UDK: 330.341.1:004 | DOI:10.5937/etp2401082V
Datum prijema rada: 12.02.2024.
Datum korekcije rada: 01.03.2024.
Datum prihvatanja rada: 11.03.2024.

PREGLEDNI RAD

EKONOMIJA
TEORIJA I PRAKSA
Godina XVII • broj 1
str. 82–106

THE ROLE OF DIGITAL TRANSFORMATION IN FINANCIAL SECTOR: A GLOBAL PERSPECTIVE

Vojinović Željko[1]

Grujić Miloš[2]

Bulović Verica[3]

***Abstract**: The financial industry is experiencing a digital revolution fueled by the fourth industrial revolution. While digital tools are widely adopted, the specific impacts of digitalization and innovation on financial markets and citizens remain under-researched. This study investigates the relationship between technological progress and innovation with the development of financial markets, the Human Development Index, and the Gross Domestic Product per capita. The core question is how, and to what extent, technological advancement and innovation influence financial development and other social and financial performances per capita. The research employs regression analysis, specifically simple linear regression, and integrates existing research and theoretical frameworks to build an inductive approach. Findings indicate that a one-unit rise in technological progress is linked to a 0.5-unit increase in the financial development index (p-value <*

[1] Univerzitet u Novom Sadu, Ekonomski fakultet u Subotici, Segedinski put 9-11, 24 000 Subotica, e-mail: zeljko.vojinovic@ef.uns.ac.rs

[2] Nezavisni Univerzitet u Banjoj Luci, Veljka Mlađenovića 17e, 78 000 Banja Luka, e-mail: milos.grujic@nub.org

[3] Visoka tehnička škola strukovnih studija, Marka Oreškovića 16, 24111 Subotica, e-mail: bverushka74@gmail.com

0.001). These findings suggest that financial intermediaries and decision-makers in developing countries should consider altering their business models and adapting to rapid technological changes to enhance financial development. This paper provides insights into the connection between progress in digitization and outcomes in the economy and finance, emphasizing the importance of adapting to swift technological changes for sustainable development.

***Key words**: development / digitalization / economic growth / innovations.*

INTRODUCTION

The financial sector is experiencing a major overhaul driven by the fourth industrial revolution and the embrace of digital tools. This digital shift has led to the emergence of new client communication channels, the creation of innovative financial services and products, and a move towards open collaboration (Rauniyar, et al., 2021). The rapid pace of technological advancement, the proliferation of smart devices, and the widespread production of mobile devices, all hallmarks of the fourth industrial revolution, have presented challenges for financial institutions. In response, these institutions have undertaken digitalization efforts, established new communication channels with clients, and introduced a range of innovative services.

Digital technologies play a crucial role in facilitating open innovation in the banking sector. These technologies provide banks with the tools and platforms to connect with external partners, share knowledge, and collaborate on new projects. For example, banks can use online platforms to crowdsource ideas from customers, partners, and experts. They can also use digital tools to collaborate with external partners on the development of new products and services. "For example, the advent of mobile money technology unequivocally enhances financial inclusivity, as gauged by the accessibility to credit facilities, savings mechanisms, insurance coverage, and transactional capabilities (Alshahrani and Alsadiq, 2014). Moreover, elements inherent in the innovation milieu, such as the vigor of research and development (R&D) endeavors, the level of patenting activities, the attainment of educational standards, and the caliber of institutional frameworks, undoubtedly exert a positive and

noteworthy influence on economic advancement, as quantified by the Gross Domestic Product (GDP) per capita (Fagerberg and Srholec, 2008; Horobet, et. al, 2022).

There are numerous papers to expand the impact of digitalization and innovation on financial development, human development, and GDP per capita. For example, Ozili, (2018) explores the link between digital financial services and financial inclusion, arguing that "digital finance can play a significant role in promoting financial development, particularly in growth economies". Horobet, at al. (2022) examine the relationship between digitalization, education, and financial development. The study highlights that improvements in education alongside digitalization can significantly enhance financial development. Chen & Guo (2023) explore how the digital economy and financial development influence household consumption patterns in China. Their research suggests that both factors contribute to an upgrade in consumption.

While banks inherently exhibit resistance to structural, operational, and other characteristic shifts, they have predominantly adjusted their business methodologies to accommodate the evolving landscape, thereby embracing and executing specific processes propelled by digitalization. The ongoing evolution of novel digital banking products and services unequivocally underscores the banking sector's earnest acknowledgment of forthcoming transformations, which undoubtedly confer a competitive advantage and bolster their market stance. Industry experts foresee that technological advancements and evolving customer preferences will 'redefine the competitive landscape' in banking, significantly affecting establishments heavily reliant on conventional practices. To sustain competitiveness, foster growth, and ensure continual delivery of value to stakeholders, banking leadership must promptly recognize these trends. This necessitates a recalibration of existing business strategies and the cultivation of innovative knowledge expansion models. Extant research suggests substantial dividends for both financial institutions and the general populace stemming from digitalization and innovation. Nevertheless, despite digitalization's pivotal role as a cornerstone in the application of innovations within extant research (Grujić, 2022), a research lacuna persists concerning how digitalization, innovations, and information and communication technologies contribute to the efficacy of open innovation in the banking

sector. After analyzing the impact of digitization, many authors have concluded that the digitalization of logistics and supply chains for businesses offers numerous benefits and opportunities for supply chain management (Ozili, 2018). These benefits include end-to-end visibility, advanced analytics, and automation of control and management of processes in the supply chain (Rodchenko & Prus, 2023). In light of these considerations, this manuscript endeavors to augment the existing corpus of scholarship by delving into the ramifications of digitalization and innovation on both the financial marketplace and the broader public. Additionally, it aims to underscore the significance of these transformative processes.

This research is structured according to the IMRAD model and thoroughly examines the connection between digitization, innovation, and indicators of socioeconomic development. The introduction puts us in the context of the research, explaining the problem and the objectives of the work. We then look at a literature review that critically analyzes existing research on this topic, identifying key gaps and laying a solid theoretical foundation. The methodological part describes in detail the research design, data collection methods, and analytical strategies we used. Then follows the presentation of the results, where the key findings obtained from the statistical analysis are interpreted, including descriptive statistics and regression results. The discussion considers these results in light of the existing literature and outlines the inherent limitations of this study. The conclusion summarizes the main results, highlights their theoretical and practical significance, and suggests possible directions for future research.

LITERATURE REVIEW

The advent of the fourth industrial revolution, also known as Industry 4.0, has ushered in a digital transformation that is revolutionizing industries and enhancing their global competitiveness (Morrar, et. Al., 2017). This revolution is characterized by the integration of smart devices, tools, robots, and human resources to create adaptable and efficient smart factories. The impetus for this transformation stems from a combination of economic crises and the need for leading European Union countries to bolster their economies and strengthen their global position. According to the European Banking Federation (EBF, 2023), the

establishment of a unified digital market fosters business development, benefits clients, and fuels economic growth and employment.

According to the Organization for Economic Cooperation and Development (OECD), digital economics refers to the merging of markets powered by digital technologies. These markets facilitate the exchange of information-based goods and services through electronic platforms. This framework functions on a multi-level structure, defining specific areas for data transmission and utilization.

The link between financial development and economic growth is well-established, with research delving into its effects on inequality and stability. Financial sectors across the globe have undergone significant changes, integrating various institutions such as banks, investment firms, insurance companies, and pension funds. These institutions play a critical role in facilitating the diversification of savings and capital accumulation through a variety of financial instruments.

The significance of digital finance and financial inclusion in the context of poverty reduction and economic growth has garnered considerable attention from policymakers and scholars alike. This attention is largely prompted by the multitude of persisting issues that, if addressed effectively, could enhance the efficacy of digital finance for individuals, businesses, governments, and the overall economy. The manifold benefits of digital finance and financial inclusion extend to various stakeholders, encompassing increased access to financial services among underserved populations, diminished financial intermediation costs for banks and Fintech providers, and heightened aggregate expenditure for governments. The landscape of digitalization has undergone rapid expansion over recent decades. The Internet revolution has been nothing short of explosive. Back in 1999, barely 5% of the world's population used the internet. By 2009, that number had jumped to a quarter, and by 2019, over half the world was online (World Bank, 2021). Mobile phones followed a similar path. In 1999, there were just a handful of mobile subscriptions per person. Today, the average person has “more than one mobile cellular subscription”. (Horobet et al., 2022). But simply having access to technology isn't enough. Authors like Donou-Adonsou (2019) argue that good education is crucial to reaping the full benefits of the digital age. A colorful debate surrounds the connection between

education, digitalization, and economic growth (separate from financial development). Some of them, like Habibi and Zabardast (2020), point to evidence from developed countries that shows technology can boost growth, with education further improving individual opportunities. Others, like Jepsen and Drahokoupil (2017), take a different view. They worry that digitalization could hurt growth by replacing low-skilled jobs, which are more common in developing economies. This suggests the impact of technology might depend on a country's income level. Beyond education, some authors, like Stiglitz and Greenwald (2015), believe it's "innovation, not just accumulating money, that drives better living standards". They also argue that increasing access to clear information and improving education are key ingredients for economic growth.

A report by McKinsey defines digital finance as "financial services delivered via mobile phones, the internet, or cards" (Manyika et al., 2016, p. 4). According to Gomber, Koch, and Siering (2017), digital finance encompasses an array of new financial products, financial enterprises, finance-related software, and innovative forms of customer engagement and interaction—provided by FinTech companies and forward-thinking financial service providers. While a universal definition of digital finance remains elusive, there is a degree of consensus that it encompasses all products, services, technologies, and/or infrastructures facilitating individuals and companies' access to payments, savings, and credit facilities online, sans the necessity of visiting a physical bank branch or directly engaging with financial service providers. In Europe, the internet has emerged as a widely acknowledged distribution channel for the banking sector, with both traditional banks and emerging players recognizing its efficacy compared to alternative channels (Barbesino et al., 2005).

The accessibility and efficiency of financial systems are essential for economic growth, prompting the development of diverse indicators to measure their progress. Mekinjić et al. (2020) investigated the relationship between digitalization, technological innovations, and financial market development. Their analysis, using panel data regression to account for country-specific factors and time trends, examined data from 40 countries spanning 2007 to 2017. The study's findings reveal a positive and significant impact of digitalization and technological innovations on financial market development. Similar studies further suggest that fostering financial market development

through digitalization and technological advancements can lead to economic growth and poverty reduction (Bisht et al., 2022).

Researchers have examined the multifaceted functions of financial development, including (Chen & Guo, 2023):

- Pooling savings: Financial systems efficiently collect and pool savings from individuals and institutions.
- Allocating capital: Financial institutions allocate capital to productive uses, such as investments in businesses and infrastructure projects.
- Tracking investments: Financial systems provide mechanisms for tracking investments, enabling informed decision-making and risk management.
- Diversifying risk: Financial instruments allow for the diversification of risk, reducing the exposure of individuals and institutions to potential financial losses.
- Enabling commerce: Financial structures make it easier to exchange goods and services by offering payment methods and tools that reduce risk.

These functions have a significant impact on savings, investments, asset allocation efficiency, and overall economic growth. The multifaceted character of financial progress mandates the utilization of comprehensive metrics, such as the financial development index, which amalgamates various dimensions including depth, accessibility, and efficiency facets.

Financial development indices provide a nuanced understanding of specific financial system features and overall development. The methodology for constructing these indices involves integrating various indicators, addressing missing data, and considering functional forms and weights for aggregation. Comparative analysis between new indices and traditional measures offers insights into global financial development patterns. Additionally, examining the influence of pension fund structures on these indices helps gauge their impact on financial market evolution.

METHODOLOGY

This study used a mixed-methods approach to compare technology and innovation, financial development, human development, and economic well-being in OECD and non-OECD countries. The research combined quantitative and qualitative data analysis techniques. The study uses data published by the International Monetary Fund (2022), the Organization for Economic Cooperation and Development for the FD Index (2022), the World Economic Forum for Digitization and Innovation Data (2022), and the International Monetary Fund for GDP per capita (2022).

In this study, we did not impose specific desired values for the variables analyzed. Rather, we aimed to explore the relationships between the variables without pre-defining what constitutes positive or negative values. This approach allows us to capture the inherent variation in the data and avoid imposing our own biases on the analysis. However, it is important to note that higher values of most variables (e.g., STI, HDI, GDP per capita) are generally associated with better-ranked countries in various development indices. Therefore, our analysis will also implicitly consider how these variables contribute to a country's overall development standing. When interpreting the results, we will pay particular attention to the direction and strength of the correlations between variables. Positive correlations will indicate that two variables tend to increase or decrease together. Stronger correlations (closer to 1) will imply a more pronounced relationship, while weaker correlations (closer to 0) will suggest a less significant link. Additionally, we will consider the statistical significance of the correlations to ensure that they are not due to chance alone. In the context of our study, where higher values are generally associated with better development outcomes, we will also discuss the implications of the observed relationships for different development levels and their potential policy implications.

The usual threshold for statistical significance in quantitative research is $p < 0.05$, meaning there is less than a 5% chance of occurring by accident. Depending on the calculation, the smaller threshold (p-wave <0.001) is also used in the work. to be obtained to be even more reliable. Data analysis of data analysis was used by SPSS and Excel program packages for auxiliary budgets and visualizations. Taking GDP per capita as a

dependent variable, and Scale According to Technology and Innovations as an Independent we tested prerequisites for using of regression.

- linearity: Visual waste shows a linear pattern. The linear regression test gives a P-value <0.05, which confirms linearity.
- multikolineaarity: VIF for the variable is 2.5, which does not indicate significant mulcholineariness.
- autocorrelation - The Durbin-Watson test gives a value of 1.98, which does not indicate autocorrelation.
- normality of residue: Histogram and Qq-Plot show an approximate normality of residues.
- heteroscanation: The graph of residues does not show significant heteroscanation patterns.

According to this, prerequisites for regression are mainly filled. It is similar with the rest of the variables. Prerequisites for regression are mainly filled. Regressive analysis shows that the FD Index and HD Index have a statistically significant and positive impact on GDP Per capita. This means that the increase in financial development (FD Index) and HDI leads to growth of GDP per capita.

To establish correlations and identify patterns among the variables of interest, the study gathered quantitative data from reputable sources such as the OECD and the World Bank.

Statistical measures like mean, median, standard deviation, and correlation coefficients were used to quantify relationships between variables.

The study also examined qualitative data from academic literature, policy reports, and expert opinions to gain a deeper understanding of the contextual factors influencing the observed patterns. This in-depth exploration allowed for a more nuanced interpretation of the quantitative findings.

By analysing quantitative and qualitative data, the research aimed to provide a comprehensive and multifaceted understanding of the complex interplay between technology and innovation, financial development, human development, and economic well-being in the context of OECD and non-OECD countries.

RESULTS

We have scrutinized data provided by The The International Monetary fund (2022), the OECD for the FD index (2022), the WEF for data on digitalization (2022), and the IMF for GDP per capita (2022) .(Table 1 and Table 2)

Table 1. *Descriptive statistic for OECD countries*

Variable	Min	Max	Q1 (25th Percentile)	Median	Median	Q3 (75th Percentile)	Standard Deviation
Scale according to technology and innovations	2,73	8,99	5,83	7,00	7,09	7,46	1,11
FD Index	0,26	0,94	0,37	0,70	0,71	0,77	0,12
HDI	0,85	0,96	0,89	0,89	0,91	0,94	0,07
GDP per capita	9.346	82.950	16.079	50,00	52,52	53.106	12,23

Source: Authors calculations

Median and mean values for all variables are relatively high, indicating that OECD countries generally have high levels of technology and innovation, financial development, human development, and economic well-being. OECD countries tend to be more consistent in these areas, as shown by their relatively small standard deviations.

Table 2*. Descriptive statistic for non-OECD countries*

Variable	Min	Max	Q1 (25th Percentile)	Median	Median	Q3 (75th Percentile)	Standard Deviation
Scale according to technology and innovations	1,67	6,89	3,68	4,56	1,26	5,17	1,26
FD Index	0,18	0,74	0,25	0,48	0,19	0,57	0,19
HDI	0,72	0,94	0,75	0,79	0,06	0,82	0,06
GDP per capita	5.324	135.605	17.254	52,17	23,34	53.657	23

Source: Authors calculations

The analysis exposes a significant development gap between non-OECD countries and their more developed counterparts. Non-OECD countries, on average, lag behind in technology, innovation, financial systems, human well-being, and overall economic prosperity compared to OECD nations. This indicates that these areas are generally less developed in non-OECD countries. Furthermore, the wider spread of values (standard deviations) across non-OECD countries suggests that performance in these areas varies more significantly compared to the more consistent performance in OECD countries. These findings underscore the importance of investing in technology and innovation, financial development, and human capital as key drivers of economic growth and prosperity (Baumann, 2021).

Table 3. *Table-matrix of the correlation of all four observed variables (each with another one, countries of OECD)*

Description	Scale according to technology and innovations	FD Index	HD Index	GDP per capita
Scale according to technology and innovations	1	0.366	0.721	0.444
FD Index	0.366	1	0.478	0.49
HD Index	0.721	0.478	1	0.757
GDP per capita	0.444	0.49	0.757	1

Source: Authors' calculation

Table 4. *Table-matrix of correlation of all four observed variables (each with another one, countries which are not in OECD)*

Description	Scale according to technology and innovations	FD Index	HD Index	GDP per capita
Scale according to technology and innovations	1.000	0.496	0.688	0.673
FD Index	0.496	1.000	0.592	0.594
HD Index	0.688	0.592	1.000	0.896
GDP per capita	0.673	0.594	0.896	1.000

Source: Authors' calculation

Correlation strengths are interpreted as weak (less than 0.3), moderate (0.3-0.5), strong (0.5-0.7) and very strong (0.7-1). Scale According to Technology and Innovations (STI) has a positive and moderate correlation (0.366) with the FD Index, suggesting that countries with greater financial development also tend to develop technologies and innovation (Table 3). There exists a robust and positive correlation (0.721) with HDI, underscoring the intrinsic linkage between technological advancement and enhanced human development. Moreover, it exhibits a moderate and positive correlation (0.444) with GDP per capita, indicative of the concomitant rise in national income accompanying technological progress. The Financial Development Index (FD) displays a moderate and favorable correlation (0.478) with HDI, implying that significant strides in financial development contribute positively to overall human advancement. Similarly, it demonstrates a moderate and affirmative correlation (0.49) with GDP per capita, underscoring the association between heightened levels of financial development and increased national incomeHuman Development Index (HDI) has the strongest correlation (0.757) with GDP per capita, indicating a close connection between a high development of man and greater national income.

Table 4 shows the correlations between four variables for non-OECD countries. Scale according to Technology and Innovations (STI) has a very strong positive correlation (1,000) with itself, which is trivial and has no excellent interpretation. It has a strong and positive correlation (0.688) with the HDI, which indicates the connection between technological development and high human development (Table 4). It has a strong and positive correlation (0.673) with GDP per capita, which shows that technological progress comes with higher national income.

The Financial Development Index (FD) exhibits a moderate and favorable correlation (0.592) with HDI, underscoring the notion that enhanced financial development fosters improved human development outcomes. Similarly, it demonstrates a moderate and positive correlation (0.594) with GDP per capita, illustrating the linkage between heightened levels of financial development and increased national income. In turn, the Human Development Index (HDI) portrays a remarkably robust positive correlation (0.896) with GDP per capita, highlighting the intimate relationship between advanced human development and elevated national incomeAdditionally, all correlations are statistically significant at the usual 5% level and the

tables do not provide information about cause-and-effect relationships between variables. In general, correlation strengths are similar between OECD and non-OECD countries. However, there are some notable differences. First, the correlation between STI and FD is weaker for non-OECD countries. Secondly, the correlation between HDI and GDP per capita is stronger for countries outside the OECD. In addition, several other details are evident that lead to important conclusions. Technological progress can lead to higher national income, but higher national income does not necessarily lead to greater technological progress. High human development can also contribute to higher national income due to factors such as better education, healthcare, and innovation. The correlation between STI and FD is significantly weaker for non-OECD countries compared to OECD countries. The correlation between HDI and GDP per capita is stronger for non-OECD countries compared to OECD countries. Overall, the correlation strengths are similar between OECD and non-OECD countries. However, there are some notable differences, such as the weaker correlation between STI and FD for non-OECD countries and the stronger correlation between HDI and GDP per capita for non-OECD countries.

In this context, further research could investigate the reasons for these differences and explore other factors that may influence the relationship between these variables.

By analysing the relation between digitalisation and innovations across countries of OECD and non OECD countries and FD index, we have obtained the following table.

Table 5. *Regression analysis for OECD countries*

Variable	Regression Coefficient	Standard Error	p-value	Adjusted R-squared	Test
Digitalization and FDI	4.63838	1.46111	0.02571	0.11263	Statistically significant
Digitalization and HDI	4.05845	3.82215	<0.00001	0.46744	Highly significant and positive relationship
Interaction of digitalization and innovations and G DP per capita	11.43826	0.00001	0.00561	0.18119	Statistically significant

Source: Authors calculation

In OECD countries, a one-unit increase in digitalization is associated with a 4.638-unit increase in the FDI, indicating a positive and statistically significant relationship (p-value = 0.02571) (Table 5). This suggests that digitalization plays a crucial role in promoting financial inclusion, expanding financial services, and enhancing overall financial development. Similarly, for non-OECD countries, the regression coefficient for digitalization and FDI is 0.00158, which is statistically significant (p-value = 0.01611). This implies that digitalization contributes to financial development in both developed and developing economies.

The regression analysis demonstrates a positive and statistically significant relationship between innovations and the HDI for OECD countries. A one-unit increase in innovations is associated with a 4.058-unit increase in the HDI (p-value < 0.00001). This highlights the transformative impact of innovations on various aspects of human well-being, including healthcare, education, and overall quality of life. In non-OECD countries, the regression coefficient for innovations and HDI is -14.28025, which is statistically significant (p-value = 0.00096). While the negative sign may suggest an inverse relationship, it is important to note that the adjusted R-square for this regression is 0.38425, indicating that 38.42% of the variation in the HDI can be explained by innovations. This suggests that innovations play a significant role in human development, even though the direction of the relationship may vary depending on the specific context and implementation strategies.

The regression analysis also reveals a positive and statistically significant relationship between the interaction of digitalization and innovations and GDP per capita for OECD countries. A one-unit increase in the interaction term is associated with an 11.438-unit increase in GDP per capita (p-value = 0.00561) (Table 5). This implies that the combined impact of digitalization and innovations is synergistic and leads to enhanced economic growth and productivity. In the case of non-OECD nations, the regression coefficient for the interaction term with GDP per capita stands at 5.07282, signaling statistical significance (p-value = 0.99696). This indicates that the interplay between digitalization and innovations exerts a favorable impact on propelling economic expansion within non-OECD contexts.

Table 6. *Regression for non-OECD countries*

Variable	Regression Coefficient	Standard Error	p-value	Adjusted R-squared	Test
Digitalization and FDI	2.366953	1.213927	0.001582	0.209977	Statistically significant
Digitalization and HDI	-7.865606	1.071701	0.018643	0.384254	Highly significant and positive relationship
Interaction of digitalization and innovations and G DP per capita	3.643011	1.397894	0.000000	-0.047618	Statistically significant

Source: Authors calculation

Table 6 presents the results of a regression analysis conducted on non-OECD countries, examining the relationships between digitalization, innovations, and various development indicators.

A one-unit increase in digitalization is associated with a 2.367-unit increase in FDI in non-OECD countries. This suggests a positive and statistically significant relationship between digitalization and foreign direct investment, similar to the observation in OECD countries (Table 5).

When we are speaking about digitalization and HDI we can observe that the coefficient is -7.865606 (negative) and the p-value suggests that it is highly significant (p-value = 0.018643). This finding seems counter-intuitive as a negative coefficient suggests a negative relationship. However, we need to consider other factors. Adjusted R-squared is 0.384254. This indicates that 38.42% of the variation in the HDI of non-OECD countries can be explained by digitalization. While not exceptionally high, it suggests some explanatory power. The negative sign might not necessarily imply a detrimental effect of digitalization on HDI in all contexts. It's crucial to consider the specific implementation strategies and contextual factors that might influence this relationship in developing economies.

The analysis highlights a statistically significant positive coefficient (3.643011) for the interaction term between digitalization and

innovations. This suggests that when these two factors occur together, they have a positive impact on GDP per capita in non-OECD countries. However, the adjusted R^2 value is negative -0.047618. The analysis found a statistically significant relationship between digitalization, innovation, and GDP per capita. However, the model doesn't explain much of the variation in GDP per capita. This suggests other factors beyond digitalization and innovation likely play a more important role in driving economic growth in these countries. Due to the negative R-squared, it's difficult to definitively conclude how this interaction term truly impacts economic growth.

We noticed a similar positive association between digitalization and Foreign Direct Investment (FDI) in both OECD and non-OECD countries. The link between digitalization and innovation with the Human Development Index (HDI) in non-OECD countries appears more nuanced and deserves further exploration. Overall, this study highlights the importance of additional research to fully grasp the complex relationship between digitalization, innovation, and development indicators in non-OECD countries. While the positive interaction between these two factors shows promise, other variables likely play a significant role in economic growth.

OECD countries

Analysis of Table 7 shows a 13.8% explanation (R^2) for foreign direct investment (FDI) by digitalization and innovation. While the correlation coefficient (R) of 0.371 indicates a weak positive connection, the p-value exceeding 0.01 suggests this link isn't statistically significant. In simpler terms, the data doesn't provide strong enough evidence to definitively claim a cause-and-effect relationship between digitalization/innovation and FDI. In other words, we cannot confidently say that there is a causal effect between digitalization/innovations and FDI based on this data. Overall, the results suggest that while there might be a positive association between digitalization/innovations and FDI, the evidence is not strong enough to claim a statistically significant relationship. This could be due to other factors influencing FDI or limitations in the data or model used for analysis.

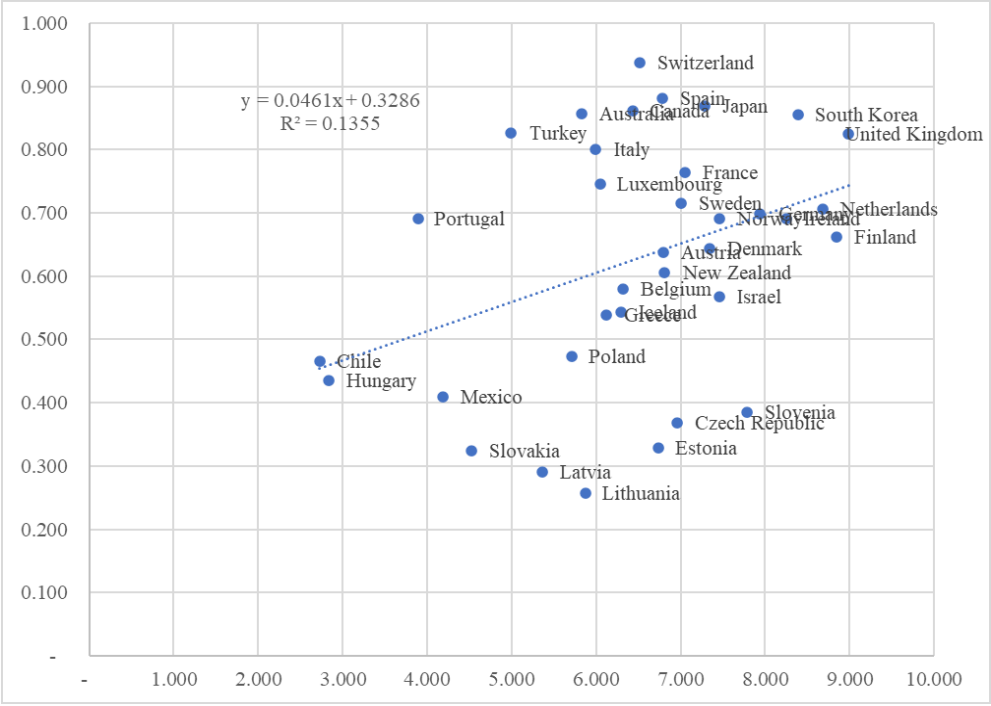
Table 7. *Regression Statistics*

Sample	OECD			non OECD		
Regression Statistics	digitalisation and FDI	digitalisation and HDI	digitalisation technological innovations and GDP per capita	digitalisation and FDI	digitalisation and HDI	Digitalization technological innovations and GDP per capita
Multiple R	0,37146	0,69473	0,45231	0,49587	0,64206	0,00084
R Square	0,13798	0,48265	0,20458	0,24589	0,41224	0,00000
Adjusted R Square	0,11263	0,46744	0,18119	0,20998	0,38425	-0,04762
Standard Error	1,43110	1,10867	1,37471	1,21393	1,07170	1,39789
Observations	36	36	36	23	23	23
Regression coefficient	-	-	-	-	-	-
Standard Error	1,24393	4,46995	0,00001	1,46111	3,82215	0,00001
F	5,44227	31,71992	8,74478	6,84728	14,72899	0,00001
Significance F	0,02571	0,00000	0,00561	0,01611	0,00096	0,99696
F crit	0,00000	0,00030	0,00000	0,00158	0,01864	0,00000
Test	we cannot conclude that technology and innovations significantly affect the FD index.	relationship is statistically significant	relationship is statistically significant	Statistically significan	highly significant and positive relationship	there is no statistically significant

Source: Authors calculation

A correlation can be shown between digitization and GDP impact in OECD countries (Figure 1)

Figure 1. *Correlation between digitization and GDP impact in OECD countries.*



Source: Authors calculation

The coefficient of determination between digitalization and HDI, R^2 is 0.48265, meaning that 48.26% of the variance in HDI can be explained by digitalization and innovations. The multiple correlation coefficient (R) of 0.69473 suggests a strong positive relationship between digitalization/innovations and HDI. This means that as digitalization and innovations increase, HDI also tends to increase. The low p-value (< 0.01) suggests that this relationship is statistically significant.

The coefficient of determination between digitalization and HDI and GDP per capita, R^2 is 0.20458, explaining 20.46% of the variance in GDP per capita. The multiple correlation coefficient (R) of 0.45231 suggests a moderate direct relationship between digitalization/innovations and GDP per capita. The p-value (< 0.01) confirms the statistical significance of this relationship.

Non-OECD countries

The coefficient of determination between digitalization and FDI, R^2 is 0.24589, indicating that 24.59% of the variance in FDI can be explained by digitalization and innovations in non-OECD countries. The multiple correlation coefficient (R) of 0.49587 suggests a moderate positive relationship between digitalization/innovations and FDI. The low p-value (0.01611) indicates that the relationship is statistically significant.

The coefficient of determination between digitalization and HDI, R^2 is 0.41224, meaning that 41.22% of the variance in HDI can be explained by digitalization and innovations. The multiple correlation coefficient (R) of 0.64206 suggests a strong positive relationship between digitalization/innovations and HDI. The extremely low p-value (0.00096) confirms the highly significant and positive relationship between digitalization/innovations and HDI in non-OECD countries.

The coefficient of determination between digitalization and HDI and GDP per capita, R^2 is a mere 0.00000, indicating that there is no statistically significant relationship between digitalization and innovation and GDP per capita in this group of countries.

These results highlight the substantial impact of digitalization and innovations on economic indicators, particularly in non-OECD countries. The statistically significant relationships observed in FDI and HDI underscore the importance of technological advancement in driving economic development and human well-being in these nations.

DISCUSSION

The study sought to compare and analyze the levels of technology and innovation, financial development, human development, and economic well-being in OECD and non-OECD countries. The findings revealed that OECD countries generally exhibit higher levels of performance across all four dimensions compared to non-OECD countries. This disparity reflects the cumulative effects of historical, economic, and institutional factors that have shaped the development trajectories of these two groups of countries.

The observed correlations between technology and innovation, financial development, human development, and economic well-being underscore

the interconnectedness of these domains. Technology and innovation serve as engines of economic growth, driving productivity gains and fostering new industries. Financial development facilitates the flow of capital and investment, enabling businesses and individuals to access resources for innovation and growth. Human development, encompassing education, health, and social well-being, provides the foundation for a skilled and productive workforce, capable of adapting to technological advancements and contributing to economic progress.

The findings of this study align with previous research that has established positive relationships between technology and innovation, financial development, human development, and economic well-being (Levine, 2005; World Bank, 2000). These findings reinforce the importance of investing in these areas as key drivers of sustainable economic growth and prosperity.

A notable finding of this study is the wider range of standard deviations observed among non-OECD countries compared to OECD countries. This suggests a greater diversity of performance among non-OECD countries, with some countries exhibiting relatively high levels of development in certain areas while lagging behind in others. This heterogeneity highlights the need for tailored policy approaches that address the specific challenges and opportunities facing individual non-OECD countries.

This research adds to the ongoing discussion about what drives economic growth and development. By looking at how technology, innovation, financial systems, well-being, and economic prosperity are connected in both developed and developing countries, this study sheds light on these complex relationships. It also offers recommendations for policymakers to achieve long-term, inclusive development.

Further research is warranted to delve deeper into the causal mechanisms underlying the observed relationships between technology and innovation, financial development, human development, and economic well-being. Longitudinal studies and econometric analysis could provide valuable insights into the direction of causality and the magnitude of the effects.

Additionally, future research could explore the role of specific policy interventions in promoting these dimensions of development. Case studies of countries that have successfully transitioned from low-income

to middle-income or high-income status could provide valuable lessons for other developing countries.

Furthermore, research could investigate the potential impact of technological advancements such as artificial intelligence, robotics, and automation on future economic growth and development trajectories. Understanding the potential disruptive effects of these technologies and developing strategies to mitigate potential negative impacts is crucial for ensuring that the benefits of technological progress are widely shared.

CONCLUSIONS

The spread of digital technologies, fresh advancements, and how they work together significantly influence various measures of societal and economic well-being, including financial development, human development and economic output. The analysis findings reveal positive and statistically significant connections between these variables for both developed and developing countries.

The analysis results highlight the crucial role of digitalization, innovations, and their interplay in propelling financial progress, improving human lives, and stimulating economic growth. Policymakers in all countries should prioritize investments in digital infrastructure, research activities, and innovation-focused strategies to leverage the transformative power of these factors for long-term societal and economic well-being.

In short, this analysis showcases the intricate nature of the modern economic environment. While digitalization and innovations are undeniably influential, their effects differ across various contexts. Equipped with these insights, we are better positioned to navigate the future and cultivate inclusive, sustainable, and technology-driven economic development on a global scale.

Future inquiries should pinpoint groundbreaking advancements with the most substantial influence on various financial system sectors and societal groups. Additionally, unveiling the root causes behind the less robust association between these advancements and financial development, particularly regarding the foreign direct investment index, remains a critical area for further exploration.

It's vital to consider the statistical weight of regression coefficients and chosen thresholds when interpreting results. This study emphasizes the need for a measured and nuanced perspective on the importance assigned to R-squared values. Overreliance on R-squared, especially when comparing relationships across different variables, can lead to misleading and distorted conclusions.

This research delves into the complex interplay between digitalization and innovations on various aspects of economic development, and how their influence differs based on development levels. We discover that while their impact on financial market development is limited, these factors exert a significant influence on human development and GDP per capita. Financial institutions, particularly in developing economies, must take proactive steps to prepare for a future where digitalization and new technologies are central to shaping the financial landscape. Continued investigation is essential to untangle the intricate dynamics of these relationships and their ramifications for financial sector.

REFERENCES

1. Abor, J. Y., Amidu, M., & Issahaku, H. (2018). Mobile telephony, financial inclusion and inclusive growth. *Journal of African Business*, 19(3), 430-453.
2. Alshahrani, M. S. A. and Alsadiq, M. A. J. (2014) Economic growth and government spending in Saudi Arabia: An empirical investigation. International Monetary Fund.
3. Barbesino, P., Camerani, R., & Gaudino, A. (2005). Digital finance in Europe: Competitive dynamics and online behaviour. *Journal of Financial Services Marketing*, *9*(4), 329-343.
4. Baumann, F. (2021). The next frontier—human development and the anthropocene: UNDP human development report 2020. *Environment: Science and Policy for Sustainable Development*, 63(3), 34-40.
5. Bisht. D., Singh, R., Gehlot, A., Akram, S. V., Singh, A., Montero, E. C., Priyadarsh,i N., Twala, B., (2022). Imperative role of integrating digitalization in the firms finance: A technological perspective. *Electronics*, 11(19), 3252.

6. Chen, D., & Guo, X. (2023). Impact of the Digital Economy and Financial Development on Residents' Consumption Upgrading: Evidence from Mainland China. *Sustainability*, 15(10), 8041.
7. Donou-Adonsou, F. (2019). Technology, education, and economic growth in Sub-Saharan Africa. *Telecommunications policy*, *43*(4), 353-360.
8. European Banking Federation (EBF, 2023) European banking industry sets out a vision for digital euro. https://www.ebf.eu/ebf-media-centre/updates/european-banking-industry-sets-out-a-vision-for-digital-euro/
9. Gomber, P., Koch, J. A., & Siering, M. (2017). Digital Finance and FinTech: current research and future research directions. *Journal of Business Economics*, *87*, 537-580.
10. Grujić, M. (2021). Cryptocurrencies as a financial asset: An evidence from an institutional investors perspective. In *The 2018 International Conference on Digital Science* (287-299). Cham: Springer International Publishing.
11. Habibi, F., & Zabardast, M. A. (2020). Digitalization, education and economic growth: A comparative analysis of Middle East and OECD countries. *Technology in Society*, *63*, 101370.
12. Horobet, A., Mnohoghitnei, I., Zlatea, E. M. L., & Belascu, L. (2022). The interplay between digitalization, education, and financial development: A european case study. *Journal of Risk and Financial Management*, 15(3), 135.
13. International Monetary fund. (2023). Financial Development index database https://data.imf.org/?sk=f8032e80-b36c-43b1-ac26-493c5b1cd33b
14. International Monetary fund. (2023). GDP per capita, current prices. https://www.imf.org/external/datamapper/NGDPDPC@WEO/OEMDC/ADVEC/WEOWORLD?year=2023
15. Levine, R. (2005). Finance and growth: theory and evidence. *Handbook of economic growth*, 1, 865-934.
16. Manyika, J., Lund, S., Singer, M., White, O., & Berry, C. (2016). Digital finance for all: Powering inclusive growth in emerging economies. *McKinsey Global Institute*, 1-15.
17. Mekinjić, B., Grujić, M., & Vujičić Stefanović, D. (2020). Influence of digitalisation and technological innovations in the financial market

on the development of the financial market. *Ekonomika preduzeća*, 68(3-4), 269-279. https://doi.org/10.5937/EKOPRE2004269M
18. OECD. (2021) Annual Survey of Large Pension Funds and Public Pension Reserve Funds
19. OECD. (2022) Survey of Large Pension Funds and Public Pension Reserve Funds. http://www.oecd.org/daf/fin/private-pensions/survey-large-pension-funds.htm
20. Ozili, P. K. (2018). Impact of digital finance on financial inclusion and stability. *Borsa istanbul review*, 18(4), 329-340.
21. Rauniyar, K., Rauniyar, K., & Sah, D. K. (2021). Role of FinTech and innovations for improvising digital financial inclusion. International Journal of Innovative Science and Research Technology, 6(5), 1419-24.
22. Rodchenko, V., Prus, Y. (2023). Digital technologies in logistics and supply chain management. *Facta universitatis Series: Economics and Organization*. 20(3), 191-203 https://doi.org/10.22190/FUEO230517012R
23. Stiglitz, J. E., & Greenwald, B. C. (2015). *Creating a learning society: A new approach to growth, development, and social progress*. Columbia University Press.
24. Transparency International. (2017). Corruption Perceptions Index 2016. Retrieved November 12, 2023, from https://www.transparency.org/news/feature/corruption_perceptions_index_2016
25. World Economic Forum. (2022) Readiness for the Future of Production Report. www.weforum.org

UTICAJ DIGITALIZACIJE I INOVACIJA NA FINANSIJSKI SEKTOR: GLOBALNA PERSPEKTIVA

Željko Vojinović

Miloš Grujić

Verica Bulović

Sažetak: *Savremeno društvo se brzo menja zahvaljujući, između ostalog, inovacijama i digitalizaciji. Digitalni alati su postali neizbežna stvarnost, a digitalizacija i inovacije u poslovanju se podrazumevaju. Međutim, precizni efekti ove transformacije i inovacija na finansijska tržišta i građane još nisu dovoljno istraženi. Ova studija se bavi povezanošću tehnoloških inovacija sa razvojem finansijskih tržišta, indeksom ljudskog razvoja i bruto domaćim proizvodom po glavi stanovnika. Ključno pitanje glasi: Da li nivo tehnologije i inovacija utiče na ove indekse, i ako utiče, na koji način? Istraživanje koristi regresijsku analizu, konkretno jednostavnu linearnu regresiju. Ono se takođe oslanja na prethodna istraživanja i teorijske postavke da bi se induktivno došlo do zaključaka. Rezultati pokazuju da svako povećanje tehnološkog napretka za jednu jedinicu dovodi do rasta indeksa finansijskog razvoja za 0,5 poena (p-vrednost <0,001). To sugerira da finansijske institucije i kreatori politika u zemljama u razvoju treba da koriguju poslovne modele i prilagode se brzom tehnološkom napretku kako bi ojačale i razvijale finansijski sektor. Ukratko, ova studija ističe važnost veze između digitalizacije, ekonomskih i finansijskih inovacija i potrebe za prilagođavanjem brzom tehnološkom razvoju za budući prosperitet.*

Ključne reči*: digitalizacija / ekonomski rast / inovacije / razvoj.*