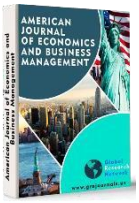

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Article

The Role of Digital Technologies and Human Capital in Improving Bank Efficiency

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Abstract: This paper discusses the effect of digital technologies and human capital towards the improvement of bank efficiency while under the conditions of digital transformation. It examines the effects of digitalization on banks based operational processes and relates digital technologies to the quality of human capital and banks performance. After comparing traditional and digital banks, the study found that only an integrated development of technologies and human capital will guarantee a persistent effect on the efficiency of the banking sector.

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1. Introduction

In the context of the digital transformation of the economy, the banking sector is undergoing significant structural and technological changes. The active implementation of digital technologies—such as remote banking, big data, artificial intelligence, and business process automation—is becoming an important factor in increasing banks' operational efficiency, improving the quality of financial services, and strengthening their competitive position in the financial market.

However, the level of development of human capital largely determines the success of the implementation of digital technology in banks. Human resources / personnel with digital qualifications and with the ability to continuously learn and adapt to technological developments are becoming leading prerequisites for the successful digitalization of banking. These days, human capital is not only a resource providing for digital solutions but also a strategic lever in building lasting competitive advantages for banks.

It is widely recognised through experience that the transformation of banks in a digital environment without the simultaneous development of human capital will hold back the full impact of the new technology.) Digital initiatives will remain underpowered and will fail to make a greater impact on banks' financial performance with inadequate digital capabilities, an aversion to change and a shortage of qualified personnel. While there has been increasing attention to the digitalization of banking industry, other aspects, such as their relationship, has not been sufficiently systematized in the economic literature, especially for developing economy. This necessitates a comprehensive analysis of the role of digital technologies and human capital as complementary factors in enhancing bank efficiency.

The purpose of this article is to examine the role of digital technologies and human capital in improving banking efficiency and to identify key areas for their coordinated development amid the digital transformation of the financial sector.

Literature Review

In his research, Thomas Philippon analyzes the impact of digital technologies on the efficiency of financial intermediation and demonstrates that the implementation of digital solutions in the banking sector contributes to cost reduction and increased productivity. The author emphasizes that the full impact of technology is realized only with the availability of qualified human capital capable of adapting to digital changes [1].

The digital transformation of banks reflects broad trends within the industry to improve efficiency and compete on better customer experience, as reflected by Stijn Claessens. Digital technologies increase the specific weight of human capital because digitalization increases the requirements for personnel qualifications and the quality of management decisions, — notes the author of the work [2].

How digitalization affects the cost efficiency of banks in developing countries by Thorsten Beck As a result, the author concludes that investments in digital technologies, without human capital development, do not guarantee the sustainable growth of banking efficiency [3].

Erik Brynjolfsson and co-authors examine the relationship between digital technologies and labor productivity, emphasizing that digital transformation requires complementary investments in human capital. This conclusion is also applicable to the banking sector, where the effectiveness of digital solutions directly depends on the level of digital competencies of personnel [4].

O.I. Lavrushina examines the digitalization processes in the banking sector and notes that improving bank efficiency is only possible with the comprehensive development of the technological base and human capital. The author emphasizes the role of personnel training and changes in the organizational culture of banks [5].

I.A. Nikonova analyzes the impact of digital technologies on banking performance indicators and concludes that developing the professional competencies of bank employees is essential as a key factor in successful digital transformation [6].

E.D. Fedorova's research demonstrates that human capital is one of the determining factors in the financial stability and efficiency of banks, especially in the context of the implementation of digital and innovative technologies [7].

S.N. Silvestrov examines the digital transformation of the financial sector in the CIS countries and emphasizes that insufficient human capital development reduces the effectiveness of digital reforms in the banking system [8].

An analysis of international studies shows that in modern scientific literature, digital technologies and human capital are viewed as complementary factors in improving bank efficiency. At the same time, most authors agree that digital transformation without corresponding human capital development does not ensure sustainable growth in banking efficiency. This fact confirms the relevance of a comprehensive analysis of the role of digital technologies and human capital in improving bank efficiency.

2. Materials and Methods

The study utilized methods of analysis and synthesis, comparative analysis, and scientific abstraction to examine the impact of digital technologies and human capital on banking performance. Induction and deduction were also employed to identify the relationship between the level of digitalization, human capital development, and bank performance indicators [9]. The use of these methods ensured the validity of the conclusions and the integrity of the study.

3. Results and Discussion

The digital transformation of the banking sector is accompanied by changes in business models, operational processes, and human capital requirements [10]. The analysis shows that the impact of digital technologies on banking performance is complex and is largely determined by the level of human capital development capable of implementing and effectively using digital solutions.

The results of an analysis of scientific research and banking sector practices indicate that the implementation of digital technologies contributes to:

- A reduction in operating costs through process automation;
- Faster processing of banking transactions and improved customer service;
- Expansion of the customer base through remote service channels;
- Increased transparency and manageability of internal processes.

These effects are reflected in key banking performance indicators such as ROA, ROE, cost-income ratio (CIR), and labor productivity. Banks with a higher level of digitalization typically experience a decrease in CIR and an increase in return on assets and equity.

They support the idea that digital technologies alone are neither an independent determinant of enhancing performance [11]. There, presence of developed human capital such as digital skills, expertise and personnel adaptability, seriously amplified their influence. The impact of digitalization suffers from a lack of training among staff, slow resistance to change and workforce who lack IT and analytics specialists.

Hence, human capital is a bridge between the investment in technology and the performance of the banks. Banks that invest in staff training, digital skills development, and organizational culture change demonstrate higher performance indicators compared to banks focused solely on technological solutions [12].

The results of the analysis allow us to consider digital technologies and human capital as complementary factors in improving banking efficiency. Table 1 presents a summary of their combined impact on key bank performance indicators.

Table 1. The Impact of Digital Technologies and Human Capital on Bank Performance.

Factor	Manifestation	Result for efficiency
Digital technologies	Automation, online services	Cost reduction, ROA growth
Human capital	Digital skills training	Increased productivity
Joint influence	Digitalization + competencies	ROE growth, CIR decline
Organizational changes	Agile approaches, data culture	Sustainable growth in efficiency

Source: compiled by the author based on an analysis of scientific sources.

The study leads to the following conclusions:

- Digital technologies are an important factor in improving bank efficiency, but their impact is limited without corresponding human capital development;
- Human capital enhances the return on digital investments, ensuring the transformation of technologies into tangible financial results;
- The greatest impact is achieved with an integrated approach combining digital transformation, human resource development, and changes in organizational processes.

Thus, the analysis confirms that improving bank efficiency in today's environment requires the coordinated development of digital technologies and human capital as key factors for the sustainable development of the banking sector.

International practice shows that digital banks (neobanks), built on digital platforms and remote service channels, demonstrate different performance parameters compared to traditional banks [13]. The main differences are manifested in cost structure, labor productivity, transaction speed, and business model scalability (Table 2).

Table 2. Comparison of the efficiency of traditional and digital banks (international practice).

Indicator	Traditional banks	Digital banks
Business model	Branch-oriented	Platform, remote
Service channels	Branches, offices, call centers	Mobile and online channels
Operating expenses	High	Low
Cost-income ratio (CIR)	55–65 %	30–45 %
Labor productivity	Average	High
Product launch speed	Low	High
Scalability	Limited	High
Use of data	Limited	Active (Big Data, AI)
Personnel requirements	Traditional banking skills	Digital and analytical competencies
Customer focus	Standard	High, personalized

Source: summary of international banking practice.

A comparative analysis shows that digital banks enjoy structural efficiency advantages, primarily due to the lack of extensive branch networks and a high degree of process automation. This allows for a significant reduction in operating costs and a lower cost index ratio (CIR) than traditional banks.

At the same time, traditional banks retain advantages in terms of scale, product diversification, and customer trust [14]. However, to remain competitive, they are forced to actively implement digital technologies and transform their business models toward hybrid (omnichannel) forms.

International experience confirms that the effectiveness of digital banks is largely determined by their fundamentally different human capital. Digital banks have a higher proportion of employees in IT, data analytics, cybersecurity, and product management. This ensures faster innovation cycles and the effective use of digital technologies.

For traditional banks, the key factor in increasing efficiency is staff retraining and transforming organizational culture, which allows them to combine the advantages of scale with the flexibility of digital solutions [15]. An international comparison shows that digital banks demonstrate higher operational efficiency than traditional banks, but sustainable results are achieved with developed human capital and effective digital process management. For traditional banks, digital transformation and investment in human capital are essential for maintaining competitiveness and improving efficiency in the long term.

4. Conclusion

The study found that digital technologies have a significant impact on improving banking efficiency by transforming operational processes, service channels, and management decision-making mechanisms. The implementation of digital solutions helps reduce operating costs, speed up banking transactions, increase productivity, and improve customer service.

However, the analysis confirms that digital technologies are not a standalone factor in sustainable growth of bank efficiency. The other part that shapes their positive

contribution is the formation of human capital, the digital skills of employees, their capacity to learn and their ability to adapt to technological change. The less meaningful impact of digitalization without proper staff training and transformation of organizational culture.

An comparative study of global practices demonstrated that by process automation and absence of a large branch network, digital banks are more operationally efficient than the traditional banking model. Concurrently, established banks hold fundamental competitive advantages, so long as they adopt hybrid development models together with digital technologies and institutional resilience, and with hard-won human capital. Hence, the transformation of banking efficiency in a digital environment should be systematic, and is based on the combined development of digital technologies and human capital. Banks should follow their investments in digital infrastructure with systematic training of their staff and enable systemic improvement in management practices too that will drive sustainable gain of efficiency and competitiveness over time.

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