Challenges of Bank Service Digitalization by Artificial Intelligence: The Case of Bulgaria

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***Abstract*—Nowadays discussions, research and expertise on the capabilities and capacity of artificial intelligence and its application in the financial services sector continue to spread and gain popularity, with one of the main reasons being the overall potential cost savings for banks from the application of Artificial Intelligence (AI), valued at hundreds of billions of dollars, as well as improving the user experience, reduced to the emotions and attitudes of a person to a particular product, service or system. Most banks and other financial institutions are aware of the potential benefits of implementing and using AI in the areas of security, customer service, performing specific operations related to the security of information assets, financial resources and the reputation of financial institutions. This is also the main reason for the financial sector to focus on implementing modern solutions based on the use of AI. In the context of the Bulgarian banking sector, the use of AI would contribute to improving the consumer experience through changes related to the digitalization of most of the banks' activities, through potential cost savings, as well as by ensuring a high level of quality and reliability in servicing. Customers and management of large data flows and information systems. The paper aim is to determine the challenges of the possible critical banking services that could be digitalised by AI. Recommendations for their implementation in the Bulgarian banks are proposed**

***Index Terms*—Bank services, digitalization, artificial intelligence, information technology.**

I. Introduction

Artificial Intelligence (AI) is intelligence programmed by humans to perform human activities. This is the basis computer systems for creating AI systems, which ultimately function as a separate unit under the definition of thinking machines. According to Darrell M. West's report to the Brookings Institute, these systems have three qualities: intensity, intelligence, and adaptability [1]. People design AI-based systems with the intention that they will make decisions based on previous data or data submitted in real time or in a combination of both factors. These systems contain predefined answers, systematized in algorithmic actions and sequence. AI systems often include machine learning, deep learning, and data analysis that allow intelligent decision making for this type of system. This intelligence is not human intelligence. This is the best approximation of the machine to the human intellect. The AI systems often include subcomponents of machine learning and deep learning to create advanced relational algorithms that would adequately handle the performance of certain human functions related to decision making, reactions, action dynamics, etc. [2]:

Machine learning - this is an artificial intelligence application that provides the ability to automatically learn from the environment and apply this learning to make better decisions. There are various algorithms that machine learning uses for interactive learning, description and data analysis to predict better results. These algorithms use statistical techniques to detect models and then perform actions on those models. With the advancement of information technology, machine learning today is not like machine learning of the past. The resurgence of interest in machine learning is due to things like the growing volume and variety of data available, computational processing that is cheaper and more powerful.

Deep learning - this is the next generation of machine learning. This is a subset of machine learning. Deep learning models can make their own predictions completely independent of people. Past machine learning models still need human intervention in many cases to achieve optimal results. Deep learning models use artificial neural networks, which contributes to their effectiveness. The design of this network is inspired by the biological neural network of the human brain. It analyzes data with a logical structure similar to how one would draw conclusions and assumptions. Another advantage of deep learning models is their ability to automatically retrieve functions from raw data, also called function learning. Deep learning algorithms seek to use the unfamiliar structure in the input distribution to find good ideas, often at multiple levels, with learned functions at a higher level, defined in terms of characteristics at a lower level.

AI is suitable for solving any of the following problems:

- Repetitive tasks - manual tasks that follow logical steps to bring about a specific effect;
- Tasks related to the analysis of large amounts of data, looking for models and anomalies.

The paper aim is to determine the challenges of the possible critical banking services that could be digitalised by AI. Recommendations for their implementation in the Bulgarian banks are proposed.

II. Legal Framework and Economic Aspects of the Bulgarian Banking Sector

The banking system in Bulgaria is a set of banks and institutions that perform banking activities, which represents the relationship between the Central Bank and all Commercial Banks in the country. There are three main elements in the structure of its banking system [3], [4]:

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- *Issuance (central) bank* - the main characteristic is the fact that it serves the state: keeps the gold and foreign exchange reserves of the country, keeps the accounts of the state (payments, debts, etc.), conducts monetary policy and implements the country's budget, etc.
- *Commercial banks* - companies trading in money, with the main purpose of profit. These economic entities participate in the movement of capital. Commercial banks in Bulgaria are credit institutions that carry out the movement of cash flows in the economy. Commercial banks are intermediaries that redirect free cash from one subject to another.
- *Bank-like institutes* - specialized enterprises that perform activities for attracting and managing cash and capital of individuals and legal entities and offer products in the field of markets, investment products and financial consulting in order to ensure their own liquidity. Bank-like institutions perform a limited volume from banking operations. Such are financial companies, investment companies, e-money companies, securities brokers, leasing companies, pawnshops and discount houses, etc.

The types of banks in Bulgaria are classified according to different criteria: the source for formation of the own capital - state, municipal, private, cooperative; the legal form - sole proprietorships, commercial companies and cooperatives; the form of organization - joint stock and cooperative; the nature of economic activity - industrial, commercial, agricultural, foreign trade and others; the size of the fixed capital and the attracted funds - small, medium and large; the territorial scope of their activity - national, regional, foreign and transnational; the operations they perform - specialized and universal.

The Bulgarian banking system is subject to the international regulatory framework - Basel III in the European Union through the introduction of a Regulation and a Directive on capital requirements. The Capital Requirements Regulation (Regulation 575/2013 / EU on prudential requirements for credit institutions and investment firms and amending Regulation №648 / 2012 / EU) is directly applicable to Member States, while the Capital Requirements Directive (Directive 2013/36 / EU of the European Parliament and of the Council on the activities of credit institutions and on the prudential supervision of credit institutions and investment firms, amending Directive 2002/87 / EC and repealing Directives 2006/48 / EC and 2006/49 / EC) has been transposed into national law through the Credit Institutions Act (CIA) and its implementing acts, which form the national legal framework governing access rules for credit institutions and investment firms, as well as the supervisory and prudential framework applicable to them rules. The consistent application of legally binding Union acts, the establishment of high quality common regulatory and supervisory standards and practices is also ensured through guidelines and recommendations issued by the European Banking Authority.

The supervision of each credit institution is carried out on the basis of regulatory reports and on-site inspections and covers the financial condition and management of the inherent risks in the credit and other activities. It is crucial to maintain the necessary capital adequacy, capital buffers, asset quality and liquidity.

In Bulgaria as of May 2020, there are 19 banks, licensed companies according to the legislation and 6 branches of foreign banks. At the end of March 2020 the assets of the banking system amounted to BGN 115.1 billion and increased by BGN 0.9 billion (0.8%) compared to the end of December 2019 (1 EUR = 1.95583 BGN or 1 BGN = 0.5113 EUR).

III. Definition of Challenges of Bank Service Digitalization by Artificial Intelligence

Modern conditions of exponential development of technology affect almost all areas in human live [5]. This is one of the main challenges concerning the improvement of the environment for accessibility and customer service in the banking sector [6].

The Bulgarian banking sector is dominated by foreign-owned banks and their subsidiaries in Bulgaria. This determines the connection of the technological development between the parent banks and their subdivisions, which can be a catalyst and a prerequisite for a complete change in the environment of the banking sector in Bulgaria. Still a large part of Bulgarian banks is lagging behind in some major processes of digitalization and current trends in customer service. Some of the most problematic areas in banking services concern problems with the quality of service, customer satisfaction, and high fees for some of the services offered to bank users, problems with mobile applications and online banking. As a result, banks should certainly rethink the quality of their services in several areas.

A. Mobile Applications

One of the main problems is related to mobile applications of banks. Some of the main problems for customers are often related to the difficult orientation in them, low functionality of applications, as it is not uncommon, the problem of accessibility to them, especially at times when at the system level there is a functional problem that requires professional intervention removal. Another common problem is related to the high level of fees, which consumers assess as unreasonable according to the quality of the service offered.

At the system level, problems may be related to the fact that versions of any of the mobile applications do not work optimally on newer versions of "Android" or "IOS". The reason for complaints is the lack of possibility to perform biometric identification through the applications in question.

B. Customer Service

Another problem bank sector is customer service both online and by telephone. The main criticisms are related to the slow and sometimes not competent enough customer service. It happens that the clients of the banking institutions in Bulgaria face slow and unfriendly service by the employees of the banks, which directly affects the client's opinion regarding the bank, as well as its reputation.

The lack of efficient and competent service is reflected including and in a financial nature for banking institutions. This raises the need for Bulgarian banks to improve their

service as soon as possible, as well as the demand for feedback from their customers.

C. Reliability of Security

Cybersecurity is one of the problems on which the banking sector is extremely dependent. Digital theft, electronic fraud, lack of biometric verification are a problem for both the banks themselves and their customers. This requires the integration of additional tools for performing a specific identity card, reliable verification allowing access to resources, as well as timely information to the bank's customers related to their prevention, in case of established attacks on the bank's customers or the bank's infrastructure itself.

D. High Fees

Bank customers are often dissatisfied with the high fees for certain services that banks charge. The increase in fees is one of the problems that can be compensated by savings that any bank could achieve by introducing digitalization of a large part of the real offices and services. There are still problems with recording transactions, which sometimes do not appear in real time in the systems of banks, which can be a valid motive in choosing a bank, which can lead to a significant loss of customers.

E. Inefficient Administration

Administrative processes are often rather slow, processing customer inquiries takes time, which is one of the reasons for dissatisfaction. As these processes improve, customer satisfaction can change dramatically in a positive direction. The quality of the offered services also concerns the improvement of the competence and sales skills of the financial consultants. The changed attitudes towards the banking sector affect the tendency that for the Bulgarian consumer of a banking institution, trust and the quality of service are more important than the interest rate levels.

F. Reducing Competition

As another motive, the decline in the level of competition between banks can be accepted, which inevitably leads to a reduction in the quality of services. The main motive for reducing competition is the fact that some large mergers of banks have taken place in the last two years in Bulgaria. Some mergers have also been triggered by global takeovers in international markets. One of the key elements in the development of banking will be innovation, high technology, development of digital capabilities, as well as diverse ways to maintain close contact with bank customers, the main goal of which will be to effectively understand and meet the needs of customers, banks in Bulgaria. Increased investment in digitalization would lead to sustainable development of banks, based on which the challenges posed by the events affecting the financial sector in 2020 would be overcome.

Behind the idea of digitalization in the sector is the desire to save time and effort, while at the same time, the efficiency of services is a key component. Expanding the scope of the banking sector and improving the quality of services through digitalisation will be part of the fruitful development of the sector. It is no secret that, according to analysts in the financial sector, bank fee revenues are expected to collapse by billions worldwide.

The main reason for this is the mass penetration of more and more fintech structures, which offer significantly better conditions than standard banks for their customers.

G. Online Banking

One of the main disadvantages of e-banking is related to the security and trust of customers, as there is a lack of direct access and insight into what is happening with finances. The standard practice of registering in a bank's online banking is to provide the customer with an identity document and to sign a contract at a bank branch or to complete a long online registration. Another problem with online banking is that banks often update programs that use online banking, adding new features and functionalities that are often unfamiliar to the user and can lead to a lack of orientation.

H. Minimize Operating Costs

Although financial institutions already use the latest technology to make their work safer and simpler, employees still have to deal with a number of tasks on a daily basis, including manual document processing, preparing specific reports, etc. [7]. Such time-consuming and repetitive tasks can lead to increased operating costs and harm the overall productivity of employees, while increasing the possibility of errors in the work phase.

I. Improving the Level of Customer Service

Customer satisfaction directly affects the work of any organization, including in the banking sector. One of the main problems that consumers face is that financial institutions are not functionally available when customers need them most. Hence, financial institutions need to focus on providing the right and necessary services to customers when they need them most. AI chatbots and voice assistants must be included in the implementation of this continuous service [8].

Regardless of time zone or location, users can use chatbots for any task that does not require human interaction, such as learning about the services provided by the bank, solving problems and seeking answers to any questions that customers may have regarding of the bank. AI chatbots are constantly accumulating information about the bank's customers, monitoring and analyzing their previous interactions and the history of inquiries and use of services to provide them with a specific personalized user experience. When applied correctly, AI can support credit decision systems, complementing them and helping them to be more accurate and reliable.

J. AI as a Tool for Detecting Fraud and Abuse in the Banking Sector

Banks could benefit from a fraud detection solution based on machine learning [9]. This means the model can be trained to detect fraud in terms of transactions, methods of operating applications, and more. AI fraud detection and prevention solutions based on anomaly detection are more common than those based on predictions and analyses. This type of application requires a machine-based model that is trained through a continuous stream of input data.

The model is trained to have a basic sense of normalcy for

the content of bank transactions, loan applications or information to open a new account.

The software can then notify any deviations from the normal model so that employees can review and analyze specific cases. This could contribute to the reduction of errors in the operating process with a significant increase in the detection of real fraud and directing resources and time to real cases of fraud.

K. Risk Management through the Use of AI

The risk management plan in the banking sector contains a broad set of tools and directions [10]. Risk in banking is initially one of the big problems. It includes the sub-areas of risk management, risk behavior, stress tests of banks and more. In cases of financial crime, AI can improve results by specifically integrating data and algorithms to track and analyze actions. To reduce the overall number of frauds, AI can evaluate a customer transaction and compare it with stored transactions performed by the same customer, based on which analysis to find fluctuation or objective exception. From biometric data analysis to the development of specific cognitive capabilities, AI can perform detailed analyzes, make timely decisions and work in collaboration with the human factor to reduce the levels of risk that accompany the work of any financial institution.

L. Threats to Artificial Intelligence Use in Banking

One of the main threats to the sector is the widespread loss of jobs. People believe that the adoption of artificial intelligence will lead to the loss of many jobs, the disappearance of entire departments and the permanent deletion of some activities in the implementation of which are currently engaged hundreds of thousands of people around the world. This is an example of how by taking on simple human tasks and AI can lead to a shift in jobs in the banking sector as a whole. To combat this, the labor market will have to evolve. Instead of being replaced, people will have to work with AI. Another motive for AI experts is whether we will lose control of the technology. Experts ask themselves, will AI become so intelligent that people can no longer control it? In the conditions of performing standard banking operations, arbitrary action outside the context of the given powers could cause huge financial and reputational damage to a bank. With regard to the administration of personal data by banks, a possible failure of the systems in an autonomous decision would make the work of any financial institution immense, until such solutions are found. Moreover, although presented as possible scenarios and many others like them, they remain in the field of view of experts in the sector as possible and acceptable.

An element of concern at this level of development is the possibility of AI errors. It is standard practice for some of the major banks in China, for example, for AI-based systems to perform a process of reviewing and analyzing consumer loan applications. Here, however, the question arises what will happen if the computer errs in the method of calculation, judgment or decision? Or if the technology is compromised by the presence of a virus in the systems? This would have devastating consequences for an organization. By themselves, the threats could be broad-spectrum, following the processes of action and work of AI and aimed at destabilizing its activity. The possibilities for the development of AI are practically endless and this makes the experts in the field not stop working on its improvement and reach new stages of functionality. Some of the public concerns, however, directly affect the future of jobs and even humanity. However, AI should not be seen as something negative, on the contrary. It is a tool with which modern man can optimize many routine processes and activities to harness his consciousness and thought more meaningful and responsible endeavors.

In the banking sector, technologies are increasingly being imposed and digitalization of activities in the process of work related to the use of AI is being carried out [11], [12]. The future of Bulgaria banks will be strongly influenced by emerging applications and capabilities based on the use of AI, which will create the basis for increasing competition [13]. There are many reasons for the increased perception of AI in the Bulgarian banking sector.

They include: The huge competition in the banking sector; Optimization of services, process management; Introduction of self-service in banks; Search from customers to provide more personalized solutions; Creating operational efficiency; Increasing employee productivity; To focus on profitability and compliance; Vision to increase human work through the use of software robotics; To reduce fraud and security risks; Manage huge amounts of data at record speeds and retrieve valuable data.

IV. Conclusion

The application of AI in the banking industry eliminates the error-prone human processes. Machine learning, automation tools, AI handwriting and voice recognition assistants can optimize and simplify many aspects of the standard duties and responsibilities of banking employees [14], [15]. These tools can collect, classify and enter information about customers directly from their contracts and forms, access information from the bank's systems, as well as make specific inquiries according to pre-set criteria. AI is also improving the way banks perform regulatory control. This is a great opportunity for the Bulgarian banks to move repetitive and routine tasks to AI technology, while investing more energy and effort in creative, high-value tasks such as providing a higher level of service, creating innovative personalized services or finding new methods to improve customer satisfaction. AI provides better compliance with regulators and regulatory requirements. However, the strengths and weakness of AI should be mentioned when applying to the Bulgarian bank services:

AI strengths - one of the main challenges is the significant improvement in workplace productivity. Instead of spending hours of manpower on repetitive tasks, employees can configure AI to manage a number of activities that also require the analysis of vast amounts of data, something standard for the banking industry. Although the sector has long used information technology and digital services in the process of work, AI allows you to manage multiple tasks at times more efficiently than before. This would benefit all large financial institutions. With AI use for managing day-to-day tasks banks could save substantial labor costs,

which is currently identified as one of the major cost items for any bank. Through digitalization using AI, the levels of operating costs and even fees for non-compliance and errors, which are an integral factor of human activity in the work process, are reduced. AI technology could optimize customer service processes and increase customer satisfaction. AI provides real-time access to all information resources with up-to-date information, which in its essence would contribute to better customer service and experience. Another factor to be optimized would be routine tasks, such as analyzing reports, reports, graphs and other information, listing, compiling tables and specialized reports, examining data fluctuations and anomalies or changes in performance.

AI weaknesses – One of the main weaknesses of the technology is the fact that AI is limited. This is a tool, but not necessarily a solution. AI can communicate and perform repetitive actions, but it cannot communicate emotionally. For this reason, the problem arises about the nature of information analysis in a number of activities. Although it can use information, AI will not be able to grasp or respond to the complexity of human emotion. It is here that the difference between man and machine comes to the fore. In the field of banking, customer service and analysis of information concerning purely human judgment and response, AI would not cope with the same adequacy and precision as the human factor, which determines the specifics of automation of processes and activities and proves that, although extremely useful in many respects, AI cannot completely replace the human factor in finance and banking. The developers who underlie the development of AI technology are constantly working on its development, trying to redefine its limits of operation and capabilities. Currently, AI is able to perform a task, learn and store information, perform specific data analysis. However, perhaps in the future we will be able to improve and redesign technology, as it will no longer be so dependent on the operational intervention of human activity. It is this potential reality that makes people worry about the development of the autonomy of technology and reaching a point where it will make its own decisions without being coordinated with man.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Both authors have an equal contribution to this work. Both authors had approved the final version.

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