Innovative Digital Technologies in Finance for Promoting Sustainable Development Goals: Baltic Economies Compared to OECD Countries

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Abstract: - Financial technologies support achieving sustainable development goals (SDGs)from the micro level to the entire economy. The study aims to reveal the role of innovative digital technologies in the financial sector in promoting the SDGs, paying special attention to the Baltic countries. Digital financial technologies and their application for ensuring sustainable development, focusing on the analysis of achieving sustainable development goals in the Baltic countries, thus providing the link between innovative digital technologies and promoting sustainable development goals, are under investigation. The study identifies the SDGs significantly affected by technological innovations in the financial sector: SDG 1 refers to the necessity of ending poverty; SDG 8 promotes inclusive and sustainable economic growth; SDG 9 stresses the importance of resilient infrastructure, industrialization, and innovation; and SDG 10 appeals to reduce inequality within and among countries. The countries' performance in achieving these SDGs is heterogeneous: Baltic countries need to improve the achievement of these four SDGs, lagging behind other OECD countries due to the relatively low level of digital technologies.

Key-Words: - digital finance, digital technologies, SDGs, Financial Development Index, digitalization index, Baltic countries.

1 Introduction

The development of information technologies has contributed to the emergence and rapid growth of financial technologies (FinTech). Innovative technologies in the financial industry, including blockchain technology, artificial intelligence (AI), machine learning, etc., help improve financial services, facilitate access to finance, etc. Nowadays, financial technologies support the sustainable development of countries. [1], has facilitated green digital financing and will enable financing initiatives related to the SDGs, making them essential for

promoting development. The adoption of the SDGs by the United Nations in 2015 has started a new era of trends toward sustainable development around the globe, contributing to the reduction of poverty and promotion of sustainable development in countries. SDGs consist of 17 goals ensuring well-being, inclusion, equality, innovation, economic growth and others, [2]. The challenges countries face in promoting the SDGs are widely studied; however, they are not in all European regions. Analysis of the 2024 SDG dashboards for OECD countries shows that the Baltic countries face significant challenges in Europe in reaching all the mentioned goals. Moreover, in Latvia and Lithuania, the challenges in achieving some sustainable development goals are considered as major, [3].

Several studies are devoted to digitalization and financial sector development in the Baltic countries. [4], [5], [6], [7] however, not in the context of sustainable development.

The study aims to reveal the role of innovative digital technologies in the financial sector in promoting the SDGs, paying special attention to the Baltic economies.

It studies digital financial technologies and their application to ensuring sustainable development, focusing on the analysis of achieving sustainable development goals in the Baltic countries. Thus, it provides the link between innovative digital technologies and promoting sustainable development goals. The Baltic countries are chosen due to their relatively low level of SDG achievement.

The case of the Baltic countries (Estonia, Latvia, and Lithuania) is useful for analysis due to their huge progress since regaining independence in the 1990s, transition to the market economy, membership in the EU, and strong positions in the financial sector development, digitalization of the economy, and moving toward sustainable development. However, the digitalization level of the financial industry is not sufficient yet. As previous studies of the digitalization of the financial sector in the Baltic countries stress, the financial industry participants consider innovative digital technologies as one of the critical factors in ensuring the sustainable development of the industry and the whole economy. [8], using the most promising technologies such as Blockchain technology, Cloud computing, and AI.

2 Literature Review

Nowadays, the importance of financial technologies is recognized internationally, [9]. Besides, FinTech is continuously developing due to product and process innovation, which benefits the economy and the well-being of society. The implication of financial technologies contributes to the development of the financial industry and stimulates technological progress and productivity growth. Moreover, China's experience shows that FinTech can help reduce poverty, [10].

According to the United Nations, the World Bank, etc. [11], [12], [13], digital innovation in the financial sector can significantly contribute to achieving several UN SDGs through various instruments and tools. The connection between finance and technology, often referred to as FinTech, can improve financial inclusion, encourage economic growth, and provide the necessary ground for sustainable development initiatives.

Based on the existing research, the authors identified several UN SDGs most affected by these financial sector innovations, as well as the interplay between the financial industry and technological innovations:

- SDG 1: end poverty in all its forms everywhere.
- SDG 8: promote sustained, inclusive and sustainable economic growth, full and productive employment, and decent work for all.
- SDG 9: build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.
- SDG 10: reduce inequality within and among countries.

Studies identified the crucial importance of digital technologies in providing access to financial products and services for the unbanked and underbanked, helping them save, borrow, and invest more efficiently. Understanding their needs is not just an essential step but an urgent one towards addressing poverty, thus achieving SDG 1, [14], [15], [16]. On the other hand, digital finance innovations can significantly boost economic productivity. These innovations enable faster, cheaper transactions and provide new tools for small businesses to manage their finances and access loans, fostering economic growth. Besides, digital financial services not only facilitate faster and cheaper transactions but also provide a platform for financial inclusion, which in turn can lead to increased economic activity and growth, thus

contributing to the achievement of SDG 8, [17], [18], [19], [20], [21].

SDG 9 implies promoting inclusive and sustainable industrialization, fostering innovation, and building resilient infrastructure. The development of digital financial infrastructure contributes to this goal while enabling other industries to innovate and grow, [22], [23]. According to SDG 10, reducing inequality within and among countries is essential. Digital financial services have the potential to significantly reduce disparities by providing access to financial services for marginalized groups and reducing the costs of financial transactions, including remittances. This potential offers a hopeful outlook for a more inclusive financial landscape, [14], [18], [22], [24].

Digital technologies in finance, including blockchain, big data analytics, and artificial intelligence, allow for increased availability and efficiency of financial services (Figure 1).

Figure 1 shows that the application of innovative digital financial technologies allows supporting decision-making and automatization of services and processes, provides remote solutions for innovative financial services, [25], [26], [27].
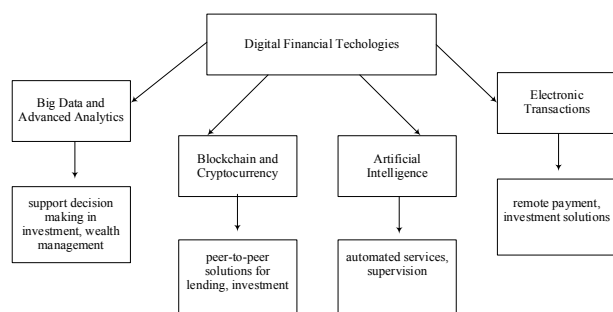

Fig. 1: Contribution of innovative digital financial technologies, [26], [27], [28]

Therefore, this study focuses on the use of digital technologies in the financial sector of the economy to promote these selected sustainable development goals.

3 The Baltic Countries in the Achievement of the Digital Financial Technologies Related to SDGs

Countries worldwide show different levels of progress in achieving the SDGs. Some countries have achieved high scores, while others struggle to demonstrate at least a median.

The descriptive statistics in Table 1 suggest an inclusive assessment of how OECD countries perform across these four SDGs mentioned above. The paper studies digitalization in the context of finance and innovation in promoting the SDGs, with particular attention to the case of the Baltic countries (Estonia, Latvia, and Lithuania), which show noticeable deficiencies in achieving these goals compared to other OECD countries.

Table 1. Descriptive Statistics on the Selected UN SDGs in OECD Countries, 2023, [2]

	UN SDG 1_score	UN SDG 8_score	UN SDG 9_score	UN SDG 10_score
Median	99.200	80.000	89.350	84.545
Mean	98.034	78.781	87.101	79.558
Std. Deviation	4.600	4.847	11.292	22.171
Minimum	73.540	66.230	54.860	16.200
Maximum	99.930	85.700	99.590	100.000
25th percentile	98.752	76.757	83.292	75.570
75th percentile	99.477	82.448	95.985	94.218

As indicated in Table 1, the achievement of SDG 1 by the OECD countries shows the highest overall scores among the four goals analyzed in this study. The median of 99.2 and mean of 98.034 indicate that most OECD countries are close to achieving this goal.
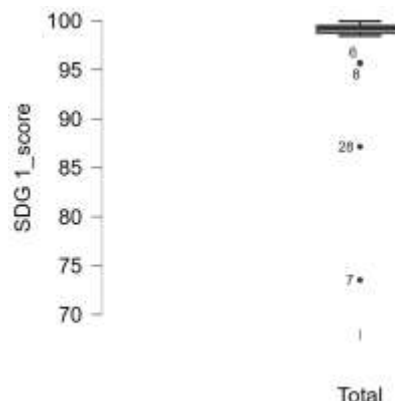

Fig. 2: The achievement of the SDG 1 in OECD countries, 2023, [2]
Outliers: 7 – Colombia; 28 – Mexico; 8 – Costa Rica; 6 – Chile

The small standard deviation (4.6) suggests a high level of consistency across countries, with the majority clustering near the top of the scale (see Figure 2). However, the minimum score of 73.54

specifies that at least one country is significantly lagging behind the others (Colombia). This outlier pulls down the mean slightly below the median, generating a slight negative skew in the distribution.

Table 2. The performance of the Baltic countries in the achievement of the digital finance-related SDGs, [2]

		UN SDG 1_SCORE	UN SDG 8_SCORE	UN SDG 9_SCORE	UN SDG 10_SCORE
ESTONIA		98.52	76.33	86.54	86.12
	Percentile (th)	18	23	36	50
LATVIA		98.81	82.7	77.24	74.08
	Percentile (th)	33	79	15	21
LITHUANIA		98.78	76.41	81.03	67.72
	Percentile (th)	31	26	21	16

A performance study of the three Baltic countries reveals substantial progress towards UN SDG 1. However, their performance is below the 75th percentile of OECD countries, indicating room for further improvement compared to top-performing nations (Table 2).

SDG 8 overall scores in OECD countries are lower in comparison to SDG 1 but still show a relatively high rate of progress. The median of 80 and mean of 78.781 suggest that most countries perform sufficiently, but bigger improvements are necessary with SDG 1. The standard deviation (4.847) is similar to SDG 1, representing a comparable level of consistency across countries. The range from 66.23 (Turkey) to 85.7 (Japan) shows that while some countries are topping, others are facing more substantial challenges in promoting decent work and economic growth (Figure 3).

Examination of the statistical data on SDG 8 reveals a nuanced picture of performance among the Baltic economies: Lithuania and Estonia demonstrate scores below the 75th percentile of OECD members. This positioning indicates that while these countries have made progress, there is still much room for improvement to reach the top OECD member countries. The data demonstrates that Latvia's score marginally exceeds the 75th percentile threshold.
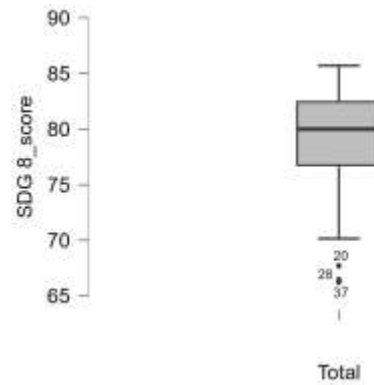

Fig. 3: The achievement of the SDG 8 in OECD countries, 2023, [2]
Outliers: 37 – Turkey; 28 – Mexico; 20 - Iceland

This suggests a relatively robust performance in promoting decent work and economic growth than its Baltic counterparts. Nevertheless, the data underscores the necessity for innovative approaches and policy interventions to enhance decent work conditions further and stimulate sustainable economic growth across all three countries. The authors believe that the success of digitalization in the region's financial sector could provide the necessary support.

The SDG 9 shows more inconsistency in performance compared to SDG 1 and SDG 8. The median (89.35) and mean (87.101) are relatively high, but the larger standard deviation (11.292) indicates more spreading in scores across countries. The wide range from 54.86 (Colombia) to 99.59 (Republic of Korea) additionally emphasizes the differences in industrial development, level of innovation, and infrastructure among OECD member countries. Some countries are nearly achieving this goal (the Republic of Korea, the USA & Sweden), while others are significantly behind (Colombia, Costa Rica & Mexico), as demonstrated by Figure 4.

Despite notable advancements, Estonia, Latvia, and Lithuania's SDG 9 performance metrics all fall below the 75th percentile compared to other OECD countries. This positioning within the inter-quartile range suggests that while the Baltic economies have made commendable progress, they have not yet achieved parity with the top-performing OECD nations in this domain. This analysis underscores the need for continued focus on policies that promote industrial innovation and infrastructure development.
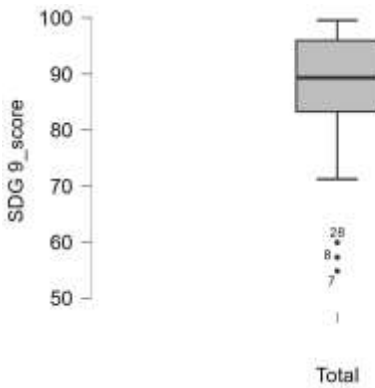
Fig. 4: The achievement of the SDG 9 in OECD countries, 2023, [2]
Outliers: 7 – Columbia; 8 – Costa Rica; 28 – Mexico

Finally, SDG 10 provides the most wide-ranging picture of the four goals chosen for the analysis. While the median (84.545) suggests that half of the countries are performing quite well, the lower mean (79.558) and the extremely high standard deviation (22.171) indicate significant disparities among OECD members. Some countries have achieved perfect scores in reducing inequalities (e.g., Belgium, Czech Republic, Iceland, Slovak Republic, and Slovenia), while others are struggling considerably (e.g., Colombia, Costa Rica) with this goal, as demonstrated by Figure 5.
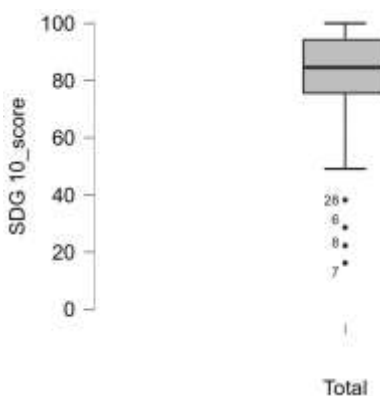

Fig. 5: The achievement of the SDG 10 in OECD countries, 2023, [2]
Outliers: 7 – Columbia; 8 – Costa Rica; 6 – Chile; 28 – Mexico

Table 2 shows that despite notable progress, Estonia, Latvia, and Lithuania's performance metrics all fall below the 75th percentile compared to other OECD members.

Statistical data analysis reveals a hierarchical pattern of consistency in UN SDG achievement among OECD nations. SDG 1 exhibits the highest level of consistent high achievement, with the lowest standard deviation and a narrow range of scores. SDG 8 follows with the second-highest consistency. In contrast, SDGs 9 and 10 demonstrate markedly higher inconsistency, with SDG 10 presenting the widest dispersion of scores among the four goals examined. The data indicate that OECD countries have achieved near-optimal performance in addressing poverty, with a significant proportion of nations reaching scores near the theoretical maximum. This finding suggests that developed economies have implemented effective strategies for mitigating extreme poverty within their controls. The asymptotic nature of these scores implies that further marginal progress may be achieved by introducing innovative approaches across multiple sectors, including finance.

The analysis of SDG 10 discloses this goal to be the most challenging for OECD countries, as evidenced by the lowest mean score and highest coefficient of variation. This outcome underscores the multifaceted and persistent nature of economic and social inequalities, even within advanced economies. The authors posit that targeted technological innovations in the financial sector could potentially improve outcomes in this domain. Examining SDG 9 scores indicates a notable performance gradient among OECD countries. While a subset of nations demonstrates high achievement, a significant gap exists between the upper and lower quartiles. This disparity emphasizes the relevance of the research topic, particularly in exploring how financial innovation might bridge this performance gap. The analysis of SDG 8 scores reveals generally positive performance across OECD countries in promoting economic growth and employment. However, the scores fall short of the exceptional levels observed for SDG 1, indicating potential for further advancement. The authors consider innovative financial technologies crucial in facilitating progress in this area.

Finally, the statistical data analysis made clear that, in most cases, the Baltic countries cannot achieve the 75th percentile; therefore, significant potential and activities are needed to achieve higher progress. This potential can be harnessed through increased investment in digital financial infrastructure and targeted financial inclusion programs for marginalized groups.

4 Digitalization, Innovative Technologies and Financial

Development of the Baltic Countries

Nowadays, digitalization is an essential aspect of economic development, helping to achieve sustainable development goals. A country's level of digitalization can be measured using different indices. The most widely used are the Global Digitalisation Index (GDI) (assesses the digital transformation of the 77 world economies) and the Digital Economy and Society Index (DESI) (monitors the overall digital performance of European countries).

GDI is one of the most complete indices used to assess the general progress of digitalization; it contains the assessment of the 77 countries representing 93% of the total GDP and 80% of the world's total population. The GDI is one of the most comprehensive indicators used to assess overall digitalization progress, as it contains assessments of 77 countries representing 93% of total GDP and 80% of the total world population. The GDI evaluates the maturity of a country's ICT industry based on the assessment of 42 indicators grouped as follows, [28]:

- Ubiquitous Connectivity (communication and data exchange infrastructure)
- Digital Foundation (deployment of advanced technologies)
- Green Energy (ensuring the positive contribution of the digital transformation to global sustainability goals)
- Policy & Ecosystem (inclusive, sustainable, and resilient digital transformation)

The GDI reflects the maturity level of the country's ICT industry and its impact on the national economy, proving a positive correlation between the GDI and the country's GDP. The countries are grouped into three clusters: Frontrunners, Adopters, and Starters.

Analysis of the GDI index report shows that 19 OECD countries (50%) are ranked as Frontrunners, constituting 86% of the leaders and showing a high level of economic digitalization. Besides, 15 OECD countries, including the Baltic countries Estonia and Lithuania, are classified as adopters – countries quickly adopting digital development.

The quick progress of the Baltic countries is also evidenced by their high position in the World Digital Competitiveness Ranking, measuring countries' capacity to use digital technologies (Estonia ranked 18th, Latvia – 40th, and Lithuania – 28th), [29].

The current study focuses on the World Digital Competitiveness Ranking, a pivotal measure of countries' use of digital technology. The authors provide a detailed data analysis, enhancing the understanding of the ranking (Figure 6).
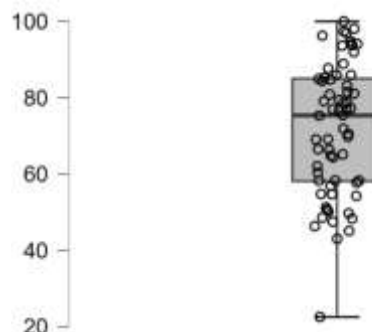

Fig. 6: World Digital Competitiveness Ranking, 2023, [30]

Figure 6 illustrates the boxplot for the World Digital Competitiveness Ranking for 2023, while Table 3 presents the descriptive statistics, showcasing the ranking across 64 nations on a standardized index scale from 0 to 100. The United States leads with a perfect score of 100.00, followed by the Netherlands and Singapore. This ranking indicates a significant concentration of digital capabilities in North America, Western Europe, and Southeast Asia, providing valuable insight into the regional distribution of digital competitiveness. A stark contrast is evident between high-performing and low-performing nations, with Venezuela ranking lowest at 22.55, a 77.45-point difference from the leader. The data also highlights the prevalence of developed economies in the upper quartile of the rankings.

Moreover, the successful digitalization of the Baltic countries is witnessed by the Digital Economy and Society Index (DESI), which comprises various indicators characterizing different aspects of digitalization: digital skills, digital infrastructures, digital transformation of businesses, and digitalization of public services, [31]. DESI helps to assess the digital performance and progress of EU countries. According to DESI, the Baltic Countries have flaws in digitalization in only several positions while showing promising results in several aspects. According to the second report on the State of the Digital Decade published by the European Commission, the main weakness of all three Baltic countries is the connectivity infrastructure, [30].

Table 3. Descriptive Statistics, [30]

Descriptive Statistics

	World Digital Competitiveness Ranking
Median	75.370
Mean	71.817
Std. Deviation	17.387
Minimum	22.550
Maximum	100.000
25th percentile	58.123
75th percentile	85.025

Besides, essential areas to improve are 'Basic digital skills and ICT specialists' (Estonia), 'Digitalisation of SMEs' (Latvia), and 'Adoption of advanced digital technologies by enterprises' (Lithuania).

On the other hand, an essential flaw of the Baltic countries is a relatively low level of innovation. According to the Global Innovation Index, Switzerland is the world leader in innovation, with the highest innovation score of 67.5. The top 10 also includes other European countries: Sweden (rank 2), the United Kingdom (rank 5), Finland (rank 7), the Netherlands (rank 8), Germany (rank 9), and Denmark (rank 10), [32]. The Baltic countries are ranked lower (Table 4), with only Estonia in the top 20.

These coefficients were chosen for their ability to measure the strength and direction of the relationship between two variables, in this case, digital competitiveness and UN SDG scores. The corresponding p-values are used to assess statistical significance, providing a robust and reliable data analysis method.

Analysis of Table 3 shows that the Baltic countries (especially Latvia) need improvements in human capital research, knowledge, and technology. The critical factor contributing to the improvement of innovation level is digitalization, the use of digital technologies, and better infrastructure is the availability of the necessary financing. Thus, a well-developed financial industry may help to improve countries' current positions.

Table 4. Global Innovation Index Ranking in Estonia, Latvia and Lithuania, [31]

	Overall	Institutions	Human ca	Infrastructure	Market sophi	Business sophi	Knowledge and

	GII		pital and research		stication	stication	technology output
Estonia	16	12	31	6	6	27	21
Latvia	42	42	45	33	53	40	51
Lithuania	35	22	44	38	28	38	29

Analysis of the Financial Development Index (FDI) of European countries shows significant differences in the development of financial markets and institutions across the countries, especially in the Baltic economies (Figure 7).
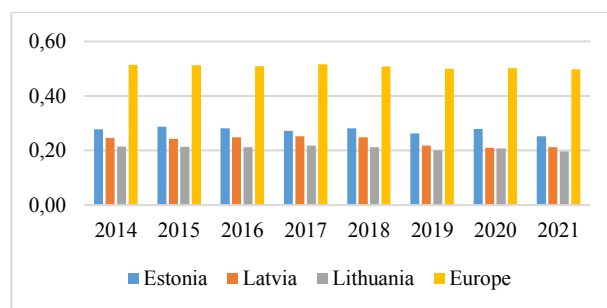

Fig. 7: Financial Development Index in the Baltic countries and Europe, 2014-2021, [32]

The FDI, developed by the IMF, helps to evaluate the development of financial markets and institutions in terms of size and liquidity (Financial Market Depth Index, FMDI), the ability of individuals and companies to access financial services, and efficiency in providing financial services at low costs and with sustainable revenues. The Baltic countries' FDI is more than two times lower than the European average, confirming the necessity to ensure higher efficiency and more sustainable revenues.

Therefore, further progress in digitalization and innovative technologies in finance will contribute to more sustainable development and a robust financial industry.

5 Digitalization in Promoting the Achievement of the SDGs

Digital technologies, finance, and innovation are among the factors that contribute to promoting the

achievement of SDGs in the economies. For the analysis, we have selected the GDI index, which assesses the digitalization level of 92% of the OECD countries (35 out of 38).

The correlation analysis between the Global Digitalization Index (GDI) and the selected UN Sustainable Development Goal (SDG) scores in Table 5 reveals nuanced associations. The study employed three correlation coefficients: Pearson's r, Spearman's rho, and Kendall's Tau B, with corresponding p-values to assess statistical significance.

As Table 5 indicates, the relationship between GDI and UN SDG 1 shows a moderate to strong positive correlation. Pearson's r (0.457, p = 0.006) indicates a statistically significant moderate linear relationship, while Spearman's rho (0.608, p < 0.001) suggests a stronger monotonic association. Kendall's Tau B (0.433, p < 0.001) verifies this moderate positive relationship. As a result, one can note that digitalization has a positive effect on the progress level in UN SDG 1.

GDI and UN SDG 8 reveal a strong positive linear correlation (Pearson's r = 0.611, p < 0.001). As measured by Spearman's rho (0.509, p = 0.002), the monotonic relationship is moderately strong, with Kendall's Tau B (0.375, p = 0.002) supporting a moderate positive association. As a result, the authors claim that the level of digitalization could positively affect decent work and economic growth.

The strongest correlation is observed between GDI and UN SDG 9. Pearson's r (0.829, p < 0.001) and Spearman's rho (0.846, p < 0.001) both indicate very strong positive relationships, with Kendall's Tau B (0.676, p < 0.001) confirming a robust positive association. So there is no doubt that a high level of digitalization leads toward better progress within the Industry, Innovation, and Infrastructure goal.

The relationship between GDI and UN SDG 10 is less consistent. While Pearson's r (0.463, p = 0.005) suggests a moderate positive linear relationship, Spearman's rho (0.218, p = 0.208) and Kendall's Tau B (0.171, p = 0.151) indicate weak and statistically non-significant monotonic relationships.

Table 5. Correlation Table

Variable		Global Digitalization Index
1. Global Digitalization Index	Pearson's r	—
	p-value	—
	Spearman's rho	—
	p-value	—
	Kendall's Tau B	—
	p-value	—
2. SDG 1_score	Pearson's r	0.457
	p-value	0.006
	Spearman's rho	0.608
	p-value	< .001
	Kendall's Tau B	0.433
	p-value	< .001
3. SDG 8_score	Pearson's r	0.611
	p-value	< .001
	Spearman's rho	0.509
	p-value	0.002
	Kendall's Tau B	0.375
	p-value	0.002
4. SDG 9_score	Pearson's r	0.829
	p-value	< .001
	Spearman's rho	0.846
	p-value	< .001
	Kendall's Tau B	0.676
	p-value	< .001
5. SDG 10_score	Pearson's r	0.463
	p-value	0.005
	Spearman's rho	0.218
	p-value	0.208
	Kendall's Tau B	0.171
	p-value	0.151

In the previous part of the research, the authors mentioned the significance of the World Digital Competitiveness Ranking. In the current discussion, we perform a correlation analysis between the World Digital Competitiveness Ranking and the selected

UN SDGs scores (Table 6). The study employed three correlation coefficients: Pearson's r, Spearman's rho, and Kendall's Tau B.

The correlation analysis in Table 6 reveals significant relationships between the World Digital Competitiveness Ranking and various SDG scores. UN SDG 8 score demonstrates the strongest positive correlation (Pearson's r=0.319, p=0.035), indicating a statistically significant relationship between digital competitiveness and decent work/economic growth metrics. UN SDG 1 score shows a weak positive correlation (Pearson's r=0.103, p=0.506), though this relationship lacks statistical significance given the high p-value.

Notably, the UN SDG 9 score and the UN SDG 10 score exhibit negative correlations with digital competitiveness, though neither reaches statistical significance. The consistency across different correlation coefficients (Pearson's r, Spearman's rho, and Kendall's Tau B) strengthens the reliability of these findings, as they demonstrate similar directional relationships despite using different computational approaches.

It is important to note that UN SDG 8 (Decent Work and Economic Growth) exhibits the most robust and statistically significant positive association with the World Digital Competitiveness Ranking across all correlation measures. This finding contrasts with the GDI analysis. In the GDI analysis, UN SDG 9 showed the strongest positive relationship. Interestingly, UN SDG 9 (Industry, Innovation, and Infrastructure) demonstrates a negative correlation with Digital Competitiveness, which differs from its strong positive association with GDI in the previous analysis. UN SDG 1 shows a weak positive relationship with Digital Competitiveness, contrary to its strong positive association with GDI. The relationship between Digital Competitiveness and UN SDG 10 appears consistently negative but weak, which differs from its weak but positive relationship with GDI. These findings suggest that while GDI and Digital Competitiveness measure aspects of digital development, they capture different dimensions of digital progress, as evidenced by their contrasting relationships with UN SDGs, particularly in industry, innovation, and infrastructure.

To deepen the analysis, the authors consider the application of Structural Equation Modelling (SEM) to determine the relationships between the Global Digitalization Index (GDI) and UN Sustainable Development Goals (SDGs), as the correlation

analysis suggests the existence of a relationship between the two variables.

Table 6. Correlation Table

Variable		World Digital Competitiveness Ranking
1. World Digital Competitiveness Ranking	Pearson's r	—
	p-value	—
	Spearman's rho	—
	p-value	—
	Kendall's Tau B	—
	p-value	—
2. SDG 1_score	Pearson's r	0.103
	p-value	0.506
	Spearman's rho	0.038
	p-value	0.807
	Kendall's Tau B	0.051
	p-value	0.636
3. SDG 9_score	Pearson's r	-0.169
	p-value	0.274
	Spearman's rho	-0.170
	p-value	0.270
	Kendall's Tau B	-0.112
	p-value	0.290
4. SDG 10_score	Pearson's r	-0.163
	p-value	0.292
	Spearman's rho	-0.030
	p-value	0.844
	Kendall's Tau B	-0.010
	p-value	0.927
5. SDG 8_score	Pearson's r	0.319
	p-value	0.035
	Spearman's rho	0.225
	p-value	0.142
	Kendall's Tau B	0.150
	p-value	0.155

SEM enables the simultaneous examination of multiple interdependent relationships between GDI and various SDGs; moreover, it captures both direct

and indirect effects of digitalization on development outcomes while accounting for the inherently interconnected nature of different development goals.

The SEM analysis reveals several significant findings. The model demonstrates robust statistical validity with favorable fit indices (Table 7), including a Comparative Fit Index (CFI) of 0.942 (above the threshold level), a Root Mean Square Error of Approximation (RMSEA) of 0.076 (falling within acceptable parameters), and a Standardized Root Mean Square Residual (SRMR) of 0.045 (indicating excellent fit). So, the model is satisfactory, and the findings are valid.

Table 7. SEM Model Fit Indices

	Model Value	Threshold level
CFI	0,942	>0,9
RMSEA	0,076	<0,08
SRMR	0,045	<0,05

Path coefficient analysis reveals existent direct effects (Table 8) between variables used in the current study:

- The relationship between the GDI and Economic Development, comprising UN SDG 8 (Decent Work) and UN SDG 9 (Innovation), exhibits a strong positive correlation with a standardized coefficient of 0.684 (p < 0.001).
- The relationship between GDI and Social Development, encompassing UN SDG1 (No Poverty) and UN SDG 10 (Reduced Inequalities), demonstrates a moderately strong positive relationship (standardized coefficient: 0.571, p < 0.001).
- Social Development shows a moderate positive influence on Economic Development (standardized coefficient: 0.423, p < 0.001).

It is worth considering that factor loadings demonstrate robust construct validity (follow Table 9) across all dimensions mentioned above. Economic development indicators show particularly strong loadings, with UN SDG 9 (Innovation) at 0.855 and UN SDG 8 (Decent Work) at 0.812. Social development components also exhibit substantial loadings, with UN SDG 1 (No Poverty) at 0.768 and UN SDG 10 (Reduced Inequalities) at 0.734.

Table 8. SEM Model Path Coefficients

Model path of direct effect	Standardized coefficient	*p*-value
GDI → economic development	0,684	<0.001
GDI → social development	0,571	<0.001
Social development → economic development	0,423	<0.001

Table 9. SEM Model Factor Loadings

Indicators	Loading of indicators
Economic development	
UN SDG 8	0,812
UN SDG 9	0,855
Social development	
UN SDG 1	0,768
UN SDG 10	0,734

Finally, the data enables a country-specific analysis of digital development, focusing on the relationship between digitalization and the performance of the UN SDGs through country comparisons. The study reveals that European nations dominate the top 10 digital leaders: France, the United Kingdom, and Germany stand out as the leaders in digitalization. Moreover, a strong correlation exists between digital leadership and high UN SDG performance, particularly in social development, where these countries consistently achieve high scores.

Furthermore, the authors identify distinct regional trends in the comparison of digitalization and SDG performance (Figure 8):

- Europe shows the highest average performance across economic and social dimensions, reflecting a well-rounded attitude towards digitalization and sustainable development.
- North America demonstrates strong overall performance but falls behind Europe in social development metrics.
- The Asian region is marked by rapid progress, especially in economic indicators of digitalization.
- Significant regional disparities in digital development persist, with considerable variations in progress across different areas.
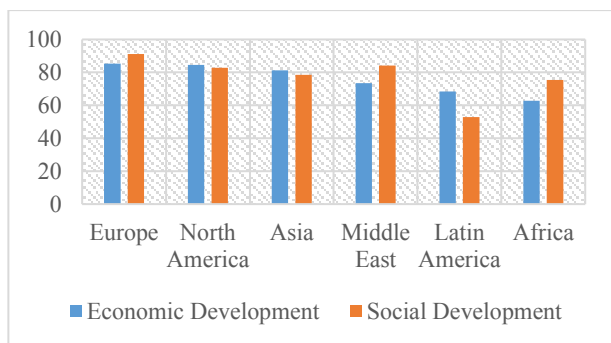
Fig. 8: Overview of the regional performance, [2]

The analyzed countries can be grouped into three distinct clusters based on their digital development and performance concerning the SDGs, as illustrated in Figure 9. The first cluster, Advanced Digital Nations, represents countries with the highest scores across economic and social dimensions of digitalization (average economic score of 88,5 & average social score of 92.3). They establish broad integration of digital technologies into their economies and societies, with well-developed infrastructure, strong digital governance, and policies to promote innovation - the total number of 15 countries among OECD nations.

The second cluster, Digital Followers, encompasses 20 OECD nations, including the Baltic countries. While these countries demonstrate robust digital advancement, their progress remains uneven; therefore, they face considerable challenges that must be addressed.

The Digital Followers group excels in e-commerce adoption and mobile connectivity. The countries within this cluster encounter persistent challenges like digital literacy, technology access equity, etc. These disparities often stem from structural impediments and inconsistent policy implementation across regions and demographic groups.

Finally, the third cluster is the Digital Emerges cluster, which includes economies with significant growth potential. These countries (a total of 20 among OECD nations) are making notable steps in digital development but continue to face difficulties, such as limited infrastructure, regulatory blocks, or challenges in aligning digitalization with the SDGs. Despite these hurdles, many nations display promising trends in key areas.

In the Baltic region, specific trends are observed. First, Estonia has become a digital pioneer with its e-Estonia initiative. Second, Latvia has made significant strides in digital infrastructure and mobile internet penetration, although it lags behind

Estonia in terms of e-government services. Third, Lithuania has made significant progress in FinTech development and digital payments but has faced challenges in rural broadband access.
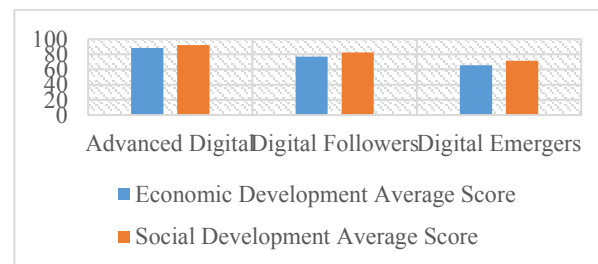

Fig. 9: Three clusters based on digital development and UN SDGs performance, [2]

This analysis highlights the importance of digitalization as a catalyst for sustainable development while emphasizing the disparities that must be addressed to ensure global equitable progress. The authors would like to claim that the findings suggest several important implications:

- Digital transformation strategies should be widely integrated into economic and social development agendas, recognizing their interconnected nature, as demonstrated above.
- Investment strategies should balance digital infrastructure development with social inclusion procedures (for example, focusing on digital skills development).
- Monitoring and evaluation frameworks should track digitalization's effects, explicitly considering potential digital gaps.

6 Conclusion

Digital technologies are widely used in different industries, including the financial industry. The higher digitalization level and the use of digital financial technologies help to promote economic growth through more efficient financial services, better access to finance, etc. Besides, digital technologies support the sustainable development of countries. The introduction of the UN Sustainable Development Goals in 2015 has empowered the focus on sustainable development worldwide.

The authors' selected goals are significantly affected by technological innovations in the financial sector: SDG 1 refers to the necessity of ending poverty; SDG 8 promotes inclusive and sustainable economic growth; SDG 9 stresses the importance of resilient infrastructure, industrialization, and innovation; and SDG 10

appeals to reduce inequality within and among countries.

The correlation analysis between the Global Digitalization Index (GDI) and the selected UN Sustainable Development Goal (SDG) scores reveals that UN SDG 9 exhibits the most robust and consistent positive association with GDI across all correlation measures. UN SDG 1 and UN SDG 8 also demonstrate strong positive relationships with GDI, particularly when evaluated using Spearman's rho and Kendall's Tau B, indicating robust positive associations that may not be strictly linear. The relationship between GDI and UN SDG 10 appears weaker and potentially non-linear, as evidenced by the discrepancy between Pearson's r and the other correlation coefficients. These findings suggest that the strength and nature of the relationships between GDI and UN SDG scores vary. Industry, Innovation, and Infrastructure show the most pronounced association with the global digitalization level as measured by the GDI.

The countries' performance in achieving these SDGs is heterogeneous. The Baltic countries (Estonia, Latvia, and Lithuania) need to improve in achieving these four SDGs, lagging behind many other OECD countries, which are related to the relatively low level of digital financial technologies.

Moreover, a brief analysis suggests the need to develop a synthetic instrument to measure digital development and test its impact and relationships with UN SDGs, which will be covered in future research. The analysis will apply the following methodology descriptive and inferential statistics, regression models to quantify the relationship between digital financial technologies and UN SDG achievements, and index construction methodology, including normalization and weighting techniques.

To sum up, the analysis validates the theoretical framework linking digitalization to sustainable development. The stronger effect on economic versus social indicators suggests the need for targeted interventions. The model's explanatory power and statistical robustness provide a solid foundation for further research and policy formulation. Moreover, these findings contribute to understanding how digital transformation influences sustainable development outcomes.

Declaration of Generative AI and AI-assisted Technologies in the Writing Process
During the preparation of this work, the authors used Grammarly in order to improve the readability and language of the manuscript. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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Contribution of Individual Authors to the Creation of a Scientific Article (Ghostwriting Policy)

Sources of Funding for Research Presented in a Scientific Article or Scientific Article Itself

Conflict of Interest

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