

Article

Investigating Digital Intensity and E-Commerce as Drivers for Sustainability and Economic Growth in the EU Countries

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Abstract: Digital technology development caused the digital transformation of the economy and society. E-commerce, the most widespread among digital innovations, reached a significant share, particularly during the COVID-19 pandemic, impacting economic growth. The progress of digital technologies and the evolution of e-commerce can contribute to the more sustainable development of organizations and worldwide economies. This paper analyzed the influences of digital transformation and e-commerce on GDP and sustainable development. The study used the Eurostat database to gather the research variables for the EU countries. The paper used artificial neural networks and cluster analysis to reveal the significant influence of digital transformation and e-commerce on GDP and sustainable organizational development. Countries with a low level of digital transformation and e-commerce should propel these activities to increase economic performance sustainably.

Keywords: digital technologies; digital transformation; digital intensity; e-commerce; sustainable development; GDP

1. Introduction

Digitalization is a critical phenomenon of the 21st century. The evolution of the Internet, mobile devices, and other digital technologies significantly impacted all areas of society, including how individuals buy, communicate, and access these pieces of information. During the past few years, e-commerce became one of the salient tendencies defining digital transformation [1]. Digital technologies are implemented in increasingly more strategic areas, covering various sectors, strategically being integrated on several levels, and substantially impacting the organizational culture or society [2]. Digital technologies substantially impact some prosperous economies' economic growth [3]. Digital transformation allows non-discriminatory access to resources and supports the transparency of economic activities [4], generating changes in corporate mentalities [5].

The linkage between digital transformation and sustainability is crucial in organizations [6]. Implementing a sustainable vision using digital transformation and e-commerce is a competitive advantage for each organization [7,8]. Digital transformation generates an innovative process, leading to increased sustainability and better economic performance [9–12]. Organizations that foresee crises and show resilience are economically and socially more sustainable because they can increase their level of innovation [13].

The SDGs, proposed by the United Nations in 2015, were meant to tackle some of the world's most pressing challenges, including poverty, unequal treatment, climate change, and environmental degradation [14]; these can be easier complied with if the organizations will embrace the digital transformation and implement e-commerce on a large scale. Digital technologies can play a significant role in achieving most of these goals, thus allowing better access to information, promoting innovation, and increasing efficiency. In the context of achieving the SDGs, digital intensity can lead to the more sustainable development of organizations and society. Digital technologies, for instance, can improve access to education, healthcare, and financial services, contributing to poverty alleviation



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and reducing inequality. Such technologies can also increase environmental sustainability by allowing better use of resources and reducing waste. On the other hand, e-commerce can play a crucial part in sustainable development through better access to goods and services, reducing marketing costs, and improving the supply chain's efficiency.

In the EU, the digital intensity increased in the past few years because many countries invested massively in digital infrastructure and supported digital innovation. In addition, the EU set the goal of access to high-speed Internet for all citizens by 2025, and several countries launched initiatives meant to facilitate digital entrepreneurship and innovation [15,16]. Nonetheless, there are still significant disparities in the digital intensity between the EU countries, some of them being left behind in digital infrastructure investment.

Apart from enhancing SDGs achievement, e-commerce can also significantly impact the GDP, thus allowing companies to reach new customers by reducing transaction costs and improving the efficiency of the supply chain. In addition, a higher percentage of e-commerce can lead to increased productivity, innovation, and competitiveness. In the EU, e-commerce steadily increased in the past few years, and online sales have a more significant share in overall retail sales [17]. In 2020, e-commerce expanded partially due to the COVID-19 pandemic. However, there is still significant untapped potential in many EU countries concerning e-commerce, with some of them unable to improve online sales [15].

This paper analyzes the impact of digital intensity and e-commerce on the EU's sustainable economic development. Despite the increasing digital transformation and the growth of e-commerce, there is a lack of understanding about how these factors impact the sustainable economic development of the European Union (EU). Therefore, the following research questions were formulated based on the research gap: RQ1. What is the impact of digital intensity on the sustainable economic development of the EU? RQ2. How does e-commerce influence the economic growth and sustainability of the EU? The research hypotheses emerged from the literature gap and research questions.

The paper introduces several novel and relevant aspects using artificial neural networks and cluster analysis techniques. These approaches provide unique insights and contribute to understanding the relationships between digital intensity, e-commerce, sustainability, and economic growth in the context of EU countries. The integration of digital intensity, e-commerce, sustainability, and economic growth in the analysis is a key contribution of the paper. Understanding how digital technologies and e-commerce practices impact sustainability and economic growth is crucial for formulating effective policies and strategies. Furthermore, the paper's findings can guide policymakers, businesses, and researchers in developing sustainable and growth-oriented approaches to leverage digitalization and e-commerce in the EU.

The structure of this paper consists of six parts. The first part brings the introduction, and the second is a literature review. The third part introduces the research methodology and describes the research results. Finally, the paper discusses the results and proposes the conclusions in the last parts.

2. Literature Review

Implementing digital technologies influences digital transformation and can be defined by applying a mix of digital technologies that generate present and future changes in mentalities, processes, and activities [18].

Over the years, digitalization was linked to e-business, e-commerce, e-services, and digital connectivity [19]. Using specific technologies such as artificial intelligence, the Internet of Things, cloud computing, blockchain, and big data, the digital transformation leads to a paradigm shift in the value chains of companies and public institutions [20–22]. Reis et al. [23] analyzed the impact of artificial intelligence on digital transformation through the effects combined with the other technologies (Internet of things, cloud computing, blockchain, big data) that give rise to new technologies and production processes. Digital transformation is multifaceted and has a variety of definitions in the research literature [24–26].

The interrelation between e-commerce and the digitalization of the economy is complex and multifaceted. While e-commerce is a form of digitalization, several unique features set it apart from other digital technologies. Firstly, e-commerce involves the exchange of goods and services through online channels, which is different from other forms of digitalization that may focus on data or communication [19]. In addition, e-commerce platforms must have robust and secure transaction processing capabilities, including payment processing and order fulfillment, to ensure a positive customer experience and build trust with consumers.

Secondly, e-commerce platforms are often global, meaning they must navigate a complex web of legal and regulatory frameworks across different jurisdictions [22]. This aspect can include everything from data privacy regulations to customs and trade laws, impacting everything from supply chain management to marketing strategies. Thirdly, e-commerce is closely tied to the broader trends of the digital economy, including the growth of social media, mobile communications, big, cloud computing, and artificial intelligence [4]. This issue led to new business models and consumer behaviors, such as social commerce and mobile payments, which constantly require e-commerce platforms to adapt and innovate to stay relevant [16]. Finally, e-commerce is not just a technological innovation but a cultural and social one. It fundamentally changed how people shop and interact with businesses, creating new expectations around convenience, price, and personalization [26]. This development led to a profound shift in the balance of power between businesses and consumers, with companies now competing not just on product quality but on the entire customer experience [24]. Overall, the interrelation between e-commerce and the digitalization of the economy is complex and dynamic, shaped by technological, economic, legal, and cultural factors.

Digital transformation significantly affects organizational and social sustainability. The concept of sustainability aims at the arrays: the social, the environmental, and the economic [27]. Social sustainability concerns the social aspects of an organization's activity [28]. Environmental sustainability aims to run an organization's business without affecting the environment by reducing the company's carbon footprint [29]. Economic sustainability drives profit maximization by meeting the needs of all the stakeholder categories. [30]. Feroz et al. [31] explored the matching areas between sustainable development and digital transformation and proposed a framework. The first research hypothesis arising from the literature review concerns the influences of digital transformation and e-commerce on sustainable development goals:

Hypothesis H1. *Digital intensity and e-commerce have a significant positive impact on the SDG Index of the EU countries.*

Some researchers agree that digitalization also positively impacts economic growth [32]. Moreover, researchers such as Abendin and Duan [33] pointed out the need to evaluate the impact of e-commerce on economic growth. Several opinions state that the Internet's influence was decisive in China's economic growth [34,35]. Concurrently, implementing digital technologies and enhanced internet connectivity at 5G and 6G speeds will lead to substantial marginal economic growth [36]. After conducting a study, several researchers concluded that information and communication technologies play a crucial part in economic growth due to their positive effects on labor productivity in the countries where these technologies were implemented [37]. Other authors claimed more investigation of the relationships between the new digital technologies, including multichannel e-commerce and economic growth [38–40]. Kurniawati [41] believed that the more developed countries have a greater fondness for digital investments, leading to considerable economic development. Based on the literature review, this is a two-way relationship; a high level of economic development generates higher investments in new technologies, whereas implementing digital technologies gives rise to additional economic growth [42].

Digital technologies, when they are appropriately used, can influence economic growth, the welfare through changes in the economic structure [43,44]. Digital transformation positively impacts economic growth because it is a crucial driver of economic growth nowadays [45,46]. Digitalization generates an increase in capital and labor productivity by offering specific solutions to protect the environment, thus improving how the three primary factors of production are used [47]. Thus, digital technologies became a production factor, encouraging economic development [48]. The latest digital technologies can support developing societies in transitioning to a developed economy. Billon et al. [49], Myovella et al. [50], Habibi and Zabardast [51], and Toader et al. [52] proved that digital transformation has a significant impact on sustainable development. A second hypothesis that emerged from the literature review is:

Hypothesis H2. *Digital intensity and e-commerce significantly positively impact the GDP per capita in EU countries.*

Digital intensity considerably affects economic sustainability, substantially impacting economic growth [53]. The differences between the individuals' degree of acceptance of the new digital technologies can be attributed to the Internet and the evolution of related digital technologies [54]. Researchers debated the matter of the inequality caused by digital technology access. Lai et al. [55] stressed the disparity between rural and urban life, both individually and on an organizational level, caused by the level of digital technology use and the internet connection speed. During the COVID-19 pandemic, the educational process was influenced by these digital inequalities raised by the differences between the degree of digitalization and internet connection speeds. Among the digital technologies, e-commerce was the area where most discrepancies were found between the economies and the country's regions [56]. A third research hypothesis explores the differences that emerge between the countries regarding digital transformation and e-commerce, as well as how sustainability and economic growth within the European Union are influenced:

Hypothesis H3. *The EU countries can be grouped into homogeneous clusters depending on digital intensity, economic growth, and sustainable development.*

3. Materials and Methods

The research design implied a process of six steps (Figure 1).

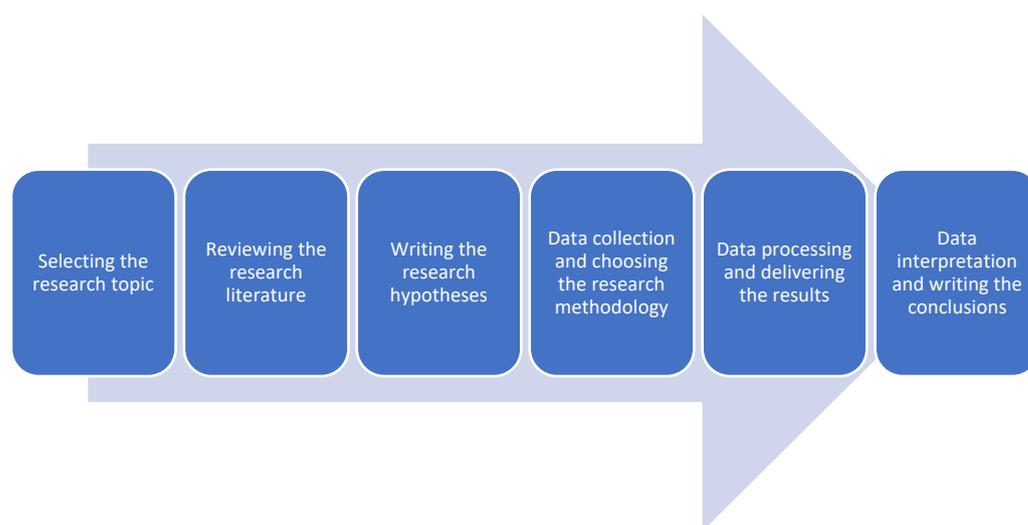


Figure 1. Research design. Source: own design.

The results of the first three steps of the research process were described in the first two sections of this paper. The data we used for the hypothesis testing were collected

from the Eurostat database [57–59] and the Sustainable Development Report 2022 [14]. The paper used a transversal approach, considering the values recorded in 2021 for the following variables: digital intensity, e-commerce, economic performance, and sustainable development. Table 1 presents the variables, the measures, and the sources from which they were collected.

Table 1. Digital intensity, e-commerce, economic performance, and the sustainable development.

Variable	Data Sets	Measures	References
Di	Enterprises with a high digital intensity index (DII version 3)	Percentage of enterprises	[57]
eCom	Enterprises with e-commerce sales of at least 1% turnover	Percentage of enterprises	[58]
GDP	GDP per capita (EU27 2020 = 100)	Purchasing power parities (PPPs)	[59]
SDG	SDG Index	Score (1–100)	[14]

Source: own design based on [14,57–59].

Enterprises with a high digital intensity index represent the level of digital intensity of enterprises using the Digital Intensity Index, which ranges from 0 to 1. Enterprises with a high Digital Intensity Index were expected to have higher digital maturity and competitiveness. Enterprises with e-commerce sales of at least 1% turnover were used to assess the adoption and integration of e-commerce in European enterprises. GDP per capita (EU27 2020 = 100) compared the economic performance of different EU member states. GDP per capita represents the total economic output of a country divided by its population. The SDG Index is a measure developed by the Sustainable Development Solutions Network to assess the progress made by countries towards achieving the United Nations' Sustainable Development Goals (SDGs). The index considers several indicators related to the SDGs, such as poverty, health, education, gender equality, and environmental sustainability. The SDG Index monitors countries' progress towards achieving the SDGs and identifies areas for improvement.

In this study, the data processing and the hypothesis testing were based on the analysis of the artificial neural networks (ANNs) and the cluster analysis, statistical methods used in other research on e-commerce and other areas [60–64]. ANNs are computational models inspired by the structure and functioning of the human brain, designed to recognize patterns and relationships in data. ANNs analysis enabled the paper to predict the influences between variables. This predictive aspect was valuable in assessing the causal relationships and identifying the significant factors driving sustainability and economic growth. Furthermore, using an ANNs model, the paper can determine the extent to which digital intensity and e-commerce contribute to these outcomes. Such predictions can inform policymakers, businesses, and researchers about the potential impacts of these factors and guide decision-making processes.

ANNs analysis implies investigating the relationships between a series of input variables and several output variables mediated by the variables in the hidden layer. Therefore, to investigate hypotheses H1 and H2, we defined digital intensity and e-commerce as variables in the input layer and GDP and SDG as variables in the output layer (Figure 2).

The research used cluster analysis to explore hypothesis H3, allowing the grouping of the EU countries into homogeneous clusters. Cluster analysis is a statistical technique to identify similar entities within a dataset. By applying this method to EU countries, the paper can identify common characteristics, patterns, or trends among countries concerning digital intensity, e-commerce, sustainability, and economic growth. Furthermore, this analysis allows for a nuanced understanding of the variations and similarities among countries and can provide insights into regional dynamics or specific clusters that exhibit similar characteristics.

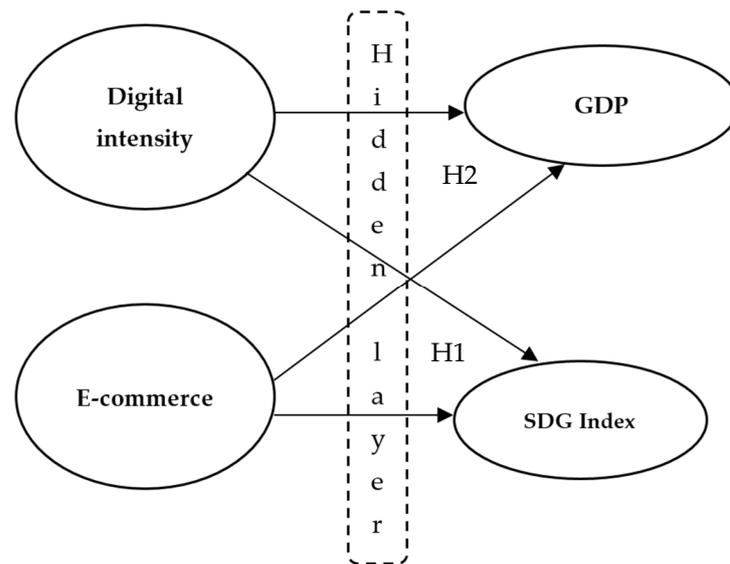


Figure 2. Theoretical model. Source: own design.

4. Results

Before proceeding to hypothesis testing, we conducted a correlational analysis based on the collected data. Table 2 displays the correlations between the four research variables.

Table 2. Correlation analysis.

		Di	eCom	GDP	SDG
Di	Pearson Correlation	1	0.587 **	0.504 **	0.615 **
	Sig.		0.001	0.007	0.001
	N	27	27	27	27
eCom	Pearson Correlation	0.587 **	1	0.177	0.464 *
	Sig.	0.001		0.378	0.015
	N	27	27	27	27
GDP	Pearson Correlation	0.504 **	0.177	1	0.117
	Sig.	0.007	0.378		0.562
	N	27	27	27	27
SDG	Pearson Correlation	0.615 **	0.464 *	0.117	1
	Sig.	0.001	0.015	0.562	
	N	27	27	27	27

Source: own design based on gathered data using SPSS v22. **. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

Analyzing the correlations, we revealed a significant positive correlation between digital intensity, the GDP, and the SDG, whereas e-commerce showed a medium correlation with the SDG and an insignificant correlation with the GDP. These correlational analyses offer a primary overview of the relationships between the variables.

In the artificial neural network analysis, the research used the MLP (multilayer perceptron) model, which allowed for identifying the influences between a series of input layer variables (digital intensity and e-commerce) and several output layer variables (GDP and SDG). The input layer variables indirectly impact the output layer variables by mediating the unobservable variables from the hidden layer [65]. For example, the individual and organizational mentalities concerning digital transformation can be hidden variables during the investigation. Furthermore, this model had other external variables that could act as biases on the hidden and input layers. Figure 3 illustrates the relationships between the model variables.

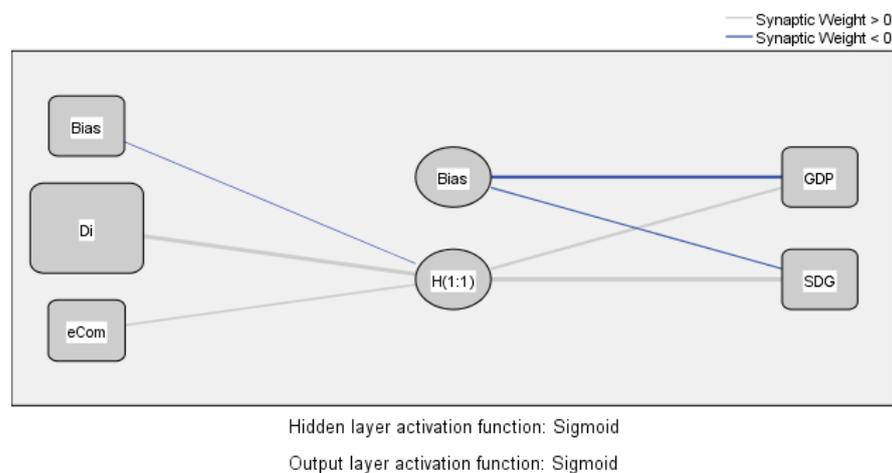


Figure 3. MLP Model. Source: own design based on gathered data using SPSS v22.

The model’s average error during the testing phase was 0.771. The method used for recalling covariates was adjusted normalization of data. Investigating the relationships between the variables points to strong positive influences of digital intensity and e-commerce on the GDP and SDG (Table 3).

Table 3. MLP values.

Predictor	Hidden Layer 1 H (1:1)	Predicted Output Layer	
		GDP	SDG
Input Layer	(Bias)		
	Di		
	eCom		
Hidden Layer 1	(Bias)	−1.870	−0.789
	H(1:1)	1.721	2.238

Source: own design based on gathered data using SPSS v22.

The influences of digital intensity (2.088) were more robust than those exerted by e-commerce (1.268), representing only a part of the digital transformation. Nevertheless, the effects exercised on the GDP (1.721) and the SDG (2.238) were powerful, and sustainable development will benefit more broadly from digital transformation. The external effects exerted within this model through the biases were significant and negative but without a greater magnitude than digital intensity or e-commerce effects. When analyzing the MLP model, we proved the validity of hypotheses H1 and H2. Digital intensity and e-commerce positively and significantly impact the SDG index and the GDP per capita in EU countries.

In order to investigate hypothesis H3, we applied the cluster analysis that implied grouping the EU countries into homogeneous clusters depending on the research variables (digital intensity, e-commerce, economic performance, and sustainable development). Cluster analysis used the average linkage (between groups) method with Euclidian distance as the clustering interval.

Figure 4 displays the dendrogram which resulted after having grouped the EU countries into homogeneous clusters.

There were two clusters, and two countries (Ireland and Luxembourg) were left out of these clusters, characterized by the unusual distribution of variables (Table 4).

Ireland had high rates of digital intensity and e-commerce, and the indicators of economic growth also had very high values, above the EU average. Luxembourg also had a less typical value distribution. Although the digital intensity was high, above the EU average, e-commerce values were low, probably because of the country’s small surface. Regarding economic growth and sustainable development, the values recorded by Luxembourg were

also contradictory. Luxembourg had the highest EU GDP per capita, whereas its SDG index counted among the lowest in the European Union. These contradictory values caused the two countries to not fit into the two clusters.

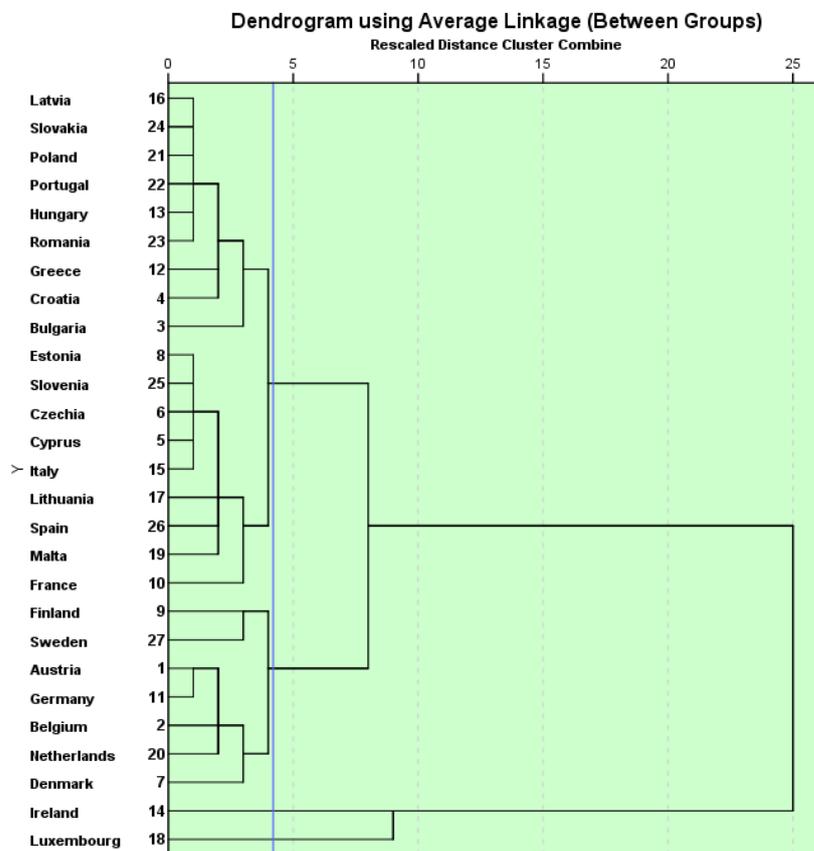


Figure 4. Dendrogram. Source: own design on gathered data using SPSS v22.

Table 4. The non-clustered countries.

	Di	eCom	GDP	SDG
Ireland	25.1	33.6	219	80.64
Luxembourg	21.4	9.1	268	75.65
UE mean	18.1	20.2	118.2	79.5

Source: own design based on gathered data using SPSS v22.

In the first cluster (A), the countries had values over the EU average for all the research indicators, except for the Netherlands, which displayed lower values of the SDG index than the EU average, and Germany, which had lower values of e-commerce than the EU average (Table 5).

Among the countries in the A cluster were the Nordic countries (Finland, Sweden, and Denmark) and other developed countries with much higher values than the average regarding all the research variables. This fact proves that the EU countries that invest in digital technologies and support e-commerce had high economic and social performances.

Table 5. Cluster A.

	Di	eCom	GDP	SDG
Austria	22.0	23.0	123	82.18
Belgium	24.8	30.6	120	79.68
Denmark	27.7	38.3	133	85.61
Finland	44.4	23.5	112	86.48
Germany	18.7	19.7	120	82.16
Netherlands	30.7	23.1	130	76.82
Sweden	39.6	34.1	123	85.15
Cluster A mean	29.7	27.5	123.0	82.6
UE mean	17.3	21.3	104.2	79.6

Source: own design based on gathered data using SPSS v22.

The second cluster (B), more heterogeneous, encompassed a larger group of EU countries divided into two sub-clusters. The first sub-cluster (B1) comprised the countries whose values of the variables were around the EU average (Table 6).

Table 6. Subcluster B1.

	Di	eCom	GDP	SDG
Cyprus	14.1	17.1	91	74.20
Czechia	12.9	24.5	92	80.41
Estonia	11.7	18.7	89	80.51
Italy	15.4	13.1	95	78.31
France	10.7	12.1	104	81.22
Lithuania	15.2	32.0	89	75.30
Malta	20.7	26.7	100	79.83
Slovenia	15.4	19.9	90	79.84
Spain	18.9	25.8	83	79.84
Subcluster B1 mean	15.0	21.1	92.6	78.8
UE mean	17.3	21.3	104.2	79.6

Source: own design based on gathered data using SPSS v22.

A second sub-cluster (B2) encompassed countries with digital intensity, e-commerce, economic performance, and sustainable development values usually under the EU average (Table 7). Of these countries, only Poland and Latvia had values of the SDG index slightly above the EU average. As for the variables of digital transformation, Croatia has high-level e-commerce but relatively low digital intensity.

Table 7. Subcluster B2.

	Di	eCom	GDP	SDG
Bulgaria	2.9	10.5	57	74.28
Croatia	11.9	29.7	70	78.73
Greece	9.1	19.3	64	76.72
Hungary	7.3	18.6	75	78.85
Latvia	9.8	14.6	72	80.05
Poland	9.6	14.8	77	80.47
Portugal	12.9	16.3	75	79.20
Romania	4.6	12.1	74	77.58
Slovakia	10.2	14.2	69	78.39
Subcluster B2 mean	8.7	16.7	70.3	78.3
UE mean	17.3	21.3	104.2	79.6

Source: own design based on gathered data using SPSS v22.

The cluster analysis proved that hypothesis H3 was valid. The EU countries can be grouped into homogeneous clusters depending on countries' digital intensity, economic growth, and sustainable development.

5. Discussion

The digital economy expanded in recent decades, transitioning from the phase where its goal was the development of innovation and the experimental implementation of digital technologies to the deep integration of digital technologies into all economic activities and areas of social life [66]. The models characterizing economic growth and sustainable social development are no longer conceivable without considering the new digital technologies because the digital economy represents a starting point and, simultaneously, a course of action for the sustainability of economic growth [67]. Maintaining stable economic growth is essential to economic, social, and environmental development, whereas digital transformation can be regarded as an essential driver of sustainable economic development [67].

Digital technologies and e-commerce, the most widespread digital innovation, often deal with matters concerning the environment, the economy, or other social aspects at the organizational level [68]. For example, digital transformation allows the seizing of new opportunities [69], obtaining social and economic sustainability due to increased work productivity and capital, and reducing the organization's carbon footprint [30].

Digital transformation affects and alters the existing organizational processes, and innovative digital solutions offer various opportunities to achieve the organization's economic, social, and environmental goals [70,71]. After investigating hypothesis H1, the paper's findings were similar to other authors [72–75], according to whom the digital transformation is a change that will affect the business models. Furthermore, the paper's findings aligned with other research highlighting the transformative nature of digital transformation, which affects organizational processes and business models [72]. Digital technologies offer a range of opportunities for organizations to create new products and services, expand into new markets, and interact with customers in new and innovative ways [71]. For instance, e-commerce revolutionized businesses' operations, enabling them to reach new customers, reduce costs, and increase revenue [63].

Moreover, e-commerce also contributed to achieving several sustainable development goals, such as reducing poverty and inequalities, promoting economic growth and job creation, and promoting sustainable consumption and production [75]. Similarly, adopting digital technologies enabled organizations to collect and analyze vast amounts of data, providing valuable insights into customer behavior and preferences and improving their decision-making processes [73]. This fact led to the development of personalized products and services, which enhanced customer experience and contributed to sustainable consumption patterns [75]. As organizations embrace digital technologies, they must develop a comprehensive digital strategy that aligns with their broader business goals and promote sustainable economic, social, and environmental practices [74].

The COVID-19 pandemic acted as a catalyst for the widespread introduction of digital technologies and for the development of e-commerce, which substantially contributed to economic resilience during the pandemic by developing a new model of sustainable business growth [76,77]. Furthermore, investigating hypothesis H2 led to similar findings to other researchers [25,37,40,44,50,78], according to whom digital technologies and the development of e-commerce are essential drivers of economic growth and performance, and investments in digital technologies lead to additional economic growth. Investments in digital technologies became increasingly crucial for businesses and governments alike, as they recognize the potential benefits digital transformation can bring to the economy [40]. This fact is reflected in the findings of the investigation into hypothesis H2, which highlights the positive impact of digital intensity and e-commerce on the GDP per capita in EU countries. By increasing productivity and efficiency, digital technologies can drive economic growth and performance [44]. By automating manual tasks and streamlining operations,

businesses can reduce costs, improve quality, and deliver products and services more quickly and effectively [76].

Additionally, digital technologies can enable businesses to access new markets and customer segments, allowing them to expand their reach and increase revenue. As digital technologies evolve and become increasingly sophisticated, their potential to drive economic growth and performance will likely increase even further. Governments can play a crucial role in supporting this growth by investing in digital infrastructure and incentivizing businesses to adopt digital technologies [50].

Digital transformation is an essential driver for achieving economic, social, and environmental goals, and it significantly impacts the economy of a country's society and environment. Similarly to the results obtained from investigating hypothesis H3, Brodny and Tutak [15] proved that countries can have different digitalization paces due to the more developed digital infrastructure. Hence, countries such as Denmark, Finland, Belgium, Sweden, and the Netherlands, with well-developed infrastructures, use digital technologies to a greater extent. These findings highlight the importance of investing in digital infrastructure to ensure that countries can reap the benefits of digital transformation and remain competitive in the global economy [79].

Furthermore, a national investment program in digital infrastructure could help to bridge the digital divide between countries, enabling those with less advanced infrastructure to catch up with their more developed counterparts. This development could involve investment in broadband connectivity, digital skills training, and developing digital platforms and services. In addition, by investing in digital infrastructure, countries can achieve economic growth and performance and contribute to environmental sustainability by reducing the need for physical travel and improving energy efficiency [15].

5.1. Theoretical Implications

In the context of ensuring sustainability, evaluating digital transformation impact is required. Some researchers stress the need to implement development programs focusing on climate change, digitalization, and sustainability [80–83]. Digital intensity and e-commerce can be powerful stimulators for achieving sustainable development goals (SDG) and economic growth (GDP) in EU countries. Digital technologies can allow better access to education, healthcare, and financial services, facilitate environmental sustainability, and stimulate innovation and efficiency. E-commerce, in turn, can have a share in GDP growth, thus enabling companies to attract new customers by reducing marketing costs and improving the efficiency of the supply chain. Although many EU countries made some progress in promoting digital intensity and e-commerce, there are still significant variations in these areas at the European level. Nevertheless, the continuous investments in digital infrastructure and innovation, as well as the politics that aim at promoting e-commerce enhancement, particularly in the countries with a low level of digitization and e-commerce (Romania, Bulgaria, Hungary, Greece), can contribute to sustainable economic growth and the environmental and social goals achievement.

5.2. Practical Implications

Sustainability and digitalization studied in combination offer new research perspectives, also representing an accumulation of challenges. More and more studies are trying to analyze the links between digitalization and sustainability within the EU by emphasizing the impacts of digitalization on sustainable business development [19]. The sustainable development goals should consider the inter-correlations between digitalization and sustainability [84]. Del Rio Castro [84] proposed a new perspective, believing that digital transformation leads to economic, cultural, and social change, which has synergistic effects on sustainability. The paper analyzed digital intensity and e-commerce as economic growth and sustainable development drivers. Like other research, the paper determined the correlation between digital and sustainable development [85], which supports the need for investments in digital infrastructure in the less digitally developed countries of the

European Union. The funds allocated by the European Commission for digitalization can contribute to gaining additional economic growth in the less developed countries of the European Union (from the sub-cluster B2) while ensuring their sustainable development. Increasing economic growth and socially sustainable development models were analyzed concerning digital technologies by considering economic growth [17].

5.3. Limitations and Further Research

The paper had a few limitations derived from the research design and variables. For the research design, we chose a transversal design that provided more data about the phenomena, but it did not offer a longitudinal perspective throughout time. Future longitudinal studies will allow analyzing the chronological evolutions of the influences between the variables. A second limitation derived from the synthetic nature of the variables selected for research.

In light of the issues raised in the paper, there is a need for further research to develop better the social aspect of sustainability in various European countries. While some European countries made significant progress in sustainability, others lag, and the level of market opportunities differs significantly.

Future research could consider the following questions to address this gap:

- How do sustainability's social aspects vary across European countries, and what factors contribute to these variations?
- What role can technology play in promoting sustainability, and how can it be leveraged to address social sustainability challenges in different European countries?
- What are the implications of different sustainability levels across European countries for regional and global sustainability efforts, and how can these be addressed using new digital technology?

Future research could examine the relationship between the structure of e-commerce and sustainability, including the impact of factors such as the size of the platform, delivery options, and the level of carbon emissions generated. The study could also explore the relationship between e-commerce and economic growth, examining the impact on employment, innovation, and productivity.

These issues could provide a starting point for further research into the social aspect of sustainability in European countries. By exploring these issues, researchers can help policymakers and businesses develop more effective strategies for promoting sustainability and building a more sustainable future.

6. Conclusions

Digital intensity and e-commerce are essential drivers for achieving sustainable development goals and economic growth. The increase in the digital economy and e-commerce changed the activities of organizations and how consumers interact with the organizations, thus leading to new opportunities for sustainable economic growth and development. Digital intensity refers to an economy or organization's digitalization and technological innovation level. Digital technologies, such as artificial intelligence, the blockchain, the Internet of Things, and cloud computing, are increasingly active in economic activities, leading to increased economic performance intensified by innovation.

The increase in e-commerce revolutionized how organizations reach customers and interact with them, allowing them to enter new markets and increase their customer portfolio. E-commerce also created new opportunities for sustainable development and growth because it allows enterprises to reduce their carbon footprint, improve the supply chain's efficiency, and create new opportunities in the labor market. Digital intensity and e-commerce can lead to faster achievement of the SDGs by allowing organizations to use technology to tackle global challenges such as poverty, inequality, climate change, and sustainable consumption and production. For instance, digital technologies can be used to develop innovative solutions to reduce greenhouse gas emissions, support agriculture and the production of sustainable energies, and facilitate access to education and healthcare.

Concerning GDP, digital intensity and e-commerce can create new markets and opportunities for enterprises, leading to increased economic growth and job creation by creating new export opportunities and increasing. By leveraging digital technologies and e-commerce, organizations can create new opportunities for growth and economic development while simultaneously addressing global challenges and promoting sustainability.

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