Modern Artificial Intelligence Technologies as a Tool of Transformation of Value Chains of Russian Commercial Banks

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ABSTRACT

The **object** of the study is the value chain of the bank. The **purpose** of the study is to identify the possibility of applying artificial intelligence (AI) technologies in the value chain stages of commercial banks and transform value chains under the influence of these technologies. It uses both general scientific **methods** — analysis, synthesis, abstraction, induction and deduction, and graphical and statistical analysis, the methodology of value chain creation. The main approaches to the formation of the value chain in the banking industry, as well as the key characteristics of the business processes included in it, were studied. Particular attention is paid to the technological component as the basis for the development of modern digital banking. During the research, the main directions for the implementation of modern artificial intelligence technologies, both applied and generative. Analysis of the value chain showed that the creation and use of AI models is an independent supporting process, the work of which not only affects the core activities of the bank, but also requires a certain level of technology development and risk-management in the bank. Data from the AI Russia case library demonstrates the actual impact of AI models on the value chain phases of marketing and sales, customer support and communications, operational processing and risk management. Based on the **results** of the study, it was concluded that the introduction of innovations in the field of artificial intelligence increases the value of the company by increasing the efficiency of business processes. The introduction of artificial intelligence into processes requires the technological maturity of the enterprise, and its use is an independent technological process that requires the participation of auxiliary processes, for example, risk management. The results of the study are of practical importance for companies in the banking industry, since methods for analyzing the impact of AI technologies on the value chain can be used when making decisions about their implementation.

Keywords: value chain; banking industry; artificial intelligence; generative models

INTRODUCTION

The use of artificial intelligence is one of the stages in the development of the digital economy, the peculiarity of which is the use of promising technologies such as the Internet, big data, virtual and augmented reality technologies, robotics, quantum technologies and blockchain. AI is the ability of computer systems to simulate human cognitive functions, such as learning or problem solving. In our study, we will focus on modern AI technologies — generative models, including large language models (solving common problems on multimodal data), application models (solving specific problems).

The use of artificial intelligence models allows you to transform the business, significantly increase its operational and economic efficiency. Business interest in using these technologies is confirmed by a significant increase in global private investment in artificial intelligence technologies: between 2013 and 2022, investment in such technologies increased from $ 14.6 billion to $ 189 billion. The key leaders in this industry are U.S. and Chinese companies, which account for more than 80% of private investment [1]. According to the estimates of the NTI Artificial Intelligence Centre, Russia also shows positive dynamics in the development of AI: the AI market in 2022 was estimated at 647 billion rubles against less than 150 billion rubles in 2013.[1] To increase investment in AI technologies and their penetration into business processes, it is necessary to understand the benefits and benefits they bring. According to a study by Rostelecom and TAdvisors, 13% of companies in 2019 did not use AI in their activities at all. The key problem for them was the lack of understanding of possible effects and fear of unprofitability of such solutions [2].

The purpose of our study is to formulate the advantages of using modern AI technologies in the financial industry.

To achieve the goal, the following tasks must be solved:

1) identify the key stages of the value chain in the banking industry, taking into account the use of financial technologies;

2) analyze existing artificial intelligence technologies, their key features and applications in business processes;

3) identify key effects on the value chain in the banking industry with modern artificial intelligence technologies;

4) on specific examples from the banking industry to show the impact of AI models on the value chain.

The scientific novelty of the study is that a new approach to the analysis of the most cost-effective business areas in the development and implementation of artificial intelligence technologies has been proposed. The procedure for analyzing the effectiveness of AI implementation can be used by banking companies that decide on the introduction of artificial intelligence into business processes, which determines the practical significance of the research.

THE CONCEPT OF A VALUE CHAIN IN THE BANKING INDUSTRY

The value chain methodology was developed by M. Porter to determine competitive advantages of the enterprise [3]. In the scientific literature, this concept was clarified for companies in the banking sector by E. Lamarck, T. Pushmann, A. Reiner, V. Smirnov and others. The key problem of defining a value chain is to assign processes to the main or supporting function. Articles of the early 2000s, for example, E. Lamarck determines that Porter's value creation analysis scheme is applicable to banks, and marketing and sales of banking products are a key element of value creation. All other elements, such as risk management, technology and infrastructure in its work, are classified as supporting [4]. Later studies on the evolution of the banking industry determine the growing role of technology and

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[1] Almanah "Artificial Intelligence: Index 2022". MIPT, NTI Competence Centre "Artificial Intelligence". 2023. URL: https://aireport.ru/ai_index_russia-2022 (accessed on 11.10.2023).
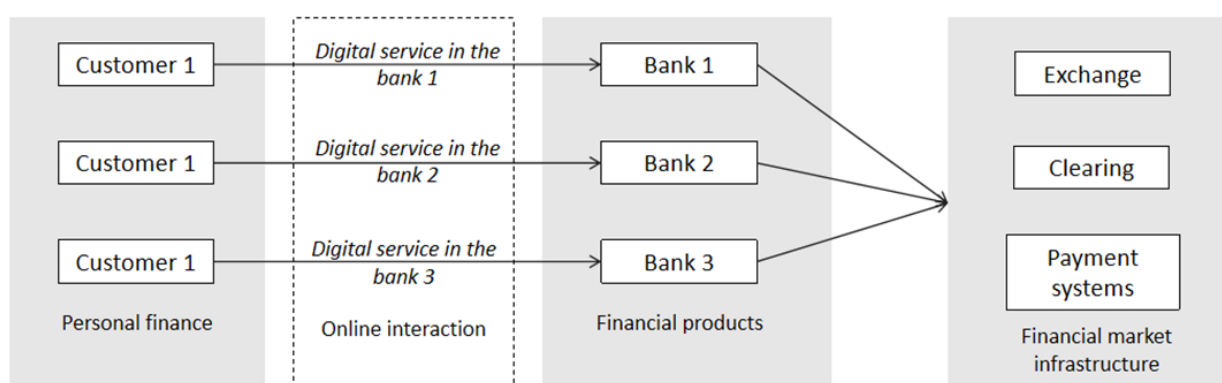
Fig. 1. **The Value Chain of Commercial Banks in the Context of Digital Transformation**
Source: Complied by the authors based on [4].

digitalization of the banking infrastructure. For Example, T. Pushmann and A. Reiner notes the change in the behavior of bank customers, defining them as "digital natives", that is, using digital technologies on a daily basis [5]. The result of this transformation was the first place of the technological component of the bank's services. It allowed banks to become a more customer-oriented business by personalizing the interface of banking services applications, expanding channels of communication with customers, customizing banking products.

Fig. 1 shows the value chain in the banking industry: a key feature here is existence of the bank's digital space, which provides online interaction. The bank itself provides financial products through this channel.

Research in the 2020s focuses on the innovative activity of banks, which allows to improve the efficiency of banking processes and introduce innovations in the bank's products and its business model. Digital transformation of the banking business is considered as a launching pad for the introduction of breakthrough technologies (disruptive technologies), such as social media, fintech, blockchain, artificial intelligence [6]. V. Smirnov highlights the technological content of banking activities in a supporting direction, noting the ambidextrality of the banking industry at the present stage of development, which means the organization of a business model that implies the

coexistence of both gradual development and innovative changes [7].

Fig. 2 presents a model of value creation in a modern bank. It includes the main activities of the bank — marketing and sales of banking products, efficiency of raising funds — funding, implementation of transactions, risk and liquidity management of the bank. All these activities are interrelated, as sales of banking products without risk management can, on the contrary, lead to a decrease in the company's value. The lack of the necessary technological base reduces the bank's ability to effectively implement the sales and risk management process, reduces sales margins. Sometimes the process and operational processes are combined in one function, as in modern banking the operational processes are implemented through working with customer data and processing them by technological systems [8].

The need for innovation in the banking industry is based on three main motives:

1) improvement of operational efficiency, which can be accompanied by a complete change in the business process or even the business model;

2) continued market growth and/or increase in profitability, especially in cases where there is high competition in the market and requires increased attention to the client and his needs;

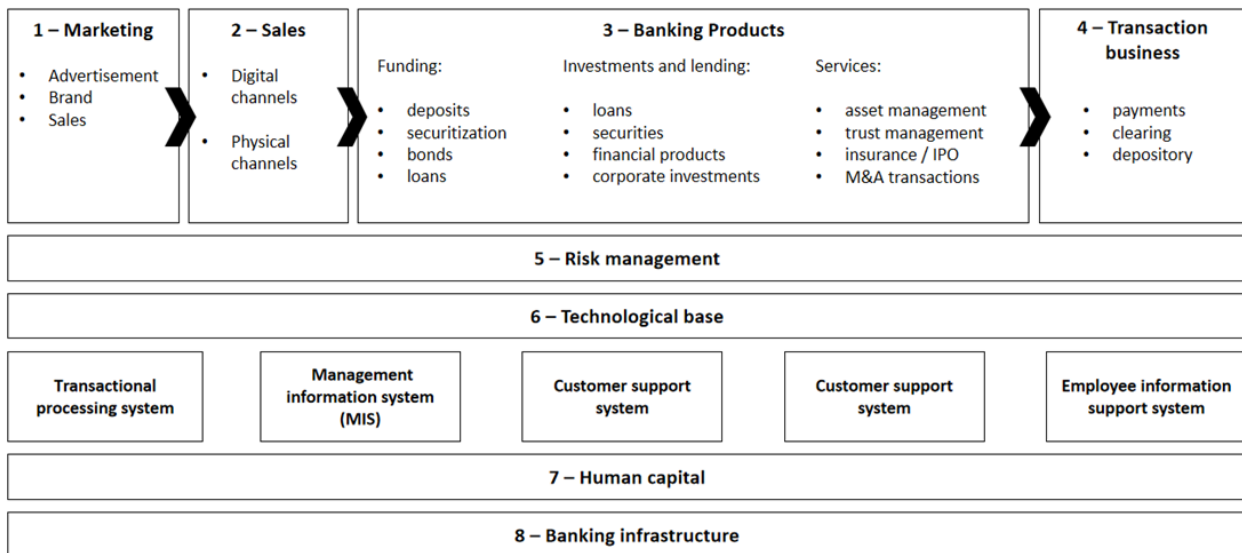3) effective risk management, including optimization of decision-making processes.

Fig. 2. **Bank Value Chain Implementing Supporting Activities**

Source: Complied by the authors based on [6].

Analysis of the value chain for the degree and nature of the impact of artificial intelligence technologies on it is carried out on the basis of changes in the above parameters. Understanding which element of the chain is affected by AI will allow you to prioritize investments and introduce them into banking processes.

ANALYSIS OF ADVANCED ARTIFICIAL INTELLIGENCE TECHNOLOGIES
Applied Models of Artificial Intelligence

This type of technology is now models that are used to solve cognitive problems based on the following technologies:

- *Machine learning.* This direction is based on the technique of learning the model on data in order to form a mathematical relationship between the predicate and the predictor, expressed in the equation and maximizing the statistical metric. The key difference is the absence of algorithms with predefined rules.
- *Computer vision.* Models of this type of technology work with the recognition or generation of data in the form of images. At the moment, the accuracy of image recognition exceeds human capabilities: the accuracy rate[2] is 99% for the latest Microsoft Cloud models against 94.9% of the correctness of human recognition [1].
- *Natural language processing.* Models of this type work with the recognition and generation of text data. Traditionally, they solve the following tasks: recognition of text and determination of logical relationships between units of text, determination of the emotional coloring of the text, machine translation of text, recognition of oral speech and digitization of it in text form.
- *Deep learning with reinforcement.* A special kind of models that works on the principle of an agent that maximizes the reward for correct actions and minimizes fines based on his own experience of interaction with the environment. Widely used in the work of industrial robots and autonomous transport.

The work of these models is already actively used by banks at almost all stages. Machine learning models are created to assess credit risks, forecast market conditions, calculate the elasticity of customer demand for banking products. Computer vision allows you to monitor the work of client managers in real

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[2] Author's note: accuracy shows the proportion of correct answers from all outcomes.

time, reducing operational risks. Natural language processing models automate document recognition processes, allow you to analyze the quality of communication with the bank's customers through speech transcription. Deep learning can be used by banks in analyzing the bank's business processes and ways to improve them. The next step in the development of deep learning models is generative artificial intelligence.

Generative Artificial Intelligence

This type of technology opens up great opportunities for application compared to application models, as it is able to work with unstructured and multimodal data — text, audio, video, images, program code, mathematical, chemical and physical formulas. Generative models can be adapted to work on all the above tasks, which makes them closer to general-purpose technologies, that is, to strong artificial intelligence [9].

The generative models are based on the following technologies:

1) *Foundation models*. Deep learning models trained on a large number of unstructured, unlabeled data, which can then be adapted to solve specific problems. For example, the modern generative model Palm2 2023 was trained for more than 3 trillion tokens (conditional data units), and 300 billion tokens were used to train the most famous GPT-3 2020 model [10]. This amount of data requires significant computing power.

2) *Modern hardware*. GPUs (graphic processing units) are used to speed up calculations. A feature of the characteristics of the models since 2016 has been the use of a huge amount of data, which significantly increases the need for computing power [11]. On the other hand, the development of generative models was made possible by increased availability and hardware performance: GPU performance increased by $ 1 between 2006 and 2021(*Fig. 3*).

3) *Integration technologies*. These are separate add-ins on top of the base model,

which are aimed at narrowly adjusting the results of the model to a specific set of data, tasks and queries. The most common example is ethical filters, specific databases, such as medical reports, which allow models to obtain specific information for additional training.

Generative artificial intelligence technology has four key areas of application — smart search, copilots, smart assistants and content generation. *Table 1* presents directions and examples of implementation.

The above examples indicate the universality of the use of generative AI in business processes in various sectors of the economy. This means that the training of the basic model should not always be the subject of investment of the company that implements it in its business processes. She can purchase a subscription to use the basic model from the developer company [13]. For example, according to this model, the business of the Open AI company, which developed the ChatGPT, GPT-3.5, GPT-4 models, was organized. In this case, the buyer company pays per unit of data — tokens and trains on internal data. This process is called "fine-tuning" [14].

The directions of using generative AI in various sectors of the economy illustrate that the function that is transformed in the value chain of a commercial bank is primarily communication with the client. Models of generative artificial intelligence, especially language models in commercial banking, can be used to hyper-personalize the process of marketing and sales of banking products. On the example of the smart assistant of Bank of America and Gigachat by Sberbank can be seen that the introduction of AI in the process of communication with the client both in the form of automation (complete replacement of human AI) and in the form of augmentation (AI as an addition to human solutions) allows the bank to automate the communication process and make it more effective. On the one hand, the skills of existing banking chatbots can be significantly improved, for
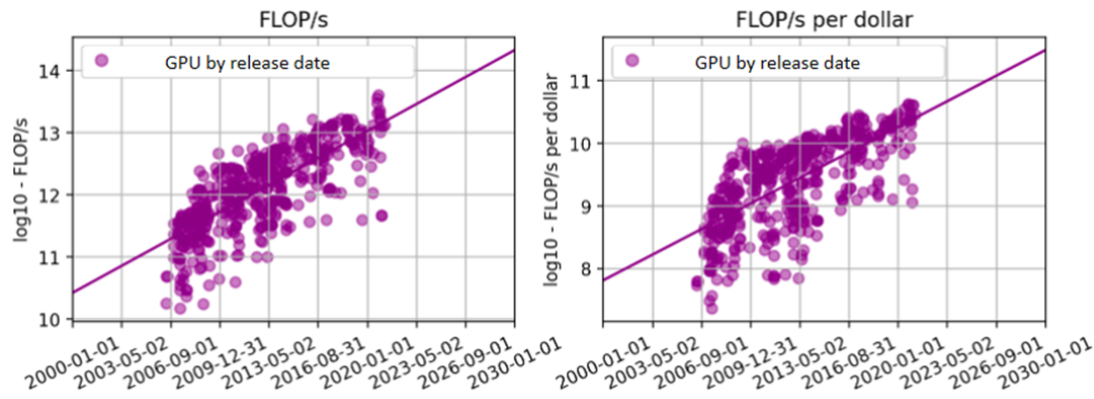
Fig. 3. **GPU Performance Between 2006 and 2021 in Terms of Out-of-System Units (FLOPs)**
Source: Complied by the authors based on [12].

Table 1

Directions for Implementing Generative Models with Examples of Application in Various Sectors of the Economy

Direction	Description	Examples of application
Smart search	Transformation of search queries: instead of a set of links — a response to a query aggregated from different sources	Bing, Google, Yandex
Copilot	A digital counterpart of an employee prompting or making a decision together with a specialist	Software development tools — GitHub Copilot, VsCode, JARVIS Copilot in medicine — NablaCopilot, CAPTIS, Sber Med AI Copilot in Fintech — Onnix, Gigachat (Sberbank), Cash Copilot
Smart assistant	Digital assistant of the company's client, allowing you to replace direct communication between the client and the employee	Smart assistant in banks — Erica в Bank of America Personalization of assistant recommendations in e-commerce — Magento 2 Amazon Personalize
Content generation and analysis	Automation of content creation and its analysis using multimodal data	Creation of advertising and product elements — Nestle, Heinz, Stitch Fix, Mattel

Source: Complied by the authors.

example, "Oleg" of Tinkoff Bank and "Salute" and "Athena" of Sberbank, and on the other hand, generative AI as a tool for summarizing customer information allows sales managers to hold meetings with customers more effectively, offering only relevant products.

ARTIFICIAL INTELLIGENCE IN THE BANK VALUE CHAIN

In terms of the stages of value creation, the AI of technologies is a separate space not only in the technological basis of the bank, but also in the process of risk management.
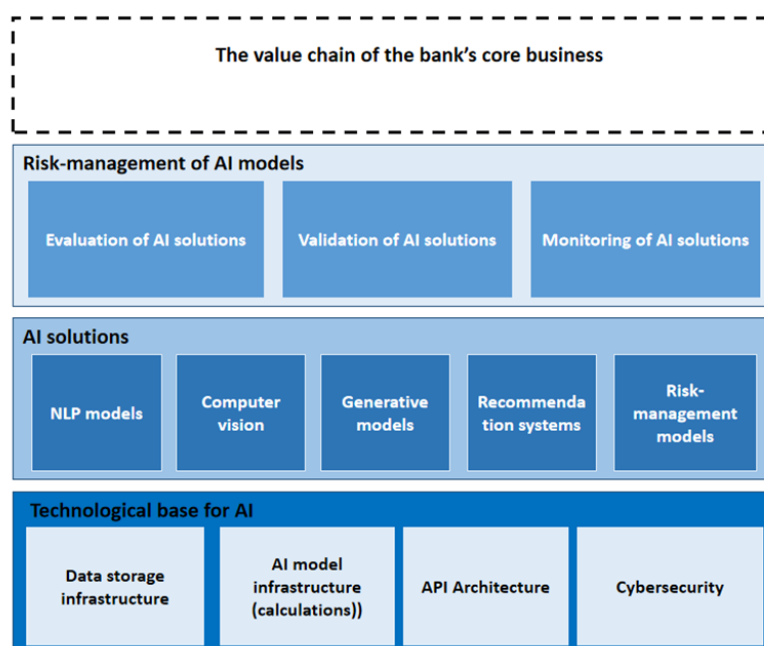
Fig. 4. **Artificial Intelligence Models in the Banking Value Chain**
Source: Complied by the authors.

To achieve the results of AI transformation, the bank needs to invest in three integrated sub-processes — the technological base for AI, the development of AI solutions and risk management of AI solutions, the result of which work together is a business process with AI in the value chain (*Fig. 4*). Each of these processes is mandatory, as the absence or weak development of one of them leads to risks for the main banking processes.

Deploying artificial intelligence capabilities in an organization requires a scalable, fault-tolerant and adaptable set of core technological components. Digitalization of the main processes and the availability of a data storage and processing system is a prerequisite for the implementation of AI solutions. Without a storage infrastructure, the calculation system for AI models does not make sense. In addition, it must be in one way or another interconnected with other analytical systems of the bank in order to access up-to-date data or, on the contrary, send the results of calculations to them [15]. This interaction is implemented using the API architecture. A separate element in this system is cybersecurity and data encryption.

The next layer is AI models and their development. They can be divided into groups by the task to be solved, or by the business processes in which they participate. Simply, they can be divided into application models and generative artificial intelligence.

Finally, all AI solutions should go through a process of assessing their effectiveness, validating them for errors, inefficiencies, discrimination and other ethical violations. After the introduction of the AI model into the business process, regular monitoring is implemented in order to neutralize the consequences of model risk [16].

Banks should have a single technology strategy, which is closely related to the business strategy and determines the strategic choice of which elements, skill sets and talents the bank will hold within the company and which — through partnerships or relationships with suppliers. In addition, the technology strategy should clearly define how each component of the AI target architecture will support the concept of the bank as an artificial intelligence-oriented company and interact with each element of

the value chain. A practical way to develop such a strategy is to assess how the bank's strategic goals (e.g. growth, profitability, customer interaction, costs) can be materially implemented using a number of artificial intelligence technologies, as well as to reconcile the goals of artificial intelligence with the strategic goals of the bank. Once such agreement is reached, bank management should conduct a comprehensive analysis of the bank's position at all levels of the AI creation process in order to identify areas that need key changes, additional investments and specialists.

ANALYSIS OF THE APPLICATION OF AI MODELS IN THE VALUE CHAIN OF A COMMERCIAL BANK

The analysis of the concept of the value chain in the banking industry showed that the technological base allows to improve processes, so it is necessary to prioritize those developments in the field of AI that will have the greatest effect. According to the analytical report of the foreign company McKinsey & Company, AI technologies can increase profits through greater personalization of offers, reduce costs due to increased automation, reduce errors. The overall effect of the introduction of AI on the value of the company in the banking industry is estimated at 15% of revenue, most of which — 60% of the effect — falls on marketing and sales. The rest of the effect falls on risk management, human capital and technological base [17]. At the same time, the effect of modern generative models is estimated at 3–5% of revenue and is more manifested in the development and maintenance of the bank's technological solutions and customer support [18].

Based on the data of the library of successful initiatives to implement AI Russia, we analyzed the examples presented there for economic effects and classified their impact on one of the four elements of the value chain — marketing and sales,

customer support, operational processing and risk management.[3] In total, 35 successful implementation cases were presented in the "Finance, Credit, Insurance" industry section, of which 7 initiatives were aimed at transforming processes in marketing and sales, 10 — at developing customer support, 11 — at operational processes, 7 — at risk management processes. The data were presented by twelve companies in the financial sector of Russia — Sberbank, VTB, Gazprombank, Alfabank, Otkritie, Pochta Bank and others. The conclusions and evaluation of economic results were based on the effects stated on the web page of each initiative. Let's consider examples of the use of AI at each stage of the value chain and assess the potential contribution to the efficiency of the bank.

1. **Marketing and sales.** The main models are aimed at personalizing communications in order to increase customer involvement and increase the likelihood of the transaction. The analysis of initiatives showed that the introduction of AI in the personalization of sales of a particular product or segment allows to increase revenue for specific products by 10–25%, and more global models aimed at several client segments and a group of products by 4%. At the same time, a number of models allow you to optimize marketing processes and affect the bank's costs.

Let's study at a few private examples.

At the end of 2021, Sberbank developed an individual communication policy (ICP) based on machine learning models. The essence of the model is that with the help of machine learning technologies, the ICP determines what product the client needs, in which communication channel it is more convenient for the client to get an offer, at what time to send communication, so that the client does not miss it, what frequency and

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[3] AI Russia — a library of effective AI-based solutions. URL: https://ai-russia.ru/ (accessed on 15.09.2023).

Economic Effects and Influence on the Type of Competition from Marketing and Sales Models

Case study AI	Economic effect	Competitive impact
Individual Communication Policy (ICP)	Revenue growth by 4% Increasing the clients lifespan due to an increase in satisfaction by 7%	Product competition
Search for an interested audience for targeting	Increase in sales conversion from 0.3% to 8% Reduction of attraction costs by 36 times	Product competition Cost competition
K7M	Sales growth	Product competition Cost competition

Source: Complied by the authors based on AI Russia — the library of effective AI solutions. URL: https://ai-russia.ru/ (accessed on 15.09.2023).

frequency of communication is most effective in interacting with the client. As a result of the implementation, the bank recorded an increase in revenue by 4%, as well as an increase in customer satisfaction on the CSI indicator[4] to 7%.[5]

Another example is the model of finding an interested audience for targeting Alfa Bank. In this model, the main task is to determine the audience for promoting a new credit card using the tools of the Second Party Data Exchange (SPDE) platform. As a result of the implementation of the model, there was an increase in conversion to a transaction from 0.3% to 8% and the cost of attraction decreased by 36 times.[6]

Combining a group of models allows you to transform the sales process altogether, making it fully automated. This sales experience was demonstrated by Sberbank: after the introduction of the K7M intellectual system "Credit in 7 minutes" it was possible to reduce the loan issuance time to 7 minutes. The essence of the model is to automate the

legal processes of document verification and assessment of the borrower's creditworthiness.

The impact on the value of the bank is presented in *Table 2.*

In addition to the financial effect of the company, AI models have an image and social effect, reducing the volume of irrelevant offers that affect the customer experience and perception of the company by the client. Thus, AI allows commercial banks to hyperpersonalize the offers of banking products.

2. **Customer support and communications.** At this stage, the model's value chain is focused on increasing customer satisfaction while maintaining or reducing support costs. Analysis of 10 cases of AI implementation showed that the average savings on customer contact processes are 30% of the total cost of the process and range from 200 to 1 billion per year. However, the financial effect does not fully reflect the essence of the economic effect of AI. In addition to reducing costs, banks increase customer satisfaction, which affects their willingness to purchase bank services. The lack of a unified methodology for assessing customer satisfaction and the calculation of the financial effect of its growth does not allow to unambiguously assess the contribution to the revenue of banks. Point estimates show that an increase in customer

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[4] Author's note: CSI (customer satisfaction index) shows the level of customer satisfaction with the bank's service or product.

[5] AI Russia — a Library of effective AI-based solutions. URL: https://ai-russia.ru/ (accessed on 15.09.2023).

[6] AI Russia — a Library of effective AI-based solutions. URL: https://ai-russia.ru/ (accessed on 15.09.2023).

Table 3

Economic Effects and Influence on the Type of Competition from Customer Support and Communications Models

Case study AI	Economic effect	Competitive impact
Advisor for small and medium-sized businesses	Increasing the client's lifespan by increasing loyalty by 8–10% Revenue growth per 1 client by 10–12%	Product competition
Intellectual customer support service VTB Business	Increasing the client's lifespan Reducing costs by reducing the volume of appeals by 33%	Product competition Cost competition
Anticipating the wishes of Sber's customers	Cost reduction by 1 billion rubles per year	Product competition Cost competition
Voice robot Oleg for communication with customers	Cost reduction by 33 million rubles per month	Cost competition

Source: Complied by the authors based on AI Russia — the library of effective AI solutions. URL: https://ai-russia.ru/ (accessed on 15.09.2023).

loyalty (NPS)[7] by 8% leads to an increase in revenue by 10%.

Let's study at a few private examples.

In 2023, PJSC Bank "Financial Corporation Otkritie" created the service "Advisor for Small and Medium-Sized Businesses" with smart recommendations, alerts and tips for the bank's customers. For example, the client will be prompted by a more favorable tariff, a quick solution to the issue, pay attention to important events at counterparties, the risk of blocking, cash gap and much more. The declared effect of the implementation is as follows: an increase in revenue per 1 client by 10–12%, a reduction in outflow by 38–43%, an increase in customer loyalty according to the NPS metric by 8–10%.[8]

The 2021 initiative in Sberbank called "Anticipating the wishes of Sberbank customers" is a predictive analytics tool to identify the bank's client's problems before contacting the support line. The model analyzes the data of the client's digital traces in real time and sends a hint through one of the communication channels on how to solve the problem facing him. The effect of the initiative is to save the costs of the contact center up to 1 billion rubles per year.

A similar service was developed by VTB Bank in 2021, it focused on the needs of medium and small businesses. Its essence was to create a self-learning search string based on NLP technologies in order to provide a relevant answer. The business effect of the initiative was to reduce the number of contact center calls by 32%.[9]

A separate area is the work of voice robots in customer support. Tinkoff Bank automated the call center using deep learning models. The robot was named Oleg. It allows the bank to save 33 million rubles per month.[10]

The impact on the value of the bank is presented in *Table 3*:

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[7] Author's note: NPS (Net Promoter Score) is an index of customer commitment to a product or company. NPS shows how ready the client is to recommend the company's services and products to his environment.
[8] AI Russia — a Library of effective AI-based solutions. URL: https://ai-russia.ru/ (accessed on 15.09.2023).

[9] AI Russia — a Library of effective AI-based solutions. URL: https://ai-russia.ru/ (accessed on 15.09.2023).
[10] AI Russia — a Library of effective AI-based solutions. URL: https://ai-russia.ru/ (accessed on 15.09.2023).

Table 4

Economic Effects and Influence Transaction of Processing Models on the Type of Competition

Case study AI	Economic effect	Competitive impact
Patriot	Cost reduction by 675 million rubles per year	Cost competition
Online settlement of failed operations at Sberbank ATMs	Cost reduction by 36 million rubles per year. Increasing the client's lifespan	Cost competition
Accelerating the processing of mortgage applications	Cost reduction by 24 million rubles per year	Cost competition

Source: Complied by the authors based on AI Russia — the library of effective AI solutions. URL: https://ai-russia.ru/ (accessed on 15.09.2023).

Table 5

Economic Effects and Influence on the Type of Competition from Risk Management Models

Case study AI	Economic effect	Competitive impact
Fraud monitoring: countering fraud	Reduction of expected losses by reducing the volume of fraudulent transactions by 7 billion rubles per year	Product competition
Anti-fraud facial recognition system	Reduction of expected losses by reducing the volume of fraudulent transactions by 2 billion rubles per year	Product competition
Model risk management	Reduction of process costs by 50%	Cost competition

Source: Complied by the authors based on AI Russia — the library of effective AI solutions. URL: https://ai-russia.ru/ (accessed on 15.09.2023).

3. **Operational processing.** Improvements in this type of banking involve the automation of processes related to the implementation or support of banking products. All analyzed initiatives using AI are aimed at reducing costs. The most common process is the automation of decision-making on loan applications, recognition of client documents. The effect of such initiatives ranges from 20 million rubles per year to 300 million rubles per year and in general can be estimated at 10–20% of the total costs of the process. A number of initiatives are also aimed at improving the operation of ATMs. Sberbank annually saves from 700 million rubles per year as a result of the introduction of AI in this process. When assessing the ATM network of Sberbank at 45 thousand devices for 2022, the savings for 1 device are about 15 million rubles per year, which can be used as a predictable effect for banks that plan to introduce AI into this process.

Let's study at a few private examples.

In 2020, Sberbank developed a decision-making system for the collection of Patriot.

The essence of his work is to predict the necessary amounts of cash in ATMs and bank offices. Initially, decisions on amounts were made on the basis of offline data manually, the model made it possible to predict the financial load of each point and more accurately form the volume of collection. The declared effect of the implementation is the savings of 649 million rubles on the remuneration fund of specialists engaged in forecasting and collection, as well as 35 million rubles of savings on the use of third-party software.[11]

Similarly, in 2021, Sberbank implemented a model of online settlement of failed operations at ATMs. In this case, the AI model conducts multiphase checks on the client's financial profile to assess the likelihood of a failed operation. As a result of the introduction, the bank saved 3 million rubles per month on the wage fund.

Another example of automation of operational processes was implemented in the online service "Domclick" of Sberbank. The image data recognition model made it possible to automate the process of transferring client data to the system for credit analysis. The effect of using this initiative is 2 million rubles per month.[12]

The impact on the value of the bank is presented in *Table 4*.

Risk management. This type of activity has quite a lot of applications, but the key are compliance with regulatory requirements, combating fraud, as well as controlling the risks of the borrower's default on loans. The analysis showed that the main financial effect of such initiatives is to reduce the operating costs and losses of the bank as a result of fraud. In the direction of combating fraud, the impact assessment is 2–7 billion rubles per year. Reducing operating costs is 25% of the cost of the risk control process.

Let's study at a few private examples.

To improve the security of real-time customer transactions, Sberbank in 2019 introduced the AI model "Fraud Monitoring: Countering Fraud", which analyzes card transactions and determine the probability that the transaction is fraudulent. The system itself is a cascade of online and offline models that produce cluster analysis, graph analysis, clustering and classification. The effect of the implementation of the initiative is to reduce the volume of fraudulent transactions by 7 billion rubles per year.[13]

In Pochta Bank JSC, the fight against fraudsters is carried out with the help of a face recognition system based on the VisionLabs biometric system. In the process of use, the model recognizes whether the client issuing the loan is a fraudster under someone else's name. As a result, the bank potentially prevented 2 billion fraudulent credit transactions.[14]

The artificial intelligence models themselves also need to be monitored, a decrease in the predictive capabilities of the model leads to a decrease in customer service. In 2019, Sberbank introduced a model risk management system, which made it possible to refine models in a timely manner, whose predictive capabilities became lower than required. The direct effect of this initiative is to reduce the cost of the model validation process by 50%.[15]

The impact on the value of the bank is presented in *Table 5*.

CONCLUSION

The methodology of value chain analysis in banking is a universal tool for assessing business competitiveness. Due to the development of technology and the change in

[11] AI Russia — a Library of effective AI-based solutions. URL: https://ai-russia.ru/ (accessed on 15.09.2023).

[12] AI Russia — a library of effective AI-based solutions. URL: https://ai-russia.ru/ (accessed on 15.09.2023).

[13] AI Russia — a Library of effective AI-based solutions. URL: https://ai-russia.ru/ (accessed on 15.09.2023).

[14] AI Russia — a Library of effective AI-based solutions. URL: https://ai-russia.ru/ (accessed on 15.09.2023).

[15] AI Russia — a Library of effective AI-based solutions. URL: https://ai-russia.ru/ (accessed on 15.09.2023).

the transformation of the business model, its main components are changing, despite the preservation of the key element of the chain — the banking product. The study demonstrated several approaches to determining the value chain in the bank, as well as the important role of the technological base and innovation. We have determined that innovation allows the bank to gain a competitive advantage at a certain stage of the value chain.

Modern technological trends in the banking industry are determined by the possibility of introducing artificial intelligence models. They can be divided into two types: applied models of artificial intelligence and generative models. The latter differ in that they can not only work with these of several modalities, but also solve several tasks without additional training. The potential of such models is still being tested by business, but already now it is possible to identify areas of use — smart search, copilots, smart assistants, content generation.

Special attention is paid to the place of the process of development, implementation and operation of AI in the value chain. We have determined that the AI model permeates several auxiliary components of the chain — the technological base, risk management and human capital.

To test the theoretical conclusions, we considered examples of practical use of modern models of artificial intelligence by Russian banks. Analysis of experience has shown that AI models really affect the efficiency of processes in each type of the bank's core business: they help to improve sales, customer support and interaction with the banking institution, reduce the costs of operational processing, and neutralize the potential risks borne by the bank as a credit institution.

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