the European Union, by age group (25–64 and 65–74), highlights systematic and persistent differences, both between generations and between geographical areas.

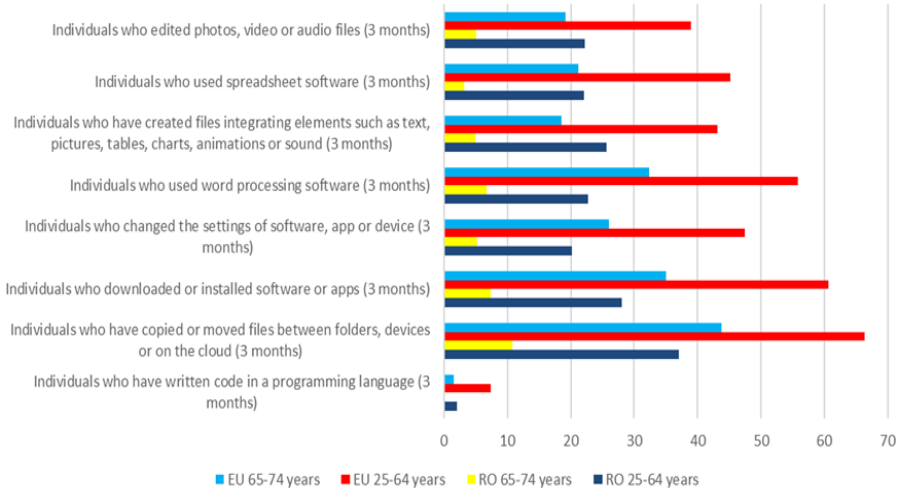

Figure 4. Individuals' level of computer skills by activity and age group in Romania and the EU, 2025 (*Source: own processing based on Eurostat data)*

Basic tasks: file handling and software installation. Among the population aged 25–64, Romania has moderate levels of basic operational skills. Only 37.05% of adults have copied or moved files between devices or to the cloud in the last three months, compared to 66.34% at EU level. The difference also holds true for downloading or installing software (28.09% in Romania compared to 60.64% in

the EU). For the population aged 65–74, the gap is much more pronounced. Only 10.79% of Romanian seniors have performed file management operations, compared to 43.74% in the EU. These results suggest a high dependence on third parties for the use of technology among seniors in Romania.

Use of productivity applications. The differences are even more evident in the case of productivity applications. The use of word processing programmes is reported by 22.71% of Romanian adults, compared to 55.78% in the EU, and the use of spreadsheets reaches only 22.05% in Romania, compared to 45.2% in the European average. For the 65–74 age group, the levels drop dramatically: 6.65% for word processing and 3.19% for spreadsheets, values that indicate extremely limited digital integration of this cohort in digital administrative or economic activities. Creating complex files (documents with text, images, tables or animations) and editing multimedia content are intermediate-level skills. In Romania, about a quarter of adults report such activities, compared to over 40% at EU level. Among Romanian seniors, these skills are almost absent (below 5–6%), suggesting that the use of digital technology is predominantly passive, focused on consumption rather than content production.

Programming remains a rare skill in all groups analysed, but the discrepancies are significant. In Romania, only 1.98% of adults and 0% of older people have written code recently, compared to 7.39% and 1.48% at EU level. This result reflects not only a generational gap, but also limited digital specialisation among the general population.

Participation in lifelong education and training is an essential indicator of social inclusion and workforce adaptability in a knowledge-based economy.

Table 1. Participation rate in education and training (in the last 12 months) at European Union level in 2025. (*Data source: Eurostat*)

Country	25-64 years	65-74 years	Country	25-64 years	65-74 years
European Union	28,5	7,0	Latvia	27,5	6,5
Belgium	35,5	7,3	Lithuania	24,7	6,9
Bulgaria	3,3	:	Luxembourg	37,5	6,0
Czechia	32,4	4,0	Hungary	49,3	5,0
Denmark	54,9	35,3	Malta	38,9	6,5
Germany	20,2	2,8	Netherlands	45,3	12,2
Estonia	53,7	16,2	Austria	37,5	7,2
Ireland	28,9	11,6	Poland	20,0	3,3
Greece	8,4	0,5	Portugal	34,5	6,5
Spain	29,7	6,5	Romania	14,4	0,4
France	37,9	13,3	Slovenia	40,3	14,2
Croatia	12,3	0,8	Slovakia	40,2	3,7
Italy	20,9	5,2	Finland	53,4	18,0
Cyprus	29,0	6,1	Sweden	61,2	29,5

A comparative analysis of participation rates (see **tabel 1**) for the 25–64 and 65–74 age groups in 2024 shows a pronounced intergenerational gap in most EU Member States, despite progress in lifelong learning. At EU-27 level, the

participation rate in education and training is 28.5% for the 25–64 age group, compared with only 7.0% for the 65–74 age group, resulting in an intergenerational gap of 21.5 percentage points. This significant difference indicates that participation in educational activities remains heavily concentrated in the active period of working life, and the integration of older people into continuing learning processes is still limited.

The Nordic countries and some Western European countries stand out with high levels of participation among both adults and older people. Sweden (61.2% vs. 29.5%), Denmark (54.9% vs. 35.3%), Finland (53.4% vs. 18.0%) and Estonia (53.7% vs. 16.2%) have the most advanced models of lifelong learning. In these countries, although the intergenerational gap persists, the participation of people aged 65–74 is substantially higher than the EU average. These performances reflect the existence of flexible education systems, active ageing policies and an institutionalised culture of continuous training that is not limited exclusively to the labour market.

A second group of countries, including France, Belgium, Austria, Slovenia, the Netherlands and Ireland, has relatively high rates for the 25-64 age group (between 28% and 45%), but much lower rates for older people (between 6% and 14%). For example, France reports 37.9% for adults and 13.3% for older people, and the Netherlands 45.3% compared to 12.2%. This pattern suggests that, although continuing education is well integrated during working life, the transition to learning in later life remains limited, possibly because training programmes are mainly geared towards the needs of the labour market.

The most pronounced gaps are observed in Southern and Eastern European countries. Romania (14.4% vs. 0.4%), Greece (8.4% vs. 0.5%), Croatia (12.3% vs. 0.8%), Poland (20.0% vs. 3.3%) and Bulgaria (3.3% for 25–64 year olds, data unavailable for 65–74 year olds) illustrate a pattern of extremely low participation, particularly among the older population. In these countries, participation in education and training after retirement age is almost non-existent, indicating significant structural barriers such as limited access to appropriate programmes, lower initial educational levels and a poorly developed culture of lifelong learning.

4. Conclusions

The statistical analysis highlights that the age-related digital divide remains a structural dimension of social and economic inequalities in the European Union, even in a context of accelerated digitisation of public services, education and everyday life. The results show a clear trend towards intergenerational convergence in internet use between 2013 and 2025, reflected in a significant reduction in the differences between the adult population (25–64 years) and the older population (65–74 years). However, this convergence is unevenly distributed across territories, being almost complete in the Nordic and Western European countries, but much slower and incomplete in Southern and Eastern Europe.

Analysis of online activities shows that there is a functional digital divide, not just a quantitative one. In Romania and other Eastern European countries in particular, internet use by older people remains focused on basic activities (interpersonal communication, information consumption), while activities with economic, educational, civic or administrative value are poorly represented. This pattern of use indicates limited integration of older people into the advanced digital ecosystem and confirms the hypothesis of predominantly passive digitisation.

The level of digital and computer skills reveals a disconnect between declared digital literacy and actual operational skills. Although a relatively high proportion of the older population reports basic digital skills, levels drop sharply when productive, problem-solving or content-creation skills are analysed. The high proportion of people without general digital skills, particularly in Romania, indicates the existence of a hard core of digital exclusion that is insufficiently captured by internet usage indicators.

The extremely low participation of people aged 65–74 in lifelong learning and training is one of the most robust conclusions of the study. Intergenerational differences in this area suggest that lifelong learning policies remain strongly anchored in the logic of the labour market, neglecting the dimension of digital education as a tool for active ageing, autonomy and social inclusion.

Overall, the general conclusion of the paper is that the digital divide in older age should be conceptualised as a cumulative mechanism of social inequality, in which age interacts with education level, income, place of residence and institutional infrastructure. Digitalisation is not, in itself, an equalising process. Without explicit public policies aimed at developing functional and advanced digital skills among older people, it risks reproducing and deepening existing forms of social exclusion.

The integration of ICT education for seniors into lifelong learning strategies, the adaptation of training programmes to the specific needs of older people, and the approach to digital inclusion as part of social cohesion and active ageing policies. In this sense, the paper makes a relevant contribution to both the literature and the debate on digital governance and educational policies in the European digital society.

REFERENCES

Eshet-Alkalai, Y. (2004) Digital Literacy: A Conceptual Framework for Survival Skills in the Digital Era. *Journal of Educational Multimedia and Hypermedia*. 13(1), 93-106, Norfolk, VA: Association for the Advancement of Computing in Education (AACE). https://www.learntechlib.org/primary/p/4793.

European Commission. (2019) Shaping Europe's digital future, https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/shaping-europes-digital-future_en. [Accessed: 3rd February, 2025].

European Commission. (2020) Digital education action plan (2021–2027) https://eur-lex.europa.eu/EN/legal-content/summary/digital-education-action-plan-2021-2027.html. [Accessed: 15th January, 2026].

European Commission. (2024) DESI dashboard for the Digital Decade (2023 onwards). https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/charts. [Accessed: 11th February, 2025].

European Council. (2006) Recommendation of the European Parliament and of the Council of 18 December 2006 on key competences for lifelong learning (2006/962/EC). https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L : 2006:394:0010:0018:en:PDF [Accessed: 5th January, 2026].

Eurostat. (2025) Digitalisation in Europe – 2025 edition - Interactive publications. https://ec.europa.eu/eurostat/web/interactive-publications/digitalisation-2025 [Accessed: 15th January, 2026].

Ferrari, A., Punie, Y. & Redecker, C. (2012) Understanding Digital Competence in the 21st Century: An Analysis of Current Frameworks. Institute for Prospective Technological Studies (IPTS). European Commission, Joint Research Centre. *Proceedings of the 7th European Conference on Technology Enhanced Learning, EC-TEL 2012, Saarbrücken, Germany, 18-21 September 2012*. [Accessed: 3rd February, 2025].

Iftimoaei, C., Vevera, A.-V. (2024) Enabling digital education: from official statistics to public policy. *International Conference on Virtual Learning*, vol. 19, pp. 247-262. https://doi.org/10.58503/icvl-v19y202421.

Kosse, F., Leffler, T. & Woemmel, A. (2024) Digital Skills: Social Disparities and the Impact of Early Mentoring. *CESifo Working Paper Series*. No. 11570, http://dx.doi.org/10.2139/ssrn.5073384.

Ministry of Education – ME. (2021) *Strategy for the Digitalisation of Education in Romania 2021-2027*. https://www.edu.ro. [Accessed: 3rd February, 2025].

Ministry of Research, Innovation and Digitalisation – MCID. (2024) *National Action Plan for the Digital Decade for Romania*. https://www.mcid.gov.ro. [Accessed: 3rd February, 2025].

National Institute of Statistics – INS. (2025) Population access to information and communication technology in 2024. https://insse.ro. [Accessed: 3rd February, 2025].

OECD. (2019) *OECD Skills Outlook: Thriving in a Digital World*. OECD Publishing, Paris. https://doi.org/10.1787/df80bc12-en [Accessed: 3rd February, 2025].

Schirmer, W., Geerts, N., Vercruyssen, A., Glorieux, I. (2022) *Digital Skills Training for Older People: The Importance of the 'Lifeworld*. https://doi.org/10.1016/j.archger.2022.104695.

Vuorikari, R., Kluzer, S. & Punie, Y. (2022) *DigComp 2.2: The Digital Competence Framework for Citizens - With new examples of knowledge, skills and attitudes, EUR 31006 EN*. Publications Office of the European Union, Luxembourg, https://publications.jrc.ec.europa.eu/repository/handle/JRC128415.