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SHULHA Natalia,
Doctor of Science (Economics), Professor,
Head of the Department of Banking
State University of Trade and Economics
19, Kioto St., Kyiv, 02002, Ukraine

ORCID: 0000-0002-2010-5884
2bank2@ukr.net

FESIUK Bohdan,
Bachelor's degree in Finance,
Banking and Insurance
State University of Trade and Economics
19, Kioto St., Kyiv, 02002, Ukraine

ORCID: 0000-0002-4829-3872
mega-mobile@ukr.net

ШУЛЬГА Наталія,
д. е. н., професор,
завідувач кафедри банківської справи
Державного торговельно-економічного університету
вул. Кіото, 19, м. Київ, 02156, Україна

ORCID: 0000-0002-2010-5884
2bank2@ukr.net

ФЕСЮК Богдан,
бакалавр зі спеціальності
"Фінанси, банківська справа та страхування"
Державного торговельно-економічного університету
вул. Кіото, 19, м. Київ, 02156, Україна

ORCID: 0000-0002-4829-3872
mega-mobile@ukr.net

DIGITALIZATION OF CORPORATE BUSINESS OF UKRAINIAN BANKS

ДИДЖИТАЛІЗАЦІЯ КОРПОРАТИВНОГО БІЗНЕСУ БАНКІВ УКРАЇНИ

Introduction. Increasing competition between banks requires the introduction of banking products with a new service and economic design, based on modern software, technology and information platforms.

Problem. Digitalization is becoming a key trend in conducting business for banks and their corporate clients.

The aim of the study is to cluster banks by the level of digitalization and determine the relationship between it and indicators of market power, financial performance and credit risk.

Methods. Input normalized indicators for 32 banks of Ukraine, determined using the MINIMAX methodology, were used. The study was based on correlation-regression and cluster analysis.

Вступ. Посилення конкуренції між банками потребує запровадження банківських продуктів із новим сервісним та економічним дизайном, які базуються на сучасних програмно-технологічних та інформаційних платформах.

Проблема. Диджиталізація стає ключовим трендом ведення бізнесу банків та їх корпоративних клієнтів.

Метою дослідження є здійснення кластеризації банків за рівнем диджиталізації та визначення взаємозв'язку між ним і показниками ринкової потужності, фінансової результативності та кредитного ризику.

Методи. Використано вхідні нормалізовані показники по 32 банках України, які визначено за допомогою методики МІНІМАКС. Дослідження базувалося на кореляційно-регресивному та кластерному аналізі.

Results. The information base for calculating the digitalization index for banks in the focus group was chosen based on the number of: the number of visitors to banks' websites, registered users of banks' mobile applications (including for legal entities and individuals), branded online inquiries, banking self-service devices, subscribers of banks in social media networks. When determining the level of digitalization in corporate business, only two indicators were used: the number of registered legal entities that use mobile bank applications and the number of brandname online searches for each of them.

Three hypotheses were put forward and their empirical verification was carried out, according to the results of which it was established that there is a moderate correlation between the digitalization index and the credit risk indicator and a low correlation between the digitalization index and indicators of financial performance and market power. Among the financial indicators a noticeable correlation was found only between the level of the interest margin and the level of digitalization.

Conclusions. *For most of the banks in the focus group, a low level of digitalization is inherent in the corporate business. It is proposed to develop a strategy for the development of the corporate business of banks on a new technological platform, which will make it possible to extend digitalization processes not only to typical, but also to exclusive financial services provided to corporate clients, taking into account their individual service.*

Keywords: banking business, corporate segment, ranking method, indicator rank, market power index, financial indicators, non-performing bank loans.

Результати дослідження. *Інформаційною базою для розрахунків індексу диджиталізації по банкам фокус-групи обрано показники кількості: відвідувачів сайтів банків, зареєстрованих користувачів мобільних додатків банків (у тому числі для юридичних та фізичних осіб), брендових онлайн-запитів, банківських пристроїв самообслуговування, підписників банків у соціальних мережах. При визначенні рівня диджиталізації в корпоративному бізнесі використано лише два індикатори – кількість зареєстрованих юридичних осіб, що користуються мобільними додатками банків, і кількість пошукових брендових онлайн-запитів по кожному з них.*

Висунуто три гіпотези та проведено їх емпіричну перевірку, за результатами якої встановлено наявність помірного кореляційного зв'язку між індексом диджиталізації та показником кредитного ризику і низького зв'язку між індексом диджиталізації та показниками фінансової результативності й ринкової потужності. Серед фінансових показників встановлено помітний кореляційний зв'язок тільки між рівнем процентної маржі та рівнем диджиталізації.

Висновки. *Для більшості банків фокусгрупи в корпоративному бізнесі притаманним є низький рівень диджиталізації. Запропоновано розробляти стратегію розвитку корпоративного бізнесу банків на новій технологічній платформі, яка дасть змогу їм поширити процеси диджиталізації не тільки на типові, але й ексклюзивні фінансові послуги, що надаються корпоративним клієнтам з урахуванням індивідуального їх обслуговування.*

Ключові слова: банківський бізнес, корпоративний сегмент, метод ранжування, ранг показника, індекс ринкової потужності, фінансові показники, непрацюючі кредити банку.

Introduction. The corona crisis and the war in Ukraine necessitated the widespread introduction of electronic sales channels for banking products, which led to a change in the forms of interaction between banks and clients. Digitalization is of particular importance, which opens up new business opportunities for banks and their corporate clients, helps reduce transaction costs and generate additional income, improves customer service, and improves business processes; provides a number of other significant preferences for both parties.

Problem. The strengthening of competition between banks requires the introduction of banking products with a new service and economic design, which are based on modern software, technology and information platforms, which will contribute to the growth of the added value chain for

providers and consumers of electronic banking services. In view of the above digitalization is becoming a key trend in conducting business for banks and their corporate clients.

Analysis of recent research and publications. Over the past decade, many publications have appeared on digitalization in various spheres of social life. This problem is especially actively discussed among scientists who study it in the banking business. Foreign scientists made significant progress in the field of digitalization of banks: F. Diner, M. Spachek, Z. Lihua, J. Strauss, F. Zabala, B. Sliusarchyk, F. Forcadel, E. Arakil; and domestic ones O. Lysiak, Yu. Lazarenko, O. Krukhmal, S. Reverchuk, V. Kovalenko.

In the scientific works of foreign scientists, a wide range of issues related to digitalization is considered, in particular:

• assessment of the impact of digital transformation on the performance of banks in Vietnam; based on the results of the research, the author made a conclusion – the larger the banks are, the stronger the impact of digital transformation on their indicators [1];

• identification of barriers and reasons for the discrepancy between the expected and actual consequences of digitalization in the banking sector [2];

• identification of the prerequisites for the digital transformation of banks and various ways of its implementation, based on the results of the analysis of which it was established that the digital transformation should be based on mature technologies, focus on the client experience and be supported by fintech talents [3];

• establishing the dependence between the bank's reputation and its digitalization, which gave the authors a reason to conclude on the need for a combination of technological (that is, digital) and reputational resources in order to obtain the expected results [4];

• conducting an analysis of Chinese banks with a higher efficiency of investments in science and technology, evaluating their digital maturity and digital transformation experience, as well as substantiating the conclusion that investments in digitalization contributed to a significant increase in the efficiency of banks, among which there is heterogeneity, as well as providing them with recommendations on the need to develop medium- and long-term strategic plans in the field of digitalization, which will focus not only on improving existing banking products and market opportunities, but also include the formation of its infrastructure [5];

• identification of threats related to operational risk management in the process of digitalization of banking services [6];

• evaluating the impact of reliability, security and speed of remote banking services in the Republic of North Macedonia on customer satisaction [7], as well as the effectiveness of electronic banking services on the profitability and stability of Islamic banks in Indonesia [8]. The issue of digitalization in banks is also discussed among domestic scientists in various aspects:

• management of banks' competitiveness in conditions of digitalization of the economy [9];

• determining the prospects of Internet banking as a direction of digitalization [10; 11];

• outline of directions for the development of banking business in the conditions of the digital economy [12; 13; 16];

• determination of the impact of digitalization of the economy on the revenues of the banking sector of Ukraine and the competitiveness of banks [14; 15];

• assessment of the impact of digitalization of the economy on the financial stability of banks [17].

The results of the analysis of the works of domestic scientists proved the existence of only isolated publications in which the current state of banking services for corporate business was investigated and a comparative analysis of digital banking services was provided [18].

Instead, the impact of digitalization on the key indicators of the corporate segment of Ukrainian banks remains unexplored, which has not only theoretical, but also practical significance for developing a strategy for its further development based on a digital platform.

The aim of the study is to cluster banks by the level of digitalization and determine the relationship between it and indicators of market power, financial performance and credit risk.

Methods. The factual basis for the study was the notes to the financial statements of "Business Segments" of banks of Ukraine, which are actively engaged in servicing corporate clients.

Input normalized indicators for 32 banks of Ukraine were used, the share of which in lending to legal entities is 88.6 %, attraction of deposits is 94.07 % of their total volume in the banking system of Ukraine. The study was also based on correlation-regression analysis when establishing the closeness of the relationship between the level of digitalization and indicators of financial performance, market power and credit risk; cluster analysis – when grouping banks by levels of digitalization, financial performance, market power and credit risk.

Results. The corporate segment plays a key role in the activity of banks, which is evidenced by the high share of attracted deposits from legal entities and loans granted to them *(Figure)*.
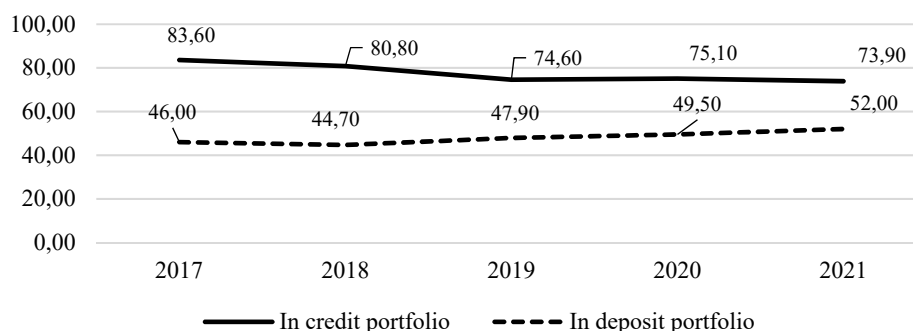
Dynamics of the share of loans and deposits of legal entities in their total volume by banks of Ukraine in 2017–2021, %

Source: developed by the authors according to [19].

The share of deposits of legal entities in the deposit portfolio of Ukrainian banks in 2021 compared to 2017 increased by 6 %, which is explained by the higher interest of banks in attracting less expensive resources from legal entities compared to individuals. Instead, the share of loans to legal entities in the loan portfolio of Ukrainian banks is gradually decreasing. This is due to the coronavirus crisis, which led to a drop in business activity and a decrease in the income of enterprises, which negatively affected their creditworthiness. As a result of military events, this negative trend continues. A decrease in the share of loans granted to legal entities led to a decrease in interest income and expenses of banks. Moreover, if the interest income of Ukrainian banks decreased by 44.2 % during the studied period, then the interest expenses decreased by only 23.1 %.

The mentioned reasons forced banks to look for opportunities to increase the effectiveness of corporate business through a set of measures, among which digitalization plays an important role.

Diagnostics of the level of digitalization in the banks of the focus group was carried out according to the following indicators and information sources:

• number of visitors to bank websites (*Similarweb* website) [20];

• number of registered users of bank mobile applications, includingfor legal entities and individuals (bank website data);

• number of branded online inquiries (*Semrush* website data) [21];

• number of self-service banking devices (the NBU website);

• number of followers of banks in social networks, including: on Instagram and Facebook (social network data).

The level of digitalization in the corporate segment, based on the available public information, can be estimated based on two indicators: the number of registered legal entities that use mobile bank applications and the number of branded online searches for each of them.

Depending on the values of these indicators, banks are assigned a number of points from 1 to 3 according to the gradation given in the *Table 1*, which presents the results of the distribution of focus group banks by the level of digitalization of the corporate segment, carried out using the Python software product.

Table 1

Clustering of focus group banks by the level of digitalization in the corporate segment

Digitalization level	Digitalization index	Number of banks in the cluster
1 – high (3 or more points)	3.0	2
2 – average (from 2 to 2.99 points)	2.0	3
3 – low (from 1 to 1.99 points)	1.0	27

Source: developed by the authors using Python.

The first cluster *(Table 1)* includes JSC CB "PrivatBank" and JSC "Oshchadbank", the second – Ukrsibbank, PUMB, Alfa-Bank, the third – 27 banks, which is 84 % of their total sample. This means that most banks in

the focus group have a low level of digitalization in the corporate segment. JSC CB "PrivatBank" and JSC "Oschadbank" are leaders in the banking system of Ukraine in terms of the level of digitalization both in general and in the corporate segment in particular, as they provide a wide range of remote banking services and have mobile applications that are used by a large number of customers.

Digitalization of services in Ukrainian banks, similar to global trends, received the greatest development not in the corporate, but in the retail segment. This situation arose due to several reasons:

firstly, natural persons use typical banking services, for which it is not difficult to formalize business processes in an electronic format;

secondly, the number of clients of natural persons is much larger than that of legal entities, in relation to whom banks most often apply an individual approach;

thirdly, the costs of customer service in the retail segment, as a rule, are higher per unit of assets than in the corporate segment, which determined the need for the priority implementation of digital technologies in the retail business.

In view of the above, it is important to find out in which direction it is appropriate to develop digitalization in the corporate business of banks and its connection with market power, credit risk and basic financial indicators. For this purpose, three hypotheses were put forward and their empirical verification was carried out with the help of correlation-regression analysis and the MINIMAX method, according to which all indicators for banks in the focus group were normalized according to the formula:

$$X'_{ij} = \frac{X_{ij} - X_{j\,min}}{X_{j\,max} - X_{j\,min}},$$

where X'_{ij} – is the normalized value of indicator j of bank i;

X_{ij} – is the actual value of indicator j of bank i;

$X_{j\,min}$ – is the minimum value of indicator j for the minimum value of indicator j in the group of surveyed banks;

$X_{j\,max}$ – is the maximum value of indicator j for the maximum value of indicator j in the group of surveyed banks.

Normalized indicators are integrated into a complex indicator reflecting the position of each bank using the arithmetic mean method.

When interpreting the tightness of the correlation dependence, the Chaddock correlation level scale was used [22].

The first hypothesis assumes the existence of a relationship between the level of digitalization and indicators of market power in the corporate segment. When calculating the market power index, the methodology of the analytical department of *YouControl* was used, which is based on indicators that comprehensively reflect the bank's market share, its place in the sector and growth dynamics compared to competitors [23].

The conducted correlation analysis made it possible to establish a moderate correlation between the market power index and the digitalization index, as the correlation coefficient is within 36%. This means that the level of digitalization in the corporate segment does not significantly affect the bank's market share in the deposit and credit market, as well as the pace of its change. Obviously, in this case, other factors play a significant role, in particular, the rating and trust in banks, the closeness of their ties with corporate clients, consideration of their business interests, the level of banking service, tariff policy, as well as the form of ownership of banks.

Further analysis showed that in terms of market power, only two state-owned banks Ukreximbank and Ukrgazbank are the leaders in the market power index. At the same time, these banks have a low level of digitalization. Among the state banks, JSC CB "PrivatBank" stands out, which has the highest level of digitalization, but an average level of market power *(Table 2)*.

Table 2

Results of clustering of focus group banks in the corporate segment by the level of market power

Level	Index of market power	Number of banks in the cluster
High (3 or more points)	3.085	2
Medium (from 2 to 2.99)	2.36	18
Low (up to 2 points)	1.40	12

Source: developed by the authors using Python.

The second cluster includes 56 %, the third – 37.5 % of the total sample of focus group banks. Among the banks of the second cluster, there are 2 banks with a high level of digitalization, 3 with an average level, and 13 with a low level of digitalization. Among the banks of the third class, those with a low level of digitalization prevail, that is, almost 45 % of their total.

The content of the second hypothesis boils down to the existence of a correlation between the levels of digitalization and financial performance in the corporate segment. Financial indicators for the corporate segment, which are calculated on the basis of the note to the financial statements "Business segments", have been reduced to a single index of financial performance.

The correlation coefficient between the financial performance index and the digitalization index is 0.19, which indicates a weak correlation dependence. The correlation between individual financial indicators and the digitalization index is illustrated in the *Table 3*.

Table 3

Correlations between individual financial indicatorsbanks of the focus group in the corporate segment and the level of their digitalization

Indicators	Net income/ Assets	Income/ Expenses	Expenses/ Commitments	Interest margin	Digitalization Index
Net income/Assets	1.000000	0.538230	0.472915	0.403072	0.024337
Income/Expenses	0.538230	1.000000	0.178214	0.409392	0.096264
Expenses/Commitments	0.472915	0.178214	1.000000	0.189525	0.127509
Interest margin of corporate semgent	0.403072	0.409392	0.189525	1.000000	0.505666
Digitalization Index	0.024337	0.096264	0.127509	0.505666	1.000000

Source: developed by the authors using Python.

Table 3 show that there is only a moderate correlation between the indicator of the bank's interest margin and the level of digitalization (correlation coefficient – 0.51). There is a weak correlation between the level of digitalization and other financial indicators. The cluster distribution of banks according to the level of financial performance is given in the *Table 4*.

Table 4

**Results of clustering of focus group banks in the corporate segment
by the level of financial performance**

Level	Index of financial performance	Number of banks in the cluster
High (2 points)	2	1
Medium (from 1.5 to 1.99)	1.69	4
Low (from 1 to 1.49)	1.09	27

Source: developed by the authors using Python.

A high level of financial performance is characteristic of IBOX BANK JSC, which at the same time is characterized by a low level of digitalization. The second cluster included 1 bank with a high level of digitalization (JSC KB PrivatBank) and 3 banks with a low level, and the third included 1 bank with a high level (JSC "Oschadbank"), 3 with a medium level (JSC "PUMB", JSC "Ukrsibbank", JSC "Alfa-Bank"), and 23 with a low level of digitalization, that is, almost 85 % of their total number.

Interpretation of *the third hypothesis* – there is a relationship between the level of digitalization and the share of non-performing loans in the loan portfolio of the corporate segment, which characterizes the level of credit risk of banks.

The data of the conducted correlation analysis indicate that there is a moderate correlation between the level of credit risk and the level of digitalization, as the correlation coefficient is equal to 0.48. The clustering of the banks of the focus group by the level of credit risk is shown in the *Table 5*.

Table 5

**Results of clustering of focus group banks in the corporate segment
by the level of credit risk**

Cluster	Average level of credit risk	Number of banks
High level (more than 0.66)	0.79	4
Average level (from 0.33 to 0.66)	0.48	5
Low level (from 0 to 0.32)	0.11	23

Source: developed by the authors using Python.

The first cluster includes 2 banks with a high level of digitalization (JSC PrivatBank, JSC Oschadbank) and 2 banks with a low level of digitalization. The second includes 1 bank with an average level (JSC "Alfa-Bank") and 4 – with a low level of digitalization; the third cluster included 2 banks with an average level (JSC "PUMB", JSC "Ukrsibbank"), as well as 21 banks with a low level of digitalization, which is almost 78 % of their total number.

So, currently digitalization in the corporate segment for the majority of Ukrainian banks has little effect on both their market power and financial performance, which determines the need for active development of electronic services for corporate clients.

The effect of digitalization should be manifested in an increase in the level of loyalty of corporate clients to the bank, which will contribute to the growth of the profitability of the corporate segment at an acceptable level of risks. For this purpose, banks need to expand the list of services to legal entities on new technological platforms, introduce a flexible pricing mechanism, and create attractive cross-selling packages of electronic services.

In the corporate business strategy, banks should focus on reducing the share of non-performing loans in the loan portfolio, increasing the interest margin due, first of all, to reducing interest costs; increasing the efficiency of operational risk management, as well as typifying the types of electronic services most used by legal entities and providing exclusive financial services based on new technological solutions.

Conclusions. Increasing competition in the market of electronic financial services, increasing risks from the external environment, and reducing margins require consideration of how digitalization affects market power, financial performance, and risks of the corporate segment of banks. For this purpose, three hypotheses were proposed and empirically tested using the Python software product. A moderate correlation between the digitalization index and the credit risk indicator and a low correlation between the digitalization index and indicators of financial performance and market power were revealed. Among the financial indicators, a noticeable correlation was established only between the level of interest margin and the level of digitalization.

It was determined that a low level of digitalization is inherent in most banks of the focus group in corporate business. In view of this, it is proposed to develop a strategy for the development of corporate business of banks on a new technological platform, which will allow them to extend digitalization processes not only to typical, but also to exclusive financial services provided to corporate clients, taking into account their individual service. Reducing the level of credit risk, increasing the efficiency of operational risk management, reducing the level of operating costs and increasing the quality of customer service should be important vectors of the strategic development of the corporate business of Ukrainian banks.

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