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Abstract	The aim of this assessment is to assess the effectiveness of the digital development of commercial banks in Uzbekistan. To accomplish the aim of this assessment, identifying the highest ranked banks in the effectiveness of digital development in commercial banks in Uzbekistan was chosen as the objective of this assessment by the researcher. The following methods were used in this assessment: survey, comparative analysis, index, correlation, statistical tables, and figures. In the end of the assessment, “Uzmilliybank” JSC, “Uzsanoatkurilishbank” JSC, “Ipoteka-bank” JSCMB, “Asakabank” JSC, and “Anor Bank” JSCS were ranked the highest positions among the banks that are effective digitally developed banks in Uzbekistan. Based on the indicators of the assessment, the level of development of digital technologies and the level of development of innovative digital technologies in commercial banks in Uzbekistan were determined. As well, the classifications of the groups on the digital technology offerings and on the effectiveness of the digital development of the commercial banks in Uzbekistan were formed in accordance with five categories of “very strong,” “strong,” “medium,” “weak,” and “very weak.” The strategy for the effective development of the offerings of digital technologies in commercial banks of Uzbekistan was recommended for the banks that were ranked in “very weak” and “weak” positions on the list of the offerings of digital technologies by the banks. In the process of the research, a regression model was also created to predict the effectiveness of the digital development of commercial banks in Uzbekistan.

Keywords (separated by '-')	digital technologies - commercial banks - effectiveness

The Assessment of the Effectiveness of the Development of Digital Technologies in Commercial Banks of Uzbekistan

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Abstract. The aim of this assessment is to assess the effectiveness of the digital development of commercial banks in Uzbekistan. To accomplish the aim of this assessment, identifying the highest ranked banks in the effectiveness of digital development in commercial banks in Uzbekistan was chosen as the objective of this assessment by the researcher. The following methods were used in this assessment: survey, comparative analysis, index, correlation, statistical tables, and figures. In the end of the assessment, "Uzmilliybank" JSC, "Uzsanoatkurilishbank" JSC, "Ipoteka-bank" JSCMB, "Asakabank" JSC, and "Anor Bank" JSCS were ranked the highest positions among the banks that are effective digitally developed banks in Uzbekistan. Based on the indicators of the assessment, the level of development of digital technologies and the level of development of innovative digital technologies in commercial banks in Uzbekistan were determined. As well, the classifications of the groups on the digital technology offerings and on the effectiveness of the digital development of the commercial banks in Uzbekistan were formed in accordance with five categories of "very strong," "strong," "medium," "weak," and "very weak." The strategy for the effective development of the offerings of digital technologies in commercial banks of Uzbekistan was recommended for the banks that were ranked in "very weak" and "weak" positions on the list of the offerings of digital technologies by the banks. In the process of the research, a regression model was also created to predict the effectiveness of the digital development of commercial banks in Uzbekistan.

Keywords: digital technologies · commercial banks · effectiveness

1 Introduction

The approval of the strategy for reforming the banking system of the Republic of Uzbekistan for 2020–2025 by the Decree of the President of the Republic of Uzbekistan No. DP-5992 of May 12, 2020 became an important basis for conducting modern banking business in local commercial banks and strengthening the competitive environment in the banking sector.

Increasing the attractiveness and quality of banking services, expanding the scope of remote services using modern information technologies, increasing the types of digital services and products, and moderately digitizing traditional banking activities are

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currently the most important strategic goals of commercial banks in Uzbekistan. In the banking sector, digital transformation is one of the priority goals of banking business in the strategic planning of banking business activity, and therefore the assessment of the development of digital technologies in commercial banks is a relevant task [1, 2].

The fact that commercial banks are constantly assessing the overall effectiveness of their activities is principally limited to the determination of general financial and economic effectiveness indicators. The study of the impact of digital technologies on overall effectiveness, the evaluation of the effectiveness of the implementation of digital technologies in commercial banks, or the evaluation of the development of digital technologies remains out of the attention of bank officials.

The aim of this assessment is to assess the effectiveness of the digital development of commercial banks in Uzbekistan and the objective of this assessment is to identify the highest ranked banks in effective digital development in commercial banks in Uzbekistan.

2 Methodology

The following methods were used in this assessment: survey, comparative analysis, index, correlation, statistical tables, and figures. In order to assess the effectiveness of the development of digital technologies in 33 commercial banks of the Republic of Uzbekistan, an assessment conducted in the Republic of Belarus [3] was used as a basis. 27 types of products and services based on digital technologies was sent to the employees of commercial banks through social networks in the form of a questionnaire. Besides, based on their feedback, it was also studied whether other digital services and products that were used in the business activities of commercial banks were available or not where they worked.

The results were calculated and summarized in the Excel office program. The effectiveness of digital development in commercial banks in Uzbekistan was assessed based on index methods [4–6]. In this assessment, the results of the assessment of the use of digital technologies in the commercial banks of Uzbekistan, the net profit indicators of the commercial banks of Uzbekistan as of July 1, 2022 [7] and the system of relative normalized indicators (1–3) [3], which takes the value from 0 to 1, were used.

The index of offered digital technologies by the bank, Of_i, is calculated using (1) formula:

$$Of_i = \frac{T_i}{max\{T_i\}} \tag{1}$$

Here,

Ti –a complex indicator of digitization of bank *i*;

max {Ti}- the maximum value in the range of complex indicators of banks digitization.

The index of the net profit of the bank, Inc_i, is calculated in line with (2) formula:

$$Inc_i = \frac{Inc_i}{max\{Inc_i\}} \tag{2}$$

Here,

Inc_i - the net profit indicator of the bank for the reporting period (month, year);

$max\ \{Inc_i\}$ – the maximum value in the range of the net profit indicators of the bank for the reporting period (month, year).

The index of the effectiveness of digital development of the bank, Eff_i, is calculated based on the method of "vector development:"

$$Eff_i = \sqrt{\frac{1}{2}(Of_i^2 + Inc_i^2)} \tag{3}$$

3 Results and Analysis

The assessment of the use of digital technologies was implemented according to the results that was based on 27 types of digital technologies, as mentioned above, and 8 types of digital services and products indicated by the survey participants (cash withdrawal "Quant", online conversion, online international money transfer, online account opening, online plastic card opening, receiving international money transfers through a mobile application, collection of credit debt from plastic cards opened by other banks, and mobile programs) but not specified in the questionnaire that was sent to the respondents.

In the assessment rating, the top five the following banks ranked the highest positions on the index of the effectiveness of digitally development of the bank:

- Uzsanoatqurilishbank JSC and Asakabank JSC with 34 points;
- Anor Bank JSC with 32 points;
- Kishloqqurilishbank JSCB and "Agrobank" JSCB with 28 points;
- Xalq Bank JSC and Ipoteka Bank JSCMB with 27 points;
- Uzmilliybank JSC, Microcreditbank JSCB, Turonbank JSC, Aloqabank JSC, and Poytaxt Bank JSC with 24 points.

Commercial banks use the following digital technologies the most among digital technologies that were listed in the survey: remote banking services—100%; issuance of bank payment cards—97%; online money transfers—100%; online deposit—85%; API interface—97%; online conversion—85%; and mobile applications—97%.

After the process of assessing the use of digital technologies in the commercial banks of Uzbekistan, indicators of digital development in the commercial banks of Uzbekistan were determined, that is, the indicators of the index of the net profit of the bank (Inc_i), the indicators of the index of offered digital technologies by the bank (Of_i), and the indicators of the index of the effectiveness of digital development of the bank (Eff_i). According to these indicators, the top five positions in the net profit of the banks were ranked by Uzmilliybank JSC, Ipoteka-bank JSCMB, Kapitalbank ATIB, Uzsanoatkurilishbank JSC, and Trustbank JSC. In compliance with the index of offered digital technologies by the bank, the top five positions were taken by Uzsanoatkurilishbank JSC, Asaka-bank JSC, Anor Bank JSC, Agrobank JSC, and Kishloqkurilishbank JSC. As a result, "Uzmilliybank" JSC, "Uzsanoatkurilishbank" JSC, "Ipoteka-bank" JSCMB, "Asaka-bank" JSC, and "Anor bank" JSCs took high-ranking positions based on the index of the effectiveness of digital development of the banks (Eff_i).

"Uzsanoatkurilishbank" JSC was the sole bank that kept its ranking position in the top five according to three indicators of the indexes (Table 1).

Table 1. The indicators of digital development in the commercial banks of Uzbekistan

Banks	Net profit of the bank during the reporting period, billion soums (Q2) 2022) [7]	The net profit index of the bank	The index of offered digital technologies by the bank	Bank rating	The index of the effectiveness of digital development of the bank	Bank rating
Uzmilliybank	986,0	1	0,705882	**5**	0,865526	**1**
Ipoteka-bank	608,4	0,617	0,794118	**4**	0,711112	**3**
Kapitalbank	486,8	0,494	0,5	10	0,496866	14
Uzsanoatqurilishbank	416,5	0,422	1	**1**	0,767605	**2**
Trustbank	329,3	0,334	0,352941	13	0,343589	26
Hamkorbank	318,0	0,322	0,441176	12	0,386428	19
Qishloq qurilish bank	273,3	0,277	0,823529	**3**	0,614422	6
Ipak yo'li Bank	258,8	0,262	0,647059	7	0,49375	15
Xalq Bank	206,3	0,209	0,794118	**4**	0,580689	8
Orient Finance Bank	195,6	0,198	0,676471	6	0,498481	13
Aloqabank	110,9	0,112	0,705882	**5**	0,505431	9
Davr-bank	87,9	0,089	0,529412	9	0,379621	20
KDB Bank Uzbekistan	86,2	0,087	0,294118	15	0,216966	32
Universal Bank	82,4	0,083	0,558824	8	0,399542	17
InFinbank	81,8	0,083	0,529412	9	0,378919	21
Agrobank	77,5	0,079	0,823529	**3**	0,58497	7
Asia Alliance Bank	71,2	0,072	0,558824	8	0,398433	18
Turonbank	56,1	0,057	0,705882	**5**	0,500753	10
Ziraat bank Uzbekistan	40,3	0,041	0,5	10	0,354733	24
Mikrokreditbank	33,8	0,034	0,705882	**5**	0,499722	11
Apelsin bank	23,7	0,024	0,5	10	0,353962	25
Madad Invest Bank	23,1	0,023	0,323529	14	0,229369	30
Asaka Bank	21,7	0,022	1	**1**	0,707278	**4**

(*continued*)

Table 1. (*continued*)

Banks	Net profit of the bank during the reporting period, billion soums (Q2) 2022) [7]	The net profit index of the bank	The index of offered digital technologies by the bank	Bank rating	The index of the effectiveness of digital development of the bank	Bank rating
Tenge Bank	15,6	0,016	0,529412	9	0,374518	22
Poytaxt Bank	12,4	0,012	0,705882	**5**	0,499213	12
Iran "Soderot" bank	5,1	0,005	0,352941	13	0,249594	29
Savdogar bank	4,0	0,004	0,323529	14	0,228788	31
Ravnak-bank	−7,2	−0,007	0,647059	7	0,457569	16
Hi Tech Bank	−7,9	−0,008	0,470588	11	0,332804	27
Anorbank	−18,5	−0,019	0,941176	**2**	0,665644	**5**
Uzagroexportbank	−20,7	−0,021	0,176471	16	0,125663	33
Turkistonbank	−22,9	−0,023	0,352941	13	0,250107	28
TBC bank	−80,4	−0,081	0,5	10	0,358224	23

The correlation analysis of the indicators of digital development of the banks was also conducted by the researcher. Based on the results of the correlation analysis, there was a weak but positive correlation between the index of offered digital technologies by the bank and the net profit index of the bank ($r = 0.264$, $p > .05$). Furthermore, a high and positive correlation between the index of the effectiveness of digital development of the bank and the net profit index of the bank ($r = 0.620$, $p < .001$). Moreover, very high positive correlations ($r = 0.910$, $p < .001$) were identified between the index of the effectiveness of digital development of the bank and the index of offered digital technologies of the bank (Table 2).

The following regression model was created to predict the effectiveness of the digital development of commercial banks in Uzbekistan:

$$Eff = 0.011 + 0.313Inc + 0.664Of \tag{4}$$

Table 2. The matrix of the correlation indicators of the digital development in the commercial banks of Uzbekistan

Variables		1. The net profit index of the bank	2. The index of offered digital technologies by the bank	3. The index of the effectiveness of digital development of the bank
1. The net profit index of the bank	Pearson's r	—		
	p-value	—		
2. The index of offered digital technologies by the bank	Pearson's r	0.264	—	
	p-value	0.138	—	
3. The index of the effectiveness of digital development of the bank	Pearson's r	0.620***	0.910***	—
	p-value	<.001	<.001	—

* p < .05, ** p < .01, *** p < .001

The coefficient of determination of the regression model was high, $R^2 = 0.983$, and it signifies that 98.3% of the index of the effectiveness of digital development of the bank was explained by the independent variables of the model, that is to say, "the net profit index of the bank" and "the index of offered digital technologies by the bank". The correlation between the independent variables and the dependent variable was very high and positive, that is $R = 0.992$. The adjusted R^2 was 0.982, which indicated the high reliability of the linear regression model. The coefficients of the general linear model were statistically significant ($p < .001$) and have the following economic meaning: an increase in the index of offered digital technologies by the bank (Of) by 1 percentage point affects the index of the effectiveness of digital development (Eff) by 0.664 percentage point; also, an increase in the net profit index of the bank (Inc) by 1 percentage point allows the index of the effectiveness of digital development (Eff) to increase by 0.313 percentage point.

The results of the obtained regression analysis verify the high importance of digital technologies in ensuring the competitiveness of banks.

Based on the results of the assessment of the use of digital technologies in the commercial banks of Uzbekistan, the level of development of digital technologies in the commercial banks of Uzbekistan was developed (Fig. 1).

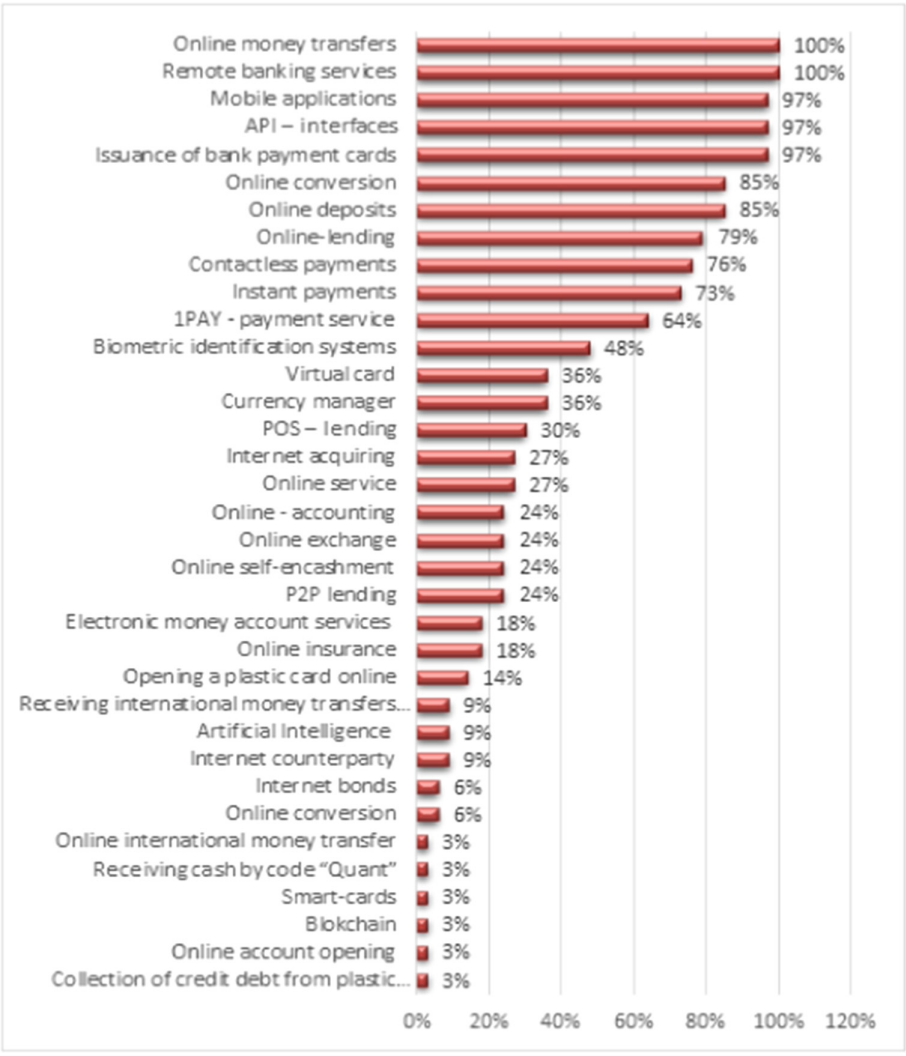

Fig. 1. The level of development of digital technologies in the commercial banks of Uzbekistan

Based on the results of Fig. 1, the level of development of innovative digital technologies in commercial banks in Uzbekistan was also created. In line with, the level of development, the following digital technologies were used less frequently than other innovative digital technologies that were highlighted in the survey list: blockchain, smart cards, receiving cash by code "Quant", online-international money transfer, receiving

international money transfers through a mobile application, using artificial intelligence and electronic money account services (Fig. 2).

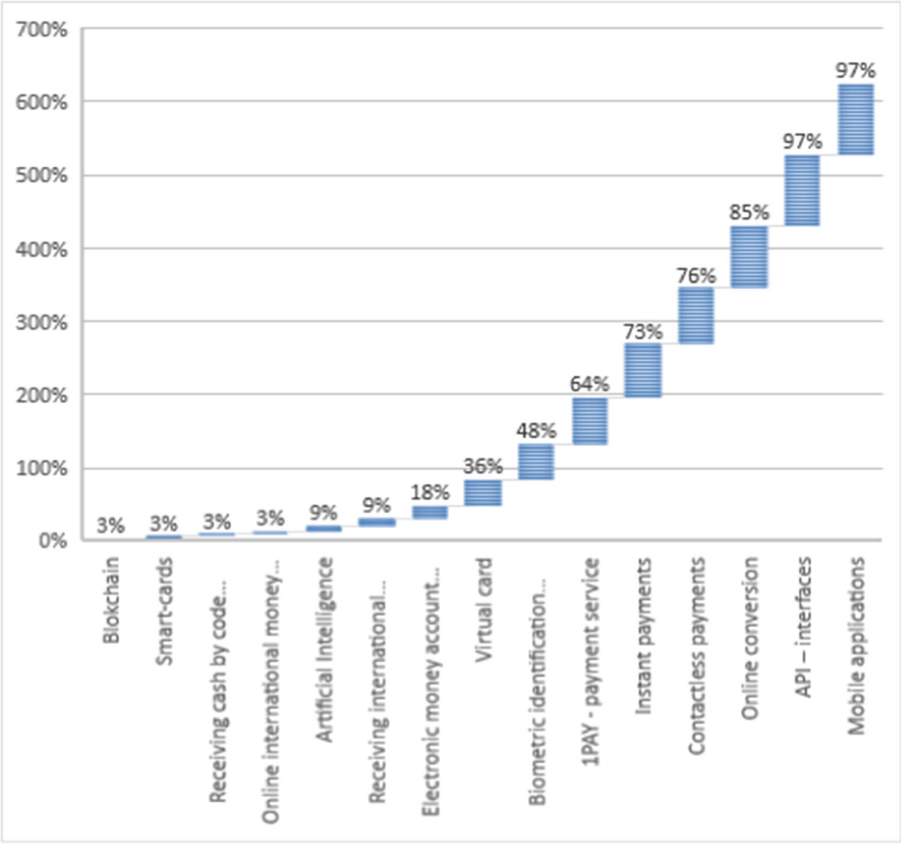

Fig. 2. The level of development of innovative digital technologies in commercial banks in Uzbekistan

Based on the indicators of digital development in commercial banks of Uzbekistan (Table 1), the classification of groups on the digital technology offerings of the commercial banks in Uzbekistan was formed. In this classification, "Uzsanoatkurilishbank" JSC, "Asakabank" JSC, "Anor bank" JSC, "Agrobank" JSC, "Kishloqkurilishbank" JSC took position in the group of "Very strong" banks (Table 3).

Along with the digital development indicators for commercial banks in Uzbekistan, the classification of the groups on the effectiveness of the digital development of the commercial banks in Uzbekistan was developed. In this classification, "Uzmilliybank" JSC was included in the group of "Very strong" banks and "Uzsanoatqurilishbank" JSC, "Ipoteka-bank" JSCMB, "Asakabank" JSC, "Anar bank" JSC, and "Kishloqkurilishbank" JSC took position in the group of "Strong" banks (Table 4).

Table 3. The classification of groups on the digital technology offerings of the commercial banks in Uzbekistan

Very strong 0.8–1.0
Uzsanoatqurilishbank, Asakabank, Anor Bank, Agrobank, Kishloqkurilishbank
Strong 0.6–0.79
Ipoteka-Bank, Xalq bank, Uzmilliybank, Aloqabank, Turonbank, Microcreditbank, Poytaxt bank, Bank "Orient Finans", Bank Ipak Yuli, Ravnaq-bank
Medium 0.4–0.59
Universal Bank, Asia Alliance Bank, Davr Bank, InFinbank, Tenge Bank, Kapitalbank, Ziraat Bank Uzbekistan, Bank Apelsin, TBC Bank, Hi Tech Bank, Hamkorbank
Week 0.2–0.39
Trastbank, Bank "Saderat" Tashkent, Bank Turkistan, Madad Invest Bank, Garant bank (Savdogar bank), KDB Bank Uzbekistan
Very week 0–0.19
Uzagroexportbank

Table 4. The classification of groups on the effectiveness of the digital development of the commercial banks in Uzbekistan

Very strong 0.8–1.0
Uzmilliybank
Strong 0.6–0.79
Uzsanoatqurilishbank, Ipoteka-Bank, Asakabank, Anor Bank, Kishloqkurilishbank
Medium 0.4–0.59
Agrobank, Xalq bank, Aloqabank, Turonbank, Microcreditbank, Poytaxt bank, Bank "Orient Finans", Kapitalbank, Bank Ipak Yuli, Ravnaq-bank
Week 0.2–0.39
Universal Bank, Asia Alliance Bank, Hamkorbank Davr Bank, InFinbank, Tenge Bank, TBC Bank, Ziraat Bank Uzbekistan, Bank Apelsin, Trastbank, Hi Tech Bank, Bank Turkistan, Bank "Saderat" Tashkent, Madad Invest Bank, Garant bank (Savdogar bank), KDB Bank Uzbekistan
Very week 0–0.19
Uzagroexportbank

4 Discussion and Conclusion

The findings of this study are that the high-ranking banks were identified based on the assessment of the effectiveness of the digital technologies in commercial banks of Uzbekistan. This assessment depends to the indicators of offerings of the digital technologies by the banks and at the same time the indicators of the net profit of the

banks. The banks that are effectively developing digitally have been identified in line with these indicators. In compliance with the assessment results, "Uzmilliybank" JSC, "Uzsanoatkurilishbank" JSC, "Ipoteka-bank" JSCMB, "Asakabank" JSC, and "Anor Bank" JSCS ranked in the high position on the list of digitally developing banks.

With regard to using the digital technologies that are offered by the banks to their customers, the most commonly used digital technologies were: remote banking services—100%; issuance of bank payment cards—97%; online money transfers—100%; online deposit—85%; API interface—97%; online conversion—85%; and mobile applications—97%.

In order to improve the effectiveness of the digital development of banks in Uzbekistan, we suggest using "benchmarking" processes in practice. "Benchmarking" is the process of measuring one's company's performance against the best in one or another industry [8]. The most basic concept of benchmarking is learning from others [9, 10]. In the process of benchmarking, an organization studies the knowledge and experience of another organization, assesses the performance, determines the strengths and weaknesses, and chooses the right strategy to improve the results [11]. The purpose of the benchmarking process is to improve the effectiveness of the organization in response to customer requirements. According to the results of Table 1, Uzmilliybank JSC, Uzsanoatqurilishbank JSC and Ipoteka-bank JSCMB were suitable partners for benchmarking processes in increasing the effectiveness of digital development in the banking sector of Uzbekistan.

The strategy for the effective development of the offerings of digital technologies in commercial banks of Uzbekistan was suggested for the banks that they ranked "very weak" and "weak" positions on the list of the offerings of digital technologies by the banks:

- to change traditional business models to digital business models;
- creation of a clear strategy based on three main components: the customer, new information technologies, and quality service, taking into account the directions of innovation, process, and product development in the creation of business models;
- to involve bank customers in the process of creating of the strategy for the effective development of the offerings of digital technologies in the bank;
- formation of mutually beneficial relations with the Central bank, commercial banks, Fintech and IT companies;
- to outsource of innovations;
- to train qualified human resources with new skills in digital technologies, in human resources management, and in understanding customer needs;
- to change business culture along with the development of human resources;
- to expand cooperation with higher education institutions and online platforms in the continuous improvement of staff qualifications;
- introduction of digital technologies as a separate project;
- recognition of digital technologies as the predominant value of the bank;
- to create an ecosystem based on digital channels;
- to create innovative digital products designed to meet the financial needs of customers within 24 h;

- creation of a separate organizational structure in the development of innovative technologies;
- to establish a Committee within the Bank Council for the purpose of monitoring and promoting digital transformation processes;
- to attract qualified specialists from leading foreign financial institutions to leadership positions;
- reorganization of the management bank and strategy to meet the requirements of the new business model;
- to use of social networks widely as a marketing tool for the extensive introduction of effective banking services;
- to introduce of convenient digital technologies based on the needs of customers;
- to expand and develop the functional capabilities of remote banking services;
- to study and in-depth analysis of the financing of programs and projects down to the lower layers;
- to study the demand of population for digital products and services and make appropriate changes to the strategy of the bank;
- integration of bank data with the database of relevant state organizations and their effective use;
- modernization of the infrastructure of the bank continuously;
- to adapt of the organizational culture in the bank for the speed of digital changes;
- improvement of the marketing system in order to increase the interest and confidence of customers in banking services;
- to improve the quality of digital banking services and products, introducing convenient online and automatic payment services and products for customers;
- to diagnose information and communication technologies in the banking system and adapt them to modern requirements;
- development of a roadmap for the introduction of digital services and products;
- creation of new digital products and services in accordance with regional and marketing strategies for further development in market conditions;
- to establish and develop cooperation relations with professional organizations on the introduction of innovative IT technologies;
- to introduce and improve the system of remote identification of users;
- to constantly assess the effectiveness of the introduction of digital technologies.

References

1. Goyipnazarov, S., Fayzieva, M.K.: The assessment of the strategic roles of human resources professionals in the banking sector in Uzbekistan. Архив научных исследований 2(1), (2022). http://journal.tsue.uz/index.php/archive/article/view/763
2. Fayzieva, M.: The role of human capital in ensuring the participation of women scientists in science. Конференции (2021)
3. Шумский, Д.С.: Оценка развития цифровых технологий в банках Республики Беларус ь. Научные труды Белорусского государственного экономического университета, Вы п. 14, Министерство образования Республики Беларусь, Белорусский государственны й экономический университет 501–509 (2021)

4. Забродская, КА.: Инфокоммуникационные технологии как фактор обеспечения инновационной конкурентоспособности банков на рынке безналичных расчетов. Вестник Белорусского государственного экономического университета **4**, 28–37 (2016)
5. Хроменкова, М.С.: Методика оценки использования инновационных технологий банками на рынке безналичных платежей Республики Беларусь. Вестник Белорусского государственного экономического университета **3**(134), 99–108 (2019)
6. Забродская, К.А.: Методологические подходы к оценке уровня развития инфокоммуникационных технологий и услуг, Веснік сувязі111(1), 25–29 (2012)
7. Тижорат банклари 2022 йилнинг 1-ярим йиллигида қанча соф фойда олгани маълум бўлди. https://bankers.uz/news/net-profit-i-half-2022
8. William, S.: Productions/Operations Management, 5th edn. Irwin Publishing Company, Burr Ridge (1996)
9. Khalilov, M.Sh., Samadov, S.I., Musayev, O.Sh., Eshkuziev, O.O., Mirzaliev, S.M., Turayev, N.M.: Social functions of entrepreneurship in Uzbekistan. In: The 5th International Conference on Future Networks and Distributed Systems, pp. 685–687 (2021)
10. Eshbayev, O.A., Mirzaliev, S.M., Rozikov, R.U., Kuzikulova, D.M., Shakirova, G.A.: NLP and ML based approach of increasing the efficiency of environmental management operations and engineering practices. In: IOP Conference Series: Earth and Environmental Science, vol. 1045, No. 1, p. 012058, IOP Publishing (2022)
11. Avezimbetovich Sharipov, K., Alisherovna Abdurashidova, N.: Benchmarking strategy for industrial enterprise development. In: The 5th International Conference on Future Networks and Distributed Systems, pp. 318–322 (2021)