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Is Europe Ready for Digital Transformation? A Comparative Analysis in the Field of Digitalization

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Abstract: *The Covid-19 pandemic has significantly accelerated digital transformation, compelling economic actors to rapidly adapt to evolving conditions. In response, the European Union has set ambitious digital targets for 2030 as part of its vision for Europe's Digital Decade, aiming to empower businesses and individuals to exploit the benefits of digitalization. The Digital Economy and Society Index (DESI) serves as a valuable tool for identifying the key drivers and challenges in achieving the EU's digital transformation goals. This research focuses on comparing EU member states across various dimensions of digitalization, including digital skills, infrastructure, business transformation, and the digitalization of public services, using DESI indicators. It is hypothesized that significant disparities exist between member states, which may be correlated with their levels of innovation performance. By employing multivariate statistical methods, the comparative analysis seeks to highlight the strengths, weaknesses, opportunities, and threats associated with digital transformation in Europe.*

1. INTRODUCTION

In the era of the Fourth Industrial Revolution, the Covid-19 pandemic has significantly accelerated the diffusion of new technologies. Digital solutions have become integral to the economy, online communication, e-commerce, and hybrid work now widely adopted. These advancements demand the continuous development of digital infrastructure, the enhancement of digital skills, the adaptation of businesses to digital technologies and the digitalization of public services. In response to the accelerated diffusion of new technologies, the European Union has developed a human-centric and sustainable vision for 2030, known as Europe's Digital Decade, to support exploiting the benefits of digitalization. This comprehensive framework serves as a guide for all actions related to the digital transformation of EU Member States. Since 2014, the European Commission has been monitoring the digital progress of Member States through the Digital Economy and Society Index (DESI). DESI includes 35 indicators grouped into four categories: digital skills, digital infrastructure, digital transformation of businesses, and the digitalization of public services. This comprehensive measure helps identify the key drivers and challenges in achieving the EU's digital transformation goals.

This research aims to compare the performance of EU Member States in the different fields of digital economy and society using DESI index. It can be assumed that there is a strong positive relationship between the innovation performance and the development of digital economy and society. Therefore, innovation performance groups created by Summary Innovation Index can be compared in DESI dimensions. Using multivariate statistical methods and simple time-series comparison there can be significant differences in several areas of digitalization among countries.

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Hypothesis One: Significant disparities exist between EU member states primarily in the soft factors of digital transformation, such as digital skills which are harder to change compared to infrastructure and these disparities may correlate with their levels of innovation performance.

Hypothesis Two: Countries with more advanced digital skills and digital infrastructure tend to perform better not only in innovation but also in overall economic performance. In contrast, the digital transformation of businesses and the digitalization of public services show significant variation among countries, facilitating faster catching-up processes for some.

2. THE THEORETICAL BACKGROUND OF THE RESEARCH

Nowadays, digitalization is a key driver of innovation and economic growth. Several studies emphasize that the widespread adoption of information and communication technologies (ICTs) generates structural changes in economies. Zherlitsyn et al. (2025) conducted a bibliometric analysis and statistical evaluation of digital transformation trends across EU countries. Their findings revealed a significant positive correlation between digital inclusion and GDP growth, with correlation coefficients of 0.9043 for actual and 0.8955 for lagged GDP growth metrics. This indicates that higher levels of digital inclusion, such as increased digital skills and internet access, are linked to greater economic growth. Ivanová and Grmanová (2023) applied DEA models using DESI dimensions as inputs and the ICT sector's GDP share as output to evaluate digitalization efficiency across EU countries, finding that while countries like Bulgaria, Romania, Greece, and Malta have low DESI scores, they perform efficiently; moreover, Malta stands out as consistently efficient across all model variations. Matthess and Kunkel (2020) conceptualized the relationship between structural change and digitalization, highlighting differences between developed and developing countries in the ability to exploit the benefits of digitalization. The authors argue that digitalization accelerates structural transformation by fostering productivity and innovation, but unequal access to digital technologies can exacerbate existing inequalities. Małkowska et al. (2021) assess the impact of digital transformation on EU countries, focusing on three dimensions: society (Society 4.0), economy (Economy 4.0), and companies (Companies 4.0). Using cluster analysis and the TOPSIS method, their findings highlight significant differences in technological development across EU countries and reveal the digitalization gap.

Human capital plays a crucial role in economic growth and innovation. In line with this, several studies highlight that digital skills are a critical factor in maximizing the benefits of digitalization. Grigorescu et al. (2021) focus on Central and Eastern European countries, showing that investments in education and digital skills significantly enhance performance across DESI dimensions. Tran et al. (2023) expand on this by categorizing digital skills into basic and advanced, finding that advanced digital skills have a stronger positive impact on GDP growth compared to basic digital skills. In addition, they found a strong, positive correlation between deploying ICT specialists and ICT development levels in the EU countries. According to the authors' analysis, human capital has a significant role both in economic and ICT development in the digital economy. Despite this, there is a huge gap in human capital between the EU Member States. Liu (2022) revealed that the EU's best-performing countries also achieve high scores in DESI indicators, highlighting that a more advanced digital economy and society are associated with better economic performance. Hunady et al. (2022) conducted a comprehensive analysis of digital readiness across EU member states, revealing that Nordic countries exhibit the highest levels of digital readiness, while newer member states, particularly from South-Eastern Europe, lag in areas such as e-commerce, and social media usage, and cloud computing adoption. Olczyk and Kuc-Czarnecka's (2022) found that fast and intensive digital transformation can close or eliminate the gap between poor and rich countries in the European Union, further underlining the importance of the development of digital infrastructure and digital skills. Kovács et al. (2022) pointed out that between 2016 and 2020, there was convergence among EU Member States based on the DESI. However, the rate of convergence varied. According to the authors' analysis, the Matthew effect tends to exist, as both the growth rate and variance of the DESI index increased significantly during this period leading to a widening gap between countries. It can be concluded that Member States with better digital infrastructure and digital skills can exploit better the opportunities offered by digitalization. Borowiecki et al. (2021) similarly highlighted a convergence among EU Member States in the development level of the digital economy and society, including its four core components. Pisar et al. (2024) found that the COVID-19 pandemic partially improved digital readiness in some less developed EU countries—such as Latvia and Slovenia—though significant disparities remained, underscoring the need for stronger EU-level actions to bridge the digital divide. Georgescu et al. (2022) used output-oriented Data Envelopment Analysis to assess digital transformation efficiency during the COVID-19 pandemic and found that only 8 of 27 EU countries were efficient, suggesting these could serve as benchmarks for others.

Imran et al. (2022) explore the relationship between digitalization and sustainability, highlighting a correlation between DESI scores and sustainable development indicators. They conclude that the digital economy significantly contributes to sustainable development. Similarly, Harangozó and Fakó (2024) found a mostly positive relationship between the digital economy and society (DESI) and the sustainable development goals index (SDGI). Their analysis, which focuses on the Visegrad Group (V4) countries, highlights that the V4 countries lag in digitalization and are around the average in sustainability. This suggests that digitalization alone cannot guarantee the realization of sustainable development. Wysokińska (2021) highlights that digital transformation—especially through ICT development—can significantly support the achievement of Sustainable Development Goals (SDGs) in the EU, but warns that unequal access to innovation may limit its inclusive impact. This perspective aligns with findings from Nosratabadi et al. (2023), who conducted an empirical study on the social sustainability of digital transformation (SOSDIT) across EU-27 countries. Their research indicates that countries with higher levels of digital inclusion and digital skills tend to perform better in achieving SDGs. Moreover, they found an inverse relationship between income inequality (measured by the Gini coefficient) and SDG performance, suggesting that reducing income disparities can enhance the positive impact of digital transformation on sustainable development.

In conclusion, there are digital disparities as highlighted by Bánhidi et al. (2020), and skill gaps within the European Union, which can be limited with an adequate strategy. Jarzębowski et al. (2024) demonstrate that higher levels of digitalization—measured through DESI, GII, and R&D intensity—are positively correlated with national competitiveness across 10 selected European countries using data from 2017 and 2022. Fidan (2024) examines the digitalization levels of European countries between 2017 and 2022 using the Digital Economy and Society Index (DESI), identifying five clusters—Digital Leaders, Digital Risers, Digital Trackers, Digital Developers, and Digital Startups. Similarly, Pinto et al. (2023) clustered EU-27 countries based on three key dimensions - digital empowerment, business digitalisation, and broadband access - highlighting distinct digital transformation profiles: Digital Access Leaders, Digital Transformation Champions, Digital Empowerment Laggards, and Empowerment-Driven Disparities. These categorizations follow the same logic as the innovation performance groups based on the Summary Innovation Index and highlight the common features and differences among countries at varying levels of digital development.

3. MEASUREMENT FRAMEWORK, METHODOLOGY AND EMPIRICAL RESULTS

Digitalization has emerged as a transformative force, reshaping economies and societies worldwide. In 2014, the European Union (EU) introduced the Digital Economy and Society Index (DESI) to measure the Member States' digital progress. DESI serves as a tool to evaluate countries' performance in digital transformation. In 2021, the EU announced a comprehensive framework, Europe's Digital Decade Strategy, designed to help countries fully leverage the benefits of digitalization by 2030. The strategy outlines measurable targets in four key areas: digital skills, digital infrastructure, the digital transformation of businesses, and digital public services. DESI measures digital progress using 35 indicators (see details in Appendix 1). Five of these relate to digital skills, while digital infrastructure and the digital transformation of businesses include 11 indicators. The digitalization of public services is measured by 8 indicators. However, there are missing values for 2 indicators (5G SIM card share of the population and e-commerce turnover) due to a lack of measurements in some countries. As a result, only 33 DESI variables are included in this analysis, which aims to compare the performance of EU Member States across different fields of the digital economy and society.

Based on relevant literature, a strong positive correlation is assumed between innovation performance and the development of the digital economy and society. As a first step in the analysis, a correlation analysis is conducted to identify the relationship between the Summary Innovation Index (SII) and DESI. If a strong relationship is identified, EU Member States can be categorized into innovation performance groups based on their overall innovation performance using the Summary Innovation Index. Subsequently, the Kolmogorov-Smirnov test is applied to assess the normality of DESI variables for further analysis. If normality is confirmed, homoscedasticity must be tested to determine the suitability of running ANOVA and t-tests. If normality is not confirmed, the Kruskal-Wallis test and Mann-Whitney U test can be used to compare DESI indicators across innovation performance groups. These statistical methods help to highlight significant differences in DESI fields between the innovation performance groups.

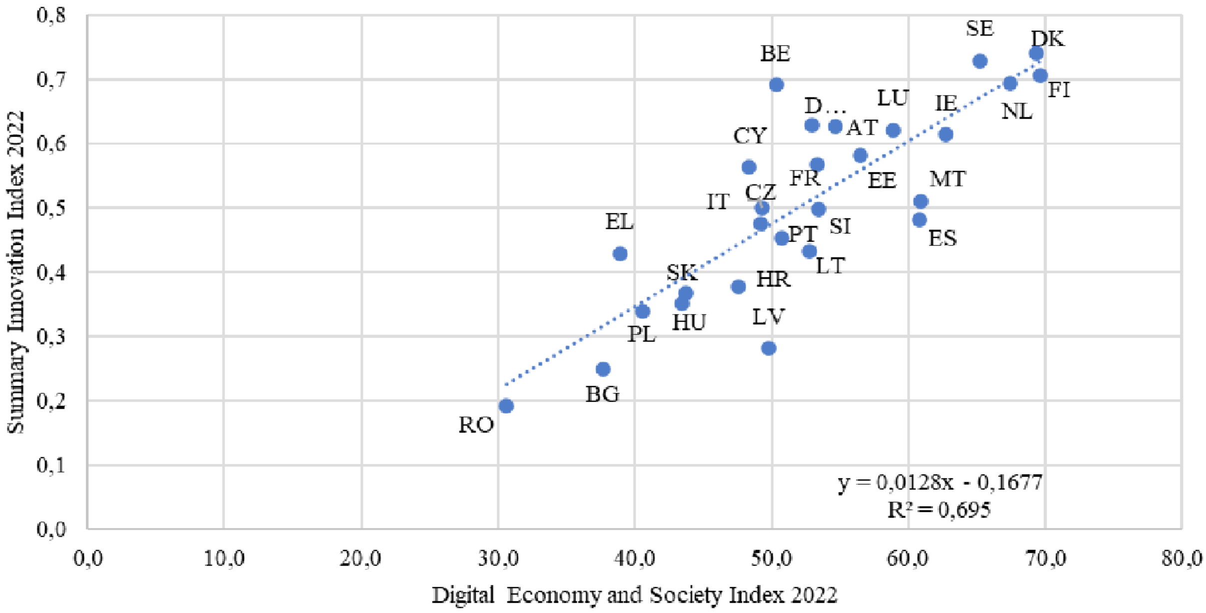

Figure 1. The relationship between Summary Innovation Index (SII) and Digital Economy and Society Index (DESI)

Source: Own calculation based on EIS (2024) and DESI (2022)

To examine the relationship between innovation performance and digital development, a correlation analysis was conducted between the SII and DESI. It should be noted that the comprehensive DESI index was only calculated up to 2022, so the correlation analysis was performed using 2022 data for both indicators. The Pearson correlation coefficient of 0.8337 indicates a strong positive relationship between these variables. The scatter plot is presented in Figure 1.

Figure 1 illustrates the relationship between the development of the digital economy and society and innovation performance in the European Union. This means that countries performing better in the digital economy and society indicators – such as digital infrastructure, digital skills, digital transformation of businesses, and digitalization of public services – tend to achieve higher levels of innovation performance. The strong correlation between these variables confirms the importance of digital development in the EU's strategy. There is no clear cause-and-effect relationship; the negative intercept parameter of the linear regression function indicates that digitalization alone is not sufficient for innovation. The scatter plot also indicates that promoting digital transformation of the economy significantly contributes to innovation.

Based on the strong positive relationship, EU Member States can be categorized into four innovation performance groups based on the Summary Innovation Index (EIS, 2023) for further analysis, as follows:

- *innovation leaders (4):* Denmark, Sweden, Finland, Netherlands
- *strong innovators (8):* Belgium, Austria, Germany, Luxembourg, Ireland, Estonia, France, Cyprus
- *moderate innovators (9):* Malta, Slovenia, Italy, Spain, Czechia, Portugal, Lithuania, Spain, Croatia
- *emerging innovators (6):* Hungary, Slovakia, Poland, Latvia, Bulgaria, Romania

The next step of the analysis involves testing the normality of DESI variables using the Kolmogorov-Smirnov test. The results show that 11 variables do not follow a normal distribution, indicating that non-parametric tests can be used to compare DESI indicators between the innovation performance groups of the EU. The Kruskal-Wallis test is an appropriate method for comparing DESI indicators across the four innovation performance groups. If the p-value is below 0.05, it can be concluded that there is a significant difference in the field of the digital economy and society. The results of the test are presented in Table 1.

In Table 1, it can be seen that in all four dimensions of the digital economy and society, indicators show significant differences; in total, this is observed in 18 out of the 33 variables examined. The greatest similarity between the innovation performance groups is found in the area of digital infrastructure, while the most significant differences are observed in the digital transformation of businesses. This may be attributed to EU funding and standards that have promoted consistent infrastructural development among Member States. In contrast, the digital transformation of businesses is more influenced by each country's economic structure, regulatory environment, and the technological readiness of local businesses. Regarding human resources, the smallest differences between Member States are observed in internet use, while the largest gap is seen in the above basic digital skills. In this regard, Bulgaria, the lowest-performing country, has a rate of 7.73%, compared to the highest-performing country, the Netherlands, with 54.53%. This means that the gap between countries widens as we move toward higher-level digital skills, leading to inequalities in leveraging digitalization opportunities. In the case of digital infrastructure, differences between Member States are moderate in overall internet take-up and mobile broadband take-up, but significant disparities exist in 5G coverage. In Romania, 32.75% of households have 5G coverage, while this rate reaches 100% in Cyprus, Denmark, Malta, and the Netherlands. The EU average is 89.3%. Interestingly, the laggards are not exclusively emerging innovators, as Belgium has a low rate of 40.35%, and the ratio is below the EU average in Estonia, Ireland, Croatia, and Slovenia. The digital transformation of businesses is a unique field, as there are significant gaps between Member States. The values of the variables are typically high in innovation-leader countries, but the rates vary. In the case of e-commerce, Ireland, Czechia, and Hungary perform well, while unicorns are primarily associated with strong innovators, such as Germany and France. It can be concluded that in the field of digital transformation of businesses, the relationship with innovation performance is less pronounced, as the highest values are not necessarily observed in the innovation leaders. In the digitalization of public services, Romania lags significantly behind. While innovation leaders perform best in e-government users, their dominance is not observed in other areas with significant differences. Digital public services for citizens are fully implemented in Malta, which has a score of 100, followed by Estonia and Luxembourg. The smallest differences in mobile friendliness are observed among EU Member States, except for Romania.

Table 1. The results of Kruskal Wallis test

Dimension	Variable	Chi-Square	Asymp. Sig.
DIGITAL SKILLS	*Internet use*	*16,880*	*0,001*
	At least basic digital skills	*15,259*	*0,002*
	Above basic digital skills	*13,566*	*0,004*
	ICT specialists	1,427	0,699
	ICT graduates	3,136	0,371
DIGITAL INFRA-STRUCTURE	*Overall internet take-up*	*11,198*	*0,011*
	Share of fixed broadband subscriptions >= 100 Mbps	3,420	0,331
	Share of fixed broadband subscriptions >= 1 Gbps	5,535	0,137
	Fixed Very High Capacity Network (VHCN) coverage	2,972	0,396
	Fibre to the Premises (FTTP) coverage	1,338	0,720
	Mobile broadband take-up	*16,136*	*0,001*
	Overall 5G coverage	*12,111*	*0,007*
	5G coverage in the 3.4–3.8 GHz band	5,190	0,158
	5G spectrum	2,272	0,518
	Edge nodes	4,430	0,219
DIGITAL TRANS-FORMATION OF BUSINESSES	*SMEs with at least a basic level of digital intensity*	*10,649*	*0,014*
	Electronic information sharing	*13,692*	*0,003*
	Social media	*15,418*	*0,001*
	Data analytics	0,650	0,885
	Cloud	*11,860*	*0,008*
	Artificial intelligence	*14,699*	*0,002*
	E-invoices	*8,951*	*0,030*
	AI or Cloud or Data analytics	*11,571*	*0,009*
	Unicorns	*11,599*	*0,009*
	SMEs selling online	1,781	0,619
DIGITALIZATION OF PUBLIC SERVICES	*e-Government users*	*13,439*	*0,004*
	Digital public services for citizens	*8,259*	*0,041*
	Digital public services for businesses	5,860	0,119
	Pre-filled Forms	*7,353*	*0,061*
	Transparency of service delivery, design and personal data	3,211	0,360
	User support	4,787	0,188
	Mobile friendliness	*12,968*	*0,005*
	Access to e-health records	0,628	0,890

Source: Own calculation based on DESI (2024)

Table 2. The results of the Mann-Whitney U test for pairs of innovation performance groups

Dimension	Variable	*Innovation leader and strong innovators*		*Strong and moderate innovators*		*Moderate and emerging innovators*	
		Mann-Whitney U	Exact Sig.	Mann-Whitney U	Exact Sig.	Mann-Whitney U	Exact Sig.
DIGITAL SKILLS	Internet use	1,500	0,008	9,000	0,008	26,000	0,955
	At least basic digital skills	2,000	0,016	28,000	0,481	7,000	0,018
	Above basic digital skills	2,000	0,016	31,000	0,673	9,000	0,036
	ICT specialists	12,000	0,570	31,000	0,673	25,000	0,864
	ICT graduates	14,500	0,808	24,000	0,277	18,500	0,328
DIGITAL INFRA-STRUCTURE	Overall internet take-up	5,000	0,073	18,000	0,093	27,000	1,000
	Share of fixed broadband subscriptions >= 100 Mbps	7,000	0,154	30,000	0,606	18,000	0,328
	Share of fixed broadband subscriptions >= 1 Gbps	4,000	0,048	23,500	0,236	20,500	0,456
	Fixed Very High Capacity Network (VHCN) coverage	6,000	0,109	31,000	0,673	21,000	0,529
	Fibre to the Premises (FTTP) coverage	8,000	0,214	32,000	0,743	22,000	0,607
	Mobile broadband take-up	1,000	0,008	14,000	0,036	23,000	0,689
	Overall 5G coverage	8,000	0,214	33,500	0,815	2,000	0,002
	5G coverage in the 3.4–3.8 GHz band	10,000	0,368	30,000	0,606	9,000	0,036
	5G spectrum	15,000	0,933	34,500	0,888	16,000	0,224
	Edge nodes	12,500	0,570	30,000	0,606	18,500	0,328
DIGITAL TRANS-FORMATION OF BUSINESSES	SMEs with at least a basic level of digital intensity	11,000	0,461	36,000	1,000	3,000	0,003
	Electronic information sharing	3,000	0,028	35,000	0,963	7,000	0,018
	Social media	7,000	0,154	24,000	0,277	3,000	0,003
	Data analytics	11,000	0,461	35,000	0,963	23,500	0,689
	Cloud	0,000	0,004	29,000	0,541	17,000	0,272
	Artificial intelligence	6,000	0,109	25,500	0,321	5,000	0,008
	E-invoices	3,000	0,028	29,000	0,541	11,000	0,066
	AI or Cloud or Data analytics	0,000	0,004	30,000	0,606	17,500	0,272
	Unicorns	10,500	0,368	19,500	0,114	11,000	0,066
	SMEs selling online	16,000	1,000	26,000	0,370	17,500	0,272
DIGITALIZA-TION OF PUBLIC SERVICES	e-Government users	0,000	0,004	25,000	0,321	13,000	0,113
	Digital public services for citizens	8,000	0,214	34,000	0,888	13,000	0,113
	Digital public services for businesses	11,500	0,461	28,500	0,481	17,000	0,272
	Pre-filled Forms	2,000	0,016	26,000	0,370	20,000	0,456
	Transparency of service delivery, design and personal data	10,000	0,368	33,000	0,815	18,000	0,328
	User support	15,500	0,933	27,500	0,423	15,000	0,181
	Mobile friendliness	1,000	0,008	23,000	0,236	17,500	0,272
	Access to e-health records	16,000	1,000	35,000	0,963	21,500	0,529

Source: Own calculation based on DESI (2024)

It is also worth examining the pairwise differences between the innovation performance groups. For this purpose, the Mann-Whitney U test can be applied, and the results are presented in Table 2. It can be seen that the differences in the indicators of the digital economy and society are likely smaller among the countries in the middle range of innovation performance.

Table 2 reveals that there are only minor differences between moderate and strong innovators, with significant differences observed in just two variables: internet use and mobile broadband uptake. In contrast, there is a significant difference in ten variables between moderate and emerging innovators, six of which are related to the digital transformation of businesses. The largest differences are observed between leaders and strong innovators, with 13 variables showing significant differences. Three of these are associated with the dimensions of digital skills, digital infrastructure, and digitalization of public services, while four are linked to the digital transformation of businesses. The critical factors contributing to differences between innovation performance groups include internet use, advanced digital skills, mobile broadband uptake, electronic information sharing, and e-invoices. The differences in internet use and mobile broadband take up indicate that countries performing well in innovation also excel in these areas. Significant differences are observed among the better-performing groups, whereas there is no notable difference among lower innovation performance countries, which lag behind in the elements of digital skills and digital infrastructure. Interestingly, some low-performing countries show signs of a catching-up process, with faster development in certain areas. For example, Latvia is above the EU average in mobile broadband take-up, having improved significantly over six years, from 67.03% in 2018 to 90.17% in 2024. The correlation is 0.7608 between the SII and internet use, and 0.7639 between the SII and mobile broadband take-up. In other cases, where significant differences are observed between innovation leaders and strong innovators, and moderate and emerging innovators indicated higher gap in EU Member States while in the middle range of innovation ranking is quite homogenous. This tendency also highlights the remaining disparities among countries in several fields.

The causes of differences can be examined with the analysis of trends in critical dimensions of DESI. There is balanced progress among countries in certain areas, such as internet usage and internet coverage. Additionally, in some countries, significant improvements can be observed in specific indicators. A notable example is the impressive progress made by Italy and Estonia in the field of e-invoices. In the case of the e-government users indicator, several strong innovators lag behind, such as Germany, and Cyprus has also fallen behind, performing below the EU average. They are outpaced by emerging innovators like Hungary, Latvia, and Slovakia.

4. FUTURE RESEARCH DIRECTIONS

This research examines the significant differences in the digital economy and society across EU Member States, which were categorized into innovation performance groups. A more detailed analysis could identify the limiting factors in each country and explore how the EU can support efforts to reduce these disparities. Future research could further investigate the relationship between innovation performance and the digital economy and society to demonstrate how investments in digital skills development and the digital transformation of businesses can enhance innovation performance and help reduce disparities within the European Union.

5. CONCLUSION

The Covid-19 pandemic accelerated digitalization progress. In response to the rapid diffusion of new technologies, the European Union developed Europe's Digital Decade Strategy to support the effective exploitation of digitalization's benefits. The Digital Economy and Society Index (DESI), which includes 35 indicators grouped into four categories – digital skills, digital infrastructure, digital transformation of businesses, and digitalization of public services – monitors the digital progress of EU Member States. This research compares the performance of EU Member States across the different dimensions of the digital economy and society using DESI data, applying multivariate statistical methods and simple time-series analysis. The correlation analysis confirmed a strong positive relationship between the development of the digital economy and society and innovation performance. As a result, DESI indicators were compared by categorizing countries into innovation performance groups based on the Summary Innovation Index.

Based on the analysis, it can be concluded that a more advanced digital economy and society is strongly associated with better innovation performance. As previously hypothesized, significant disparities exist between EU Member States, though not typically in the soft factors of digital transformation. The analysis highlights that innovation leaders clearly dominate in the areas of digital skills and digital infrastructure, although their dominance is less pronounced in digital public services. The digital transformation of businesses emerges as the most critical dimension of DESI, where substantial disparities are observed between countries. While countries demonstrate convergence in digital infrastructure, there are also best practices showcasing notable catching-up in certain areas.

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APPENDIX

A1. The structure of Digital Economy and Society Index (DESI)

Digital area	Indicator	Short definition and measurement
Digital skills (5)	**Internet use**	Individuals who use the internet at least once a week
	At least basic digital skills	individuals with 'basic' or 'above basic' digital skills in all the five competences (information and data literacy, communication and collaboration, digital content creation, safety, problem solving)
	Above basic digital skills	individuals with 'above basic' digital skills all five competences
	ICT specialist	jobs like ICT service managers, ICT professionals, ICT technicians, ICT installers and servicers
	ICT graduates	persons with a degree in ICT
Digital infrastructure (11)	**Overall internet take-up**	households with access to the Internet at home
	Share of fixed broadband subscriptions >= 100 Mbps	based on advertised download speeds
	Share of fixed broadband subscriptions >= 1 Gbps	
	Fixed Very High Capacity Network (VHCN) coverage	percentage of households covered by any fixed VHCN
	Fibre to the Premises (FTTP) coverage	percentage of households covered by FTTH and FTTB
	Mobile broadband take-up	individuals who used the internet on a mobile device
	5G coverage	percentage of households with coverage by at least one 5G mobile network
	5G coverage in the 3.4–3.8 GHz band	percentage of households with coverage by 5G using the 3.4-3.8GHz spectrum band
	5G spectrum	the amount of spectrum assigned and ready for 5G use within the so-called 5G pioneer bands
	5G SIM cards share of population	5G mobile subscriptions defined as SIM cards that generated any internet traffic on a domestic 5G network in the last 90 days.
	Edge nodes	Number of compute nodes providing latencies below 20 milliseconds.
Digital transformation of businesses (11)	**SMEs with at least a basic level of digital intensity (DII v3)**	the digital intensity score is based on counting how many out of 12 selected technologies are used by enterprises - a basic level requires usage of at least 4 technologies.
	Electronic information sharing	enterprises who have in use an ERP software package to share information between different functional areas
	Social media	enterprises using two or more of the following social media
	Data analytics	enterprises performing data analytics (internally or externally)
	Cloud	Cloud computing, measured as the percentage of enterprises using at least one intermediate or sophisticated cloud computing services
	Artificial intelligence	enterprises using any AI technology
	e-Invoices	enterprises sending e-invoices, suitable for automated processing
	AI or Cloud or Data analytics	enterprises using AI technologies or buying sophisticated or intermediate cloud computing services or performing data analytics
	Unicorns	the sum of unicorns: startups that pass a $1B valuation
	e-Commerce turnover	SMEs total turnover from e-commerce
	SMEs selling online	SMEs selling online (at least 1% of turnover)
Digitalisation of public services (8)	**e-Government users**	individuals who used the Internet, in the last 12 months, for interaction with public authorities on websites or on mobile applications.
	Digital public services for citizens	online provision of key public services for citizens, measured as the share of administrative steps that can be completed fully online for major life events
	Digital public services for businesses	online provision of key public services for entrepreneurs, measured as the share of administrative steps that can be completed fully online for major life events
	Pre-Filled Forms	the share of administrative steps that present prefilled data, already known to public administrations, in online forms to the user
	Transparency of service delivery, design and personal data	the extent to which service processes are transparent, services are designed with user involvement and users can manage their personal data
	User support	the extent to which online support, help features, and feedback mechanisms are available to both national as well as cross-border users.
	Mobile friendliness	the share of services which are provided through a mobile-friendly interface, an interface that is responsive to the mobile device
	Access to e-health records	measured as the nationwide availability of online access services

Source: DESI (2024)