International Journal of Innovative Research and Scientific Studies, 8(4) 2025, pages: 134-143

IJIRSS
International Journal of Innovative Research & Scientific Studies

ISSN: 2617-6548

URL: www.ijirss.com

Assessing the impact of COVID-19 pandemic on the use of digital technologies in the banking industry

Amit Dutta[1], Gulsara Mukina[2*], Lyudmila Popp[3], Zhanat Altaibayeva[4], Dinara Aiguzhinova[5]

[1]*Higher School of Business and Economics, Al-Farabi Kazakh National University, Almaty, Kazakhstan.*
[2,3,4,5]*Faculty of Economics and law, Toraighyrov University, Pavlodar, Kazakhstan.*

Corresponding author: Gulsara Mukina (*Email: gulsara.dyusembekova@mail.ru*)

Abstract

The COVID-19 pandemic significantly accelerated the adoption of digital technologies by bank customers, highlighting the need for remote banking services. This study aims to assess the impact of the pandemic on key indicators of innovation in the banking sector, using the European Union countries as a case study. A modified Delphi method was employed to identify relevant indicators, specifically the volume of transactions through digital platforms and the share of the population using online banking. A comparative analysis of the dynamics from 2019 to 2022 revealed a 243% increase in transaction volume and a 16% rise in online banking usage. Correlation analysis demonstrated strong relationships between these indicators and pandemic-related variables, with correlation coefficients exceeding 70% in most EU countries. Two regression models with high R^2 values (0.965 and 0.938) confirmed these relationships. The findings suggest that the pandemic served as a catalyst for rapid digital transformation in the banking industry, enabling financial institutions to adapt effectively to crises characterized by restricted customer mobility. The practical significance of this research lies in its potential to inform the development of strategies and recommendations for banks and financial institutions aimed at optimizing digitalization processes and implementing innovative technologies.

Keywords: COVID-19, digital platforms, EU, fintech, online banking, pandemic.

DOI: 10.53894/ijirss.v8i3.7745
Funding: This study received no specific financial support.
History: Received: 18 April 2025 / **Revised:** 22 May 2025 / **Accepted:** 26 May 2025 / **Published:** 11 June 2025

Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.
Transparency: The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.
Publisher: Innovative Research Publishing

1. Introduction

Financial technology (FinTech) innovations in the banking industry are fundamentally changing the way financial services are delivered, making them more accessible and user-friendly. The introduction of technologies (blockchain, artificial

intelligence, machine learning, etc.) allows banks to improve transaction processing, enhance security, and offer personalized solutions for customers. The use of mobile apps and online platforms is fueling the growth of digital banking in general, allowing customers to manage their finances anytime and anywhere. These changes not only optimize banks' operating costs but also open up new opportunities for development and growth in a rapidly changing financial market.

The COVID-19 pandemic has had a significant impact on many areas of business and the lives of ordinary users. With the introduction of quarantine measures and travel restrictions, many customers started to actively use online banking and mobile apps to manage their finances. This forced banks to adapt to the new environment, leading to increased investment in digital platforms and services.

Now that the pandemic is over and business processes in banking are out of constraints, the progress of scientific research on the topic of assessing the impact of the pandemic on the development of digital technologies lags behind the pace needed by businesses to make management decisions and plan crisis management strategies. There are various indicators for assessing the efficiency of banking activities, and innovation is not always the determinant of their changes.

It is necessary to reliably identify the indicators through which KPIs it is possible to quantitatively assess the pace of innovation implementation in the banking sector. Continuous attention of scientists is required both to identify such performance indicators and to assess the impact of various crisis factors on them. All this is necessary for banks to form an effective development strategy focused on the needs of customers.

Thus, it is important to develop a systematic approach to assessing the impact of the pandemic on the adoption of digital technologies that focuses on quantitative indicators, which will allow banks to adapt more effectively to changing market conditions. All this makes the topic of assessing the impact of the pandemic on the use of digital technologies in the banking industry relevant.

The solution to the problems outlined above will make it possible to create a more sustainable and adaptive financial system that can effectively respond to the challenges of modernity and meet the needs of customers.

2. Literature Review and Problem Statement

In recent years, financial technology has become an important enabler of change in the banking sector, especially in the face of global crises such as the pandemic. Many scholars have studied the impact of the pandemic on FinTech innovation in their papers; let's take a look at some of them.

The article Kredina et al. [1] analyzes the impact of the COVID-19 pandemic on the use of non-cash payments through national payment systems in Kazakhstan. It proves the impact of the COVID-19 pandemic on the dynamics of transformation of non-cash payments made using financial technologies. However, the sample for the study is limited to one country, which does not allow scaling of the conclusions drawn.

To determine the strengths and weaknesses of the use of online technologies by banking institutions in Ukraine during the COVID-19 pandemic, a SWOT analysis is conducted in Lunkina et al. [2]. The unconditional advantage of the study is the substantiation of key factors contributing to the growth of FinTech services in the context of the pandemic. It is found that there is an increase in demand for FinTech services among the population, especially during the COVID-19 pandemic. However, the sample for the study is also limited to one country. In addition, other external factors affecting Ukraine over the past few years may have influenced the dynamics of demand.

The study by Marcu [3] discusses how the pandemic has accelerated the digitalization process in the banking industry, leading to a significant increase in the volume of transactions through online platforms. It is emphasized that many banks were forced to adapt to the new environment by adopting innovative technologies to provide seamless customer service. On the other hand, no quantitative assessment of these changes is provided.

The importance of investments in FinTech is emphasized in the article by Kayed et al. [4]. It is shown that investments allow banks to remain competitive and offer innovative solutions to customers even in a pandemic. At the same time, the sample of countries does not have a common criterion and does not take into account the changes that took place in the industry before the pandemic.

The impact of quarantine measures on the development of online banking is discussed in Ahmed et al. [5], and a correlation between the level of strict measures and the growth of digital transactions is identified. However, the long-term consequences related to the change in customer behavior after the quarantine restrictions are lifted are not considered.

The paper by Ana et al. [6] analyzes how the pandemic contributed to the popularization of contactless payments, which changed the habits of consumers and increased the level of security of financial transactions. At the same time, the analysis is based on the assessment of qualitative changes, and there are no quantitative assessments of the dependence between the indicators.

Regulatory changes necessary to support innovation in the banking sector are explored in the article [7]. Their importance for creating a favorable environment for FinTech development is determined. However, despite recognizing the importance of regulatory changes, the article does not provide an economic and mathematical assessment of the impact of the pandemic on the efficiency of banks.

The role of artificial intelligence in transforming banking services, especially in a pandemic environment where rapid adaptation to changing conditions is required, is discussed in the study by Moharrak and Mogaji [8]. It is recorded that Artificial Intelligence (AI) has become a key tool for banks to improve customer service, automate processes, and increase the efficiency of operations. In a pandemic environment where physical interaction has become limited, banks have started to actively adopt AI to handle customer queries, analyze data, and predict consumer trends. However, it should be noted that this paper does not provide a financial assessment of the impact of AI on the performance of the banking sector.

The paper by Scarlat et al. [9] analyzes how the pandemic has affected the speed of adoption of new technologies in large banks, pointing to the need for flexibility and innovation. At the same time, not all banks have the same resources to adopt new technologies. Smaller institutions may have difficulty funding innovation, which can create an unequal market environment and limit the availability of modern services to certain customer groups. An objective assessment of the impact of the pandemic on the adoption of new technologies requires aggregation of data for all banks in the selected territory.

The importance of consumer digital literacy for successful financial technology adoption in a crisis is explored in the article by Ferilli et al. [10]. However, it is worth noting that in a crisis, when many people are facing financial difficulties, the focus on digital literacy may divert attention from other important aspects such as service availability and customer support.

The impact of the pandemic on banks' digitalization strategy, including the need to create more convenient and secure platforms for customers, is discussed in the study by Božović and Božović [11]. It is worth noting that the creation of more convenient and secure platforms requires banks to make significant investments in innovation, the payback of which directly depends on the behavioral preferences of customers.

The article Tuna and Fidanboy [12] discusses the risks and challenges associated with rapid innovation in the banking sector in a pandemic environment, emphasizing the need to manage these risks. But the pre-pandemic performance of the banking sector is not sufficiently analyzed.

An analysis of the changes in the competitive landscape that are contributing to the growth of new players in the FinTech market is presented in the study Bueno et al. [13] where technological innovations, changes in consumer preferences, and the increasing availability of digital platforms are highlighted as key factors contributing to this growth. In particular, the study emphasizes how mobile applications and online services are making financial services more accessible and user-friendly. However, no specific indicators are provided to assess the impact of these factors on the growth of the FinTech market in the banking sector.

The impact of COVID-19 on the development of mobile applications for financial management, as an important trend in the banking industry, is studied in Sendur [14]. The authors show that the COVID-19 pandemic has accelerated the digitalization of financial services, prompting both consumers and banks to seek more convenient and secure ways to manage finances. At the same time, the choice of indicators characterizing the digitalization of financial services is not sufficiently justified.

The paper Manta et al. [15] emphasizes the need for cooperation between traditional banks and FinTech companies for successful adaptation to new conditions. It is emphasized that such cooperation can lead to significant benefits for both parties. Traditional banks have an established customer base and experience in risk management, while FinTech companies offer innovative solutions and flexibility in developing new products. It should be noted that there are certain challenges and risks associated with such cooperation in a pandemic environment: it is necessary to take a balanced approach when selecting key performance indicators for banks.

The impact of the pandemic on the level of customers' trust in digital financial services is analyzed in the article Aloulou et al. [16]. The authors believe that the pandemic had a significant impact on the perception and use of digital financial services. At the same time, the post-pandemic period is not taken into account, and the changes that occurred after the lifting of the restrictions imposed are not studied.

The study Miklaszewska et al. [17] examines the long-term effects of the pandemic on the banking sector, including changes in business models and digitalization strategies. It finds that the pandemic has led to accelerated digitalization of processes in the banking sector, which has become a necessity to maintain competitiveness and meet the growing needs of customers. However, qualitative changes in business processes are mainly discussed, and quantitative analysis is provided by a small sample of countries.

Thus, it can be concluded that there may be a positive impact of the pandemic on the adoption of financial technology innovation in banking. Attention is emphasized on the importance of increasing investments in FinTech for successfully overcoming crisis situations, and there is an increase in the volume of services provided with the help of innovative technologies. At the same time, there is no economic and mathematical evidence of a correlation between COVID-19 incidence rates and the activation of digital technologies in the banking sector. Given the diversity of scientific approaches and methods, it is evident that the successful implementation of innovation in the banking sector requires a comprehensive analysis of the impact of COVID-19 on the performance indicators of the banking sector. Therefore, this paper will focus on the economic and mathematical assessment of the degree of the pandemic's impact on key indicators of digital technology development in the banking sector.

3. The Aim and Objectives of the Study

The purpose of the study is: to determine the impact of the pandemic on the use of digital technology in banking.

In order to achieve this goal, the following objectives are addressed:

- To identify indicators through which changes in the use of digital technologies in banking can be reliably assessed.
- To carry out a comparative analysis of key indicators characterizing digital technologies in the banking sector on the example of EU countries.
- To determine the degree of influence of the number of detected cases of COVID-19, the severity of quarantine measures, and other indicators on the key metrics for assessing the effectiveness of innovations in the banking sector, using the example of EU countries.

4. Materials and Methods of the Study

The following methods are used in this study: classification, generalization, comparative statistical and correlation analysis, variance, regression analysis, Delfi method.

The study period is 2019–2024 (the time horizon allows us to assess the impact of COVID-19 pandemic on financial technology innovation in the banking sector). In the first stage, the period from 2015 is additionally included to review the trends in the dynamics. The sample of countries for analysis includes EU member states as of 2024.

We will use the Delphi method to identify indicators through which we can reliably assess the degree of digital technology adoption in the banking sector. This is a structured expert forecasting method aimed at reaching consensus among a group of experts through anonymous iterative surveys. It is used to assess the significance of indicators, forecast trends, or make decisions under conditions of uncertainty.

The following coefficients are used to assess the quality of regression models:

Determination coefficient (R^2) – shows what proportion of the variation in the dependent variable is explained by the independent variables.

Durbin-Watson (DW) – checks for autocorrelation of the residuals (how much the model errors depend on each other).

The following indicators are used for analysis: volume of transactions through digital platforms (billion $), share of population using online banking (%), COVID-19 cases per capita (units), quarantine severity index (unit), FinTech investment volume (billion $), digitalization index of the economy (unit), GDP per capita (thousand $).

The information and empirical base of the study is represented by statistical and analytical reports of the European Central Bank (ECB), Statista, Eurostat, World Bank, Oxford COVID-19 Government Response Tracker, CB Insights: FinTech Investment Reports, European Banking Authority (EBA).

Data processing was performed using Python in the Jupyter notebook environment.

5. Practical Analysis of Digital Development in Banking in a Pandemic Environment

5.1. Indicators Through Which Changes in the Use of Digital Technologies in Banking Can Be Reliably Assessed

To conduct the research, 35 representatives of the banking industry were interviewed. They were asked to fill in a matrix to identify the most important indicators according to the Delphi method. The following indicators were set for evaluation: volume of transactions through digital platforms, share of the population using online banking, number of new users of digital services, level of customer satisfaction with digital services, frequency of use of digital services, transaction processing time, and share of transactions conducted without physical contact.

The resulting matrix is summarized in Table 1.

Table 1.
Results of the expert survey.

Indicator	Average score	Rank
Volume of transactions through digital platforms	8.1	2
Share of population using online banking	8.4	1
Number of new users of digital services	6.3	5
Level of customer satisfaction	7.1	3
Frequency of use of digital services	6.9	4
Transaction processing time	5.2	7
Share of transactions without physical contact	5.8	6

When ranking, experts were asked to consider a scale of significance: above 8.0 is a significant indicator, between 5.0 and 8.0 is an insufficiently significant indicator, and below 5.0 is an insignificant indicator. For further analysis, we will use indicators with a ranking that has an average score greater than 8.0, which, according to experts, represents the most significant criteria for assessing the effectiveness of digital services in the banking industry.

The data in Table 1 shows that the most relevant indicators for evaluating digital technology in the banking sector are:

1. Proportion of population using online banking.
2. The volume of transactions through digital platforms.

5.2. Comparative Analysis of Key Indicators Characterizing Digital Technologies in the Banking Sector by the Example of EU Countries

For the convenience of calculations, we introduce the following variables:

Dependents are the variables through which digital technology in banking can be quantified:

1. Volume of transactions through digital platforms (VDP – Volume of Transactions through Digital Platforms).
2. Share of population using online banking (SOB – Share of the Population Using Online Banking).

Independents are factors that can influence the dependent variables:

3. COVID-19 cases per capita (CCC – COVID Cases per Capita).
4. Index of severity of quarantine measures (IQM – Stringency Index of Quarantine Measures).
5. Volume of investments in FinTech (VIF – Volume of Investments in FinTech).
6. Index of digitalization of the economy by country (DEC Digitalization Index of Economies by Country).
7. GDP per capita (GDP – Gross Domestic Product per capita).

First of all, let us analyze the dynamics of changes in the dependent variables. Figure 1 shows the dynamics of transactions through digital platforms of EU member banks.

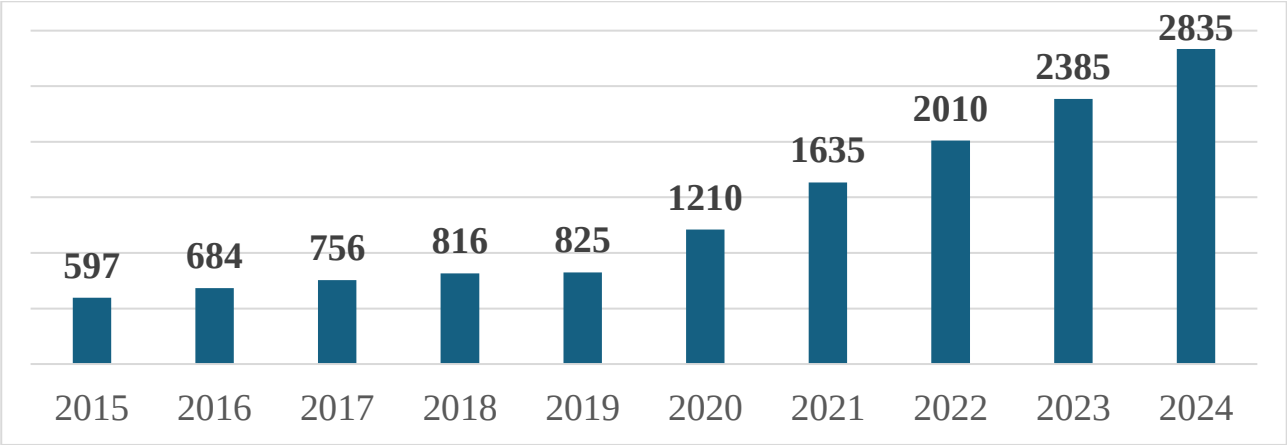

Figure 1.
Volume of transactions through digital platforms, billion $.

By analyzing the dynamics in Figure 1, we can assume that the restrictions imposed in the pandemic have increased the need for online transactions among bank customers, which translates into a 243% increase in such transactions by 2022 compared to 2019.

Figure 2 shows the dynamics of the share of the population of EU member states using online banking.

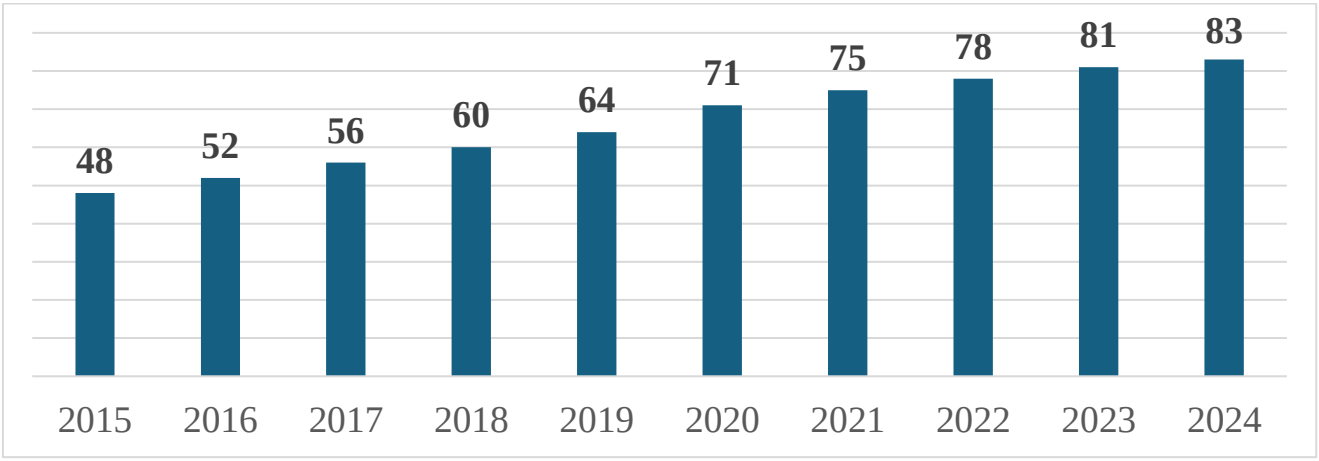

Figure 2.
Share of population using online banking, %.

A similar conclusion can be made if we analyze the changes in the indicator shown in Figure 2: there is a constant growth in the number of online banking users in the EU countries. At the same time, this growth is quite uniform, at about 3-4% annually, which may not be related to the pandemic. Therefore, the hypothesis regarding the connection of this growth with COVID constraints needs to be tested.

5.3. Determination of the Degree of Influence of the Number of Detected COVID-19 Cases, Severity of Quarantine Measures, and Other Indicators on the Key Indicators for Assessing the Effectiveness of Innovations in the Banking Sector on the Example of EU Countries

Correlation analysis was used to determine the relationships between the factors: correlation matrices were made for each of the countries, and dependencies between the variables were determined.

Table 2.
Correlation matrix of the indicator «Volume of transactions through digital platforms» with other indicators, in %.

Country/Indicator	CCC	IQM	VIF	DCE	GPD
Austria	70.1	67.1	72.0	99.6	93.5
Belgium	54.0	55.5	68.5	98.3	93.5
Bulgaria	90.8	58.5	92.0	99.8	97.1
Hungary	70.6	76.2	83.4	99.7	94.3
Germany	90.4	70.6	51.4	99.1	93.5
Greece	74.8	92.8	77.8	99.7	95.2
Denmark	51.7	78.3	67.5	99.5	95.2
Ireland	91.4	81.1	69.5	99.4	92.9
Spain	72.9	91.4	64.6	97.7	92.9
Italy	88.8	60.6	64.4	99.8	96.7
Cyprus	62.8	92.7	77.3	99.0	95.5
Latvia	58.9	75.8	79.7	98.1	95.8
Lithuania	89.8	77.4	81.5	99.4	94.3
Luxembourg	50.3	72.1	63.2	97.0	96.2
Malta	63.8	69.4	77.0	98.5	96.2
Netherlands	51.7	61.9	62.6	99.7	93.4
Poland	86.2	58.7	70.9	98.9	94.4
Portugal	92.3	84.1	60.0	99.7	94.3
Romania	71.9	58.2	81.9	100.0	97.8
Slovakia	89.4	54.6	74.8	99.1	95.6
Slovenia	78.6	84.4	75.9	99.3	94.9
Finland	78.1	53.6	69.6	99.7	93.5
France	69.6	61.6	61.8	99.6	91.1
Croatia	68.0	83.5	91.5	99.4	95.8
Czechia	52.7	58.1	75.9	99.6	94.3
Sweden	93.7	90.8	62.6	99.7	95.2
Estonia	76.3	75.3	71.5	99.9	94.9

Table 2 shows that the digitalization of the economy (DEC) is a key driver of transaction volumes through digital platforms: countries with more advanced digital technologies have higher transaction volumes. In addition, the correlation of the volume of transactions made through digital platforms with the number of people falling ill (CCC) and the index of severity of quarantine measures (IQM) shows that the pandemic and related measures also had a significant impact on the use of digitalization and accelerated the transition to digital services.

Table 3.
Correlation matrix of the indicator «Share of population using online banking» with other indicators.

Country/Indicator	CCC	IQM	VIF	DCE	GPD
Austria	65.8	87.6	73.9	98.9	86.8
Belgium	67.9	63.9	69.9	99.8	86.5
Bulgaria	89.7	52.4	90.2	98.3	89.3
Hungary	71.0	73.7	81.6	98.9	87.1
Germany	71.6	55.0	54.4	97.1	87.3
Greece	94.3	73.3	75.3	99.2	88.6
Denmark	60.1	60.8	71.5	97.1	90.8
Ireland	66.9	78.8	64.3	99.9	90.9
Spain	62.2	71.2	72.9	99.7	80.6
Italy	68.7	89.9	67.3	99.0	91.0
Cyprus	84.3	75.9	74.1	98.1	86.1
Latvia	87.9	63.3	86.4	98.9	85.6
Lithuania	91.9	71.8	81.5	99.1	86.1
Luxembourg	89.6	70.1	74.6	99.3	87.4
Malta	61.8	52.8	75.1	99.2	88.9
Netherlands	62.1	86.0	66.2	97.8	86.9
Poland	91.1	75.7	72.9	99.6	88.0
Portugal	71.6	54.5	70.3	97.9	83.9
Romania	76.7	61.8	84.4	98.0	91.5
Slovakia	71.9	51.4	74.1	98.6	86.1

Slovenia	68.6	73.9	76.1	99.1	86.3
Finland	53.8	92.1	67.9	99.7	92.8
France	68.4	81.8	65.4	98.9	85.9
Croatia	53.1	82.3	91.0	99.1	88.3
Czechia	55.7	52.0	78.9	99.2	87.1
Sweden	74.6	52.5	59.9	99.8	93.8
Estonia	52.6	87.1	71.8	98.7	91.2

When analyzing the data obtained in Table 3, it can be seen that the pandemic and related measures had a significant impact on the use of online banking, and a high level of correlation between CCC and IQM indicators is evident in almost all countries. The high correlation with VIF confirms the importance of investment in financial technology to increase the proportion of the population using online banking.

The correlation plan demonstrated the presence of relationships between the dependent and independent variables. To assess the degree of influence of the independent variables on the dependent variables, let us formulate the following regression equations:

$$VDP = const + \beta_1 CCC + \beta_2 IQM + \beta_3 VIF + \beta_4 DCE + \beta_5 GFD \quad (1)$$

$$SOB = const + \beta_1 CCC + \beta_2 IQM + \beta_3 VIF + \beta_4 DCE + \beta_5 GFD \quad (2)$$

Where:

$\beta_1, \beta_2, \beta_3$ – coefficients for the independent variables.

VDP, SOB – dependent variables.

const – free term of the regression equation, which shows the value of the dependent variable if the other variables are equal to zero.

The parameters of the equation in terms of transaction volume across digital platforms are summarized in Table 4.

Table 4.
Equation parameters by VDP variable.

Indicator	coef	std err	t	P>|t|	[0.025	0.975]
const	-4.2353	26.720	-0.159	0.876	-59.802	51.332
CCC	13.1595	0.041	321.073	0.000	13.079	13.240
IQM	0.4693	0.046	10.194	0.000	0.379	0.560
VIF	17.8313	6.889	2.588	0.017	3.504	32.159
DCE	0.4421	0.357	1.238	0.229	-0.300	1.185
GPD	-0.0002	8.81e-05	-1.780	0.090	-0.000	2.64e-05

Descriptive statistics for the results of the regression analysis are summarized in Table 5.

Table 5.
Descriptive statistics of the equation for the variable VDP.

Indicator	Significance
R-squared	0.965
Omnibus	15.868
Durbin-Watson	1.056
Prob (Omnibus)	0.000186
Jarque-Bera (JB)	17.179

The results of the regression analysis show that the variables CCC, IQM, and VIF have a significant effect on VDP, while DCE and GPD have no statistically significant effect. The model has high explanatory power, but the results of normality tests on the residuals indicate possible problems with the model's assumptions.

Table 6.
Equation parameters by variable SOB.

Indicator	coef	std err	t	P>|t|	[0.025	0.975]
const	-19.2826	12.673	-1.522	0.143	-45.638	7.073
CCC	0.8389	0.014	59.857	0.000	0.811	0.866
IQM	0.1089	0.048	2.271	0.025	0.015	0.203
VIF	-3.4036	3.268	-1.042	0.309	-10.199	3.392
DCE	1.5893	0.169	9.386	0.000	1.237	1.941
GPD	9.744e-06	4.18e-05	0.233	0.818	-7.72e-05	9.67e-05

Descriptive statistics to the results of the regression analysis are summarized in Table 7.

Table 7.
Descriptive statistics of the equation on the variable SOB.

Indicator	Significance
R-squared	0.938
Omnibus	1.346
Durbin-Watson	1.685
Prob (Omnibus)	0.510
Jarque-Bera (JB)	0.780

The results of regression analysis show that the variables CCC, IQM and DCE have a significant effect on SOB, while VIF and GPD have no statistically significant effect. The model has high explanatory power and the results of residuals normality tests indicate normal distribution of residuals, which is a positive sign for the model.

6. Discussion of the Results of Analyzing the Impact of the Pandemic on Digital Banking Technologies

Table 1 summarizes the results of the survey of 35 experts from the banking sector. As a result of applying the Delphi method, it was revealed that the key indicators for assessing innovation in banking are: «Share of the population using online banking» and «Volume of transactions through digital platforms».

Figure 1 shows that from 2019 to 2024, there is a significant increase in the volume of transactions made through digital platforms in the EU, with transaction volume increasing by almost 243% by 2022 compared to 2019. Between 2015–2019, the dynamics of the indicator were stable (growth of around 8% annually), in contrast to the dynamics for 2020–2024, where growth was 35–40% annually. This may suggest that the pandemic has contributed to the acceleration of the digitalization of the banking sector, precisely in the services conducted through digital platforms.

A similar conclusion can be drawn from Figure 2: in the pandemic, the share of the population using online banking increased from 54% in 2019 to 70% in 2022 and 77% in 2024. The increase in 2020 is 7%, which is almost 2 times higher than the values in 2015–2019.

The correlation coefficients in Table 2 indicate that there is a relationship between the dependent variable «Volume of transactions through digital platforms» (VDP) and the independent variables, such as «COVID-19 cases per capita» ranging from 50.3% (Luxembourg) to 90.8% (Bulgaria), «Quarantine measures severity index» ranging from 53.6% (Finland) to 92.8% (Greece), «FinTech investment volume» ranging from 51.4% (Germany) to 92.0% (Bulgaria). Other indicators also show high correlation values. It should be noted, however, that the volatility of the indicators related to the pandemic in various indicators requires further investigation in the framework of regression analysis.

Table 3 shows the correlation coefficients between the dependent variable «Share of population using online banking» and the independent variables selected for analysis. The correlations between the variables vary in the following ranges: «COVID-19 cases per capita» ranges from 53.1% (Croatia) to 94.3% (Greece), «Index of severity of quarantine measures» ranges from 51.4% (Slovakia) to 92.1% (Finland), «FinTech investment volume» ranges from 54.4% (Germany) to 91.0% (Croatia), «Index of digitalization of economy» and «GDP per capita» also show high coefficients. Given the volatility of the indicators, further verification by correlation analysis is required.

The results of regression analysis in Table 4 show that the independent variables CCC, IQM and VIF are statistically significant and have an impact on the variable VDP. This is supported by the results of the correlation analysis in Table 1. The descriptive statistics of the regression model are shown in Table 5: the coefficient of determination R^2 is 0.965, showing a high level of explanatory power of the model; the Durbin-Watson coefficient (1.056) may indicate positive autocorrelation of the residuals.

Table 6 shows the coefficients of the regression equation made between the dependent variable SOB and the independent variables. The variables CCC, IQM, and DCE are significant in this case. This also confirms the existence of dependencies identified in the correlation analysis, the results of which are presented in Table 3. Descriptive statistics of the regression model are presented in Table 6: the coefficient of determination R^2 is 0.938, which shows a high level of explanatory power of the model; the Durbin-Watson coefficient (1.685) may indicate a slight positive autocorrelation of the residuals.

Overall, the analysis highlights that the pandemic has fostered innovation and digitalization of the banking sector in EU countries.

There is a similar study by Liu and Chu [18] that analyzes the impact of the pandemic on financial technology innovation in the banking sector, in different countries between 2018 and 2021. The author emphasizes that the restrictions imposed during the pandemic accelerated the digitalization of the banking sector. The advantage of our study is the application of the Delphi economic-mathematical method to select dependent variables based on the expert survey, as well as a wider time range for analysis.

Another study, Ononiwu et al. [19], on a large sample of developing countries, examines the impact of regulatory measures and government support on the dynamics of digital transformation. At the same time, there is no assessment of the relationships between the dependent indicators. Our study solves this problem.

The difficulties of the study are due to the following:

- Differences in economic performance between countries.

- Possible autocorrelation indicates insufficient model specification, which requires adjustment in the research perspective.
- A high degree of correlation between indicators makes it difficult to understand cause-and-effect relationships.
- Limitations of the present study:

1. Restriction to EU countries. With a different sample of countries, there is a probability of changes in the influence of the studied factors within the analysis of variance, which may cause a revision of the weights of the used indicators.

2. The main dependent variables were determined on the basis of a survey of 35 experts from the banking industry; the dependent variables may change if the sample is expanded.

The disadvantages of the study are that it may not take into account some aspects such as inflation rates and central bank policies in different EU countries.

7. Conclusions

1. A survey of 35 representatives of the banking industry was conducted and using the Delfi method, key indicators were determined, through which it is possible to assess the development of digital technologies in the banking sector: «Volume of transactions through digital platforms» (average rating 8.1), «Share of population using online banking» (average rating 8.4).

2. A comparative analysis of the dynamics of change in the indicators «Volume of transactions through digital platforms» (243% growth by 2022 compared to 2019) and «Share of population using online banking» (16% growth by 2022 compared to 2019) proved the impact of the pandemic on the positive dynamics of change in the designated indicators, with a preferential breakthrough of digital platforms.

3. Correlation analysis revealed a relationship between the dependent indicators «Volume of transactions through digital platforms», «Share of population using online banking», and the independent indicators «COVID-19 cases per capita», «Quarantine severity index», «FinTech investment volume», and «Index of digitalization of the economy by country». In most countries, the correlation coefficients between the indicators are more than 70%. To verify the results of the correlation analysis, two regression models with a high degree of reliability (R^2=0.965 and R^2=0.938) were compiled, confirming the existence of a relationship between the dependent and independent indicators.

References

[1] A. Kredina, A. Akparova, and L. Vasa, "Analysis of the dynamics of cashless payments in Kazakhstan in the context of the Covid-19 pandemic," *Economics: The Strategy and Practice*, vol. 16, no. 2, pp. 54-61, 2021. https://doi.org/10.51176/1997-9967-2021-2-54-61

[2] T. Lunkina, A. Burkovskaya, and K. Gulich, "Application of financial technologies in the banking system of Ukraine," *Ukrainian Black Sea Region Agrarian Science*, no. 110, pp. 27–35, 2021. https://doi.org/10.31521/2313-092X/2021-2(110)-4

[3] M. R. Marcu, "The impact of the COVID-19 pandemic on the banking sector," *Management Dynamics in the Knowledge Economy*, vol. 9, no. 2, pp. 205-223, 2021. https://doi.org/10.2478/mdke-2021-0015

[4] S. Kayed, M. Alta'any, R. Meqbel, I. N. Khatatbeh, and A. Mahafzah, "Bank FinTech and bank performance: Evidence from an emerging market," *Journal of Financial Reporting and Accounting*, vol. 23, no. 2, pp. 518-535, 2025. https://doi.org/10.1108/JFRA-09-2023-0526

[5] T. Ahmed, A. Vafaei-Zadeh, R. Chanda, and K. Nawaser, "Investigating the factors influencing e-banking service adoption during COVID-19 pandemic," *International Journal of Productivity and Quality Management*, vol. 41, no. 2, pp. 197–235, 2024. https://doi.org/10.1504/IJPQM.2022.10047706

[6] A. Ana, G. Dašić, and A. Aničić, *The impact of the COVID-19 pandemic on the faster digitalization of financial and banking. In A. Lošonc & A. Ivanišević (Eds.), 8th International Scientific Conference: Socio-economic aspects of the pandemic: Crisis management*. Novi Sad: Faculty of Technical Sciences, 2022.

[7] I.-C. Popa and G. Luca, "Digitization of banking services before and after the pandemic," *Finance: Challenges of the Future*, vol. 22, no. 24, pp. 163–173, 2022.

[8] M. Moharrak and E. Mogaji, "Generative AI in banking: empirical insights on integration, challenges and opportunities in a regulated industry," *International Journal of Bank Marketing*, vol. 43, no. 4, pp. 871-896, 2025. https://doi.org/10.1108/IJBM-08-2024-0490

[9] C. Scarlat, G. D. Stănciulescu, and D. A. Panduru, "COVID-19 pandemic as accelerator: Opportunity for digital acceleration," *Journal of Internet and e-Business Studies*, vol. 2022, pp. 1-14, 2022. https://doi.org/10.5171/2022.296375

[10] G. B. Ferilli, E. Palmieri, S. Miani, and V. Stefanelli, "The impact of FinTech innovation on digital financial literacy in Europe: Insights from the banking industry," *Research in International Business and Finance*, vol. 69, p. 102218, 2024. https://doi.org/10.1016/j.ribaf.2024.102218

[11] J. Božović and I. Božović, "Impact of the pandemic COVID-19 on the digitalization of the banking sector of Serbia," *Oditor*, vol. 9, no. 1, pp. 127-159, 2023. https://doi.org/10.5937/Oditor2301127B

[12] Y. Tuna and Ö. Fidanboy, "The effect of the digitalization process on the banking sector," *The International New Issues in Social Sciences*, vol. 11, no. 1, pp. 77-106, 2023.

[13] L. A. Bueno, T. F. Sigahi, I. S. Rampasso, W. Leal Filho, and R. Anholon, "Impacts of digitization on operational efficiency in the banking sector: Thematic analysis and research agenda proposal," *International Journal of Information Management Data Insights*, vol. 4, no. 1, p. 100230, 2024. https://doi.org/10.1016/j.jjimei.2024.100230

[14] Y. Sendur, "The COVID-19 pandemic and digitalization in financial markets," *Istanbul Journal of Economics-Istanbul Iktisat Dergisi*, no. 72-2, pp. 1025-1038, 2022. https://doi.org/10.26650/ISTJECON2022-1127590

[15] A. G. Manta, R. M. Bădîrcea, N. M. Doran, G. Badareu, C. Gherțescu, and J. Popescu, "Industry 4.0 transformation: Analysing the impact of artificial intelligence on the banking sector through bibliometric trends," *Electronics*, vol. 13, no. 9, p. 1693, 2024. https://doi.org/10.3390/electronics13091693

[16] M. Aloulou, R. Grati, A. A. Al-Qudah, and M. Al-Okaily, "Does FinTech adoption increase the diffusion rate of digital financial inclusion? A study of the banking industry sector," *Journal of Financial Reporting and Accounting*, vol. 22, no. 2, pp. 289-307, 2024. https://doi.org/10.1108/JFRA-05-2023-0224

[17] E. Miklaszewska, K. Kil, and M. Idzik, "How the COVID-19 pandemic affects bank risks and returns: evidence from EU members in central, eastern, and northern Europe," *Risks*, vol. 9, no. 10, p. 180, 2021. https://doi.org/10.3390/risks9100180

[18] W.-P. Liu and Y.-C. Chu, "FinTech, economic growth, and COVID-19: International evidence," *Asia Pacific Management Review*, vol. 29, no. 3, pp. 362-367, 2024. https://doi.org/10.1016/j.apmrv.2023.12.006

[19] M. I. Ononiwu, O. C. Onwuzulike, K. Shitu, and O. O. Ojo, "The impact of digital transformation on banking operations in developing economies," *World Journal of Advanced Research and Reviews*, vol. 23, no. 3, pp. 285-308, 2024. https://doi.org/10.30574/wjarr.2024.23.3.2706