“Prospects of business process management based on chatbots”

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PROSPECTS OF BUSINESS PROCESS MANAGEMENT BASED ON CHATBOTS

Abstract

The relevance of the study is due to the growing need to use chatbots to optimize business processes. The purpose is to form a theoretical basis and practical tools for increasing the efficiency of using chatbots in business processes. The theoretical basis involves substantiating the theoretical foundations of forming a conditional chatbot profile for an optimization system. The practical toolkit includes chatbot components that depend on the complexity of tasks, the type of services, the specifics of customers, financial conditions, and other features of business processes. The result is the formation of a system profile of the chatbot, which would allow increasing the efficiency of its use in business processes. The key system components of the chatbot are substantiated: the technologies used, types of users, optimal areas of application, application algorithms, basic tools, and limitations in application. By varying the parameters of system components, one can choose their optimal values to increase the efficiency of using chatbots in business processes. It is advisable to use the specified system in business processes when determining the demand for products and their sales. The use of chatbots allows to reduce the time to complete business processes, personnel costs, and resources related to their implementation.

Keywords communication, artificial intelligence, learning, personalization, automation, imitation

JEL Classification D83, L63, M21

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INTRODUCTION

In recent years, artificial intelligence (AI) has become an important component of business development strategies, bringing innovation and increased efficiency to various sectors of the economy. Artificial intelligence is changing traditional approaches to management, marketing, customer service, and organization of various business areas.

It serves as a source of innovation, helping companies create new products and services that meet market needs. Artificial intelligence can effectively process and analyze large volumes of data. Transparent analytics helps to improve the quality of work and increase profitability, improves business processes, and improves the company's reputation. Automation of tasks, thanks to artificial intelligence, frees up working time for employees. This, according to Bill Gates, will not take away people's work but will "change it forever," increasing its creative component (Hart, 2023).

Artificial intelligence can detect potential risks and threats, helping companies make strategic decisions to prevent them.

The concept of artificial intelligence takes on new dimensions. Chatbots working on these technologies make it possible to develop this aspect, moving from the role of automated assistants to the deter-

mining factor of intelligent interaction with users, which allows companies to provide customers with quick and individual answers to questions, create personalized offers, thereby increasing variability and improving marketing strategies. This affects the profitability, reputation, and competitiveness of companies that use chatbots.

The business process is considered a set of interrelated actions that create a product (product or service). Business processes can be classified into three types: managerial, operational (logistics, marketing, selling, and payments), and supporting (accounting, personnel selection, and technical support). The business process begins with determining the consumer's demand and needs and ends with the sale of the product. It is advisable to use chatbots in business processes as one of the resources at the operational stage (marketing, selling, and payments). In addition, chatbots can be used at the supporting stage, particularly when recruiting personnel. The use of chatbots in business processes allows one to reduce the costs of personnel, time, and resources and increase the volume of product sales and customer satisfaction. All this together increases the efficiency of business processes and improves innovation performance (Vaitiekuniene et al., 2024).

The purpose of the study is to form a system profile of the components of a conditional chatbot and propose mechanisms for optimizing their parameters depending on the conditions of the business process in which the chatbot should be used.

1. THEORETICAL BASIS

The prerequisites for the practical use of chatbots in business processes were laid in theoretical works in which the concept of using artificial intelligence in machines was formulated (Turing, 2009), and the issues of its use for various types of practical tasks, including chatbots, were investigated (Weizenbaum, 2021; Jeevanandam, 2022).

Thrun et al. (2000) studied the functions of chatbots related to the maintenance of robotics built on probabilistic principles. Bengio et al. (2023) analyzed the risk factors of the use of chatbots in various fields of activity. Fuscaldo (2023), Christison (2022), and Lembicz (2023) analyzed the features of using chatbots in various areas of business. Patel (2023) and Shweta and Main (2022) examined the effects that users have from using chatbots.

All these topics together indicate a comprehensive approach to chatbot research, combining technical, social and intellectual aspects in their study and improvement. Keyword analysis demonstrates a wide range of research related to chatbots, their development and application in a number of areas. This confirms the importance of chatbots in today's world.

Artificial intelligence is becoming a defining element of technological progress, and chatbots are particularly meaningful within this space. Usually, chatbots are considered a means of automating the process of communication between a person and a computer. However, their role is much broader. The ability of chatbots to recognize and understand natural language and adapt to it is becoming an important tool for developing artificial intelligence. Chatbot is a computer program that imitates a person's cognitive abilities and implements communication with the user in written or voice format. The main purpose of a chatbot is to answer questions, perform specific tasks, or provide information without the direct intervention of a human operator in this process. In fact, the chatbot program performs the functions of a virtual interlocutor.

Depending on the principle of operation, two types of chatbots are distinguished: capable of self-learning (predictive) and incapable of self-learning (declarative) chatbots.

Declarative chatbots work according to a predefined scenario. Such chatbots are task-oriented and can answer standard questions, for example, about working hours, or perform simple operations involving a few variables. Formally, declarative chatbots support dialogue with the user using NLP (Natural Language Processing) principles. However, their capabilities are quite limited. Since there are currently a significant number of simple

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tasks where the capabilities of declarative chatbots are sufficient, they have become widely used.

Predictive chatbots have a much greater ability to adapt to the characteristics of the user and the task they have to perform. They can take into account the context of the language. Their flexibility and adaptability are achieved by applying the basics of artificial intelligence (AI). In addition to the already mentioned principles of NLP, two more elements of AI are used, namely the principles of natural language understanding (NLU) and machine learning (ML).

In modern business, chatbots have become critical for interaction with customers and optimization of business processes. They are used in various fields, including customer service, marketing, sales, internal communication, and many more. Their importance lies in automating and facilitating interaction with users, which leads to improved service and efficiency of various business processes and provides a wide range of opportunities.

The implementation of chatbots in business processes has undergone significant development thanks to the successful steps of the world's leading companies. The analysis of the results using chatbots by the world's leading companies allowed this study to systematize the evolutionary results in Table 1. The accumulated potential creates a significant basis for developing the processes of using chatbots and artificial intelligence in various business areas.

This dynamic opens up new opportunities for increasing the efficiency of communication processes, automating routine tasks, and improving customer service. Leading companies show that chatbots can become not only an effective tool for interaction with customers but also a significant factor in increasing productivity and competitiveness in today's business environment. Also, chatbots and similar disruptive technologies could be used to increase the economic and technological efficiency of renewable energy technologies implementation (Wang et al., 2023).

Thanks to chatbots, companies can interact with a large number of customers individually. Using chatbots, companies can offer personalized services to an almost unlimited range of customers. This number depends only on demand and business needs. Often, chatbots can provide a level of

Table 1. Evolutionary milestones for the use of chatbots

Initiator (developer)	Achievements in the field of chatbots
IBM Corporation (USA) (Brown, 2020)	Building chatbots for AIOps that are used in the real world. It also provides training to improve own chatbot. IBM Watson users achieved a 337% ROI (Return on Investment – measures the effectiveness of investments) within three years.
Google (USA) (Google Cloud, n.d.)	Forming a platform for creating chatbots called Dialogflow. Dialogflow is a tool that allows developers to create chatbots using artificial intelligence. It provides speech recognition, text analysis, and integration with various platforms, such as Facebook Messenger, Slack, Twitter, and others.
Microsoft (USA) (Patrizio & Bigelow, 2023)	Integrating GPT-4 and ChatGPT functionality with Word, Excel, Teams, PowerPoint, Outlook, Power Platform, Viva and other applications to enable users to collect data to create everything from marketing campaigns and business proposals to presentations.
AWS (USA) (AWS, n.d.)	An Amazon CloudWatch monitoring application that collects raw data and transforms it into readable metrics in near real-time. These statistical data are stored for 15 months, which allows access to historical information and a better understanding of how the web application or service is implemented.
Oracle (USA) (Oracle, n.d.a; Fink, 2021)	Using Digital Assistant to create conversational interfaces or chatbots. ECHO uses Oracle Digital Assistant to answer customer questions. They reached 83% of calls or questions that were solved by the automatic system, which indicates the high efficiency and independence of this tool. This led to an increase in the company's chat volume processed, from 500 per month to over 3,000 per month.
Acuvate (India) (Acuvate, n.d.)	Using the Acuvate chatbot, Unilever's Baby Dove delivered hyper-personalized recommendations for moms, and using the chatbot for marketing resulted in an 85% reduction in average customer acquisition costs. The company emphasizes the integration of chatbots into customer systems, which increases their functionality and availability.
Aivo (Argentina) (Aivo, n.d.)	Implementing a new organization focused on modern customer services and sales processes. Thanks to this, Aivo improved the quality of customer service. Aivo has processed more than 120 million conversations in English, Spanish, and Portuguese. Aivo's clients include Sony, AIG, Visa, GM, LG, Movistar, América Movil and others.
OpenAI (USA) (OpenAI, 2018)	Implementing AI models: AlphaGo Zero, which beat the best professional Go players within 24 hours; GPT-2, which can generate realistic natural language text; OpenAI Five, which defeated the reigning Dota 2 world champions; the latest OpenAI SafetyNet, an AI safety system designed to safely navigate autonomous vehicles in their environment.

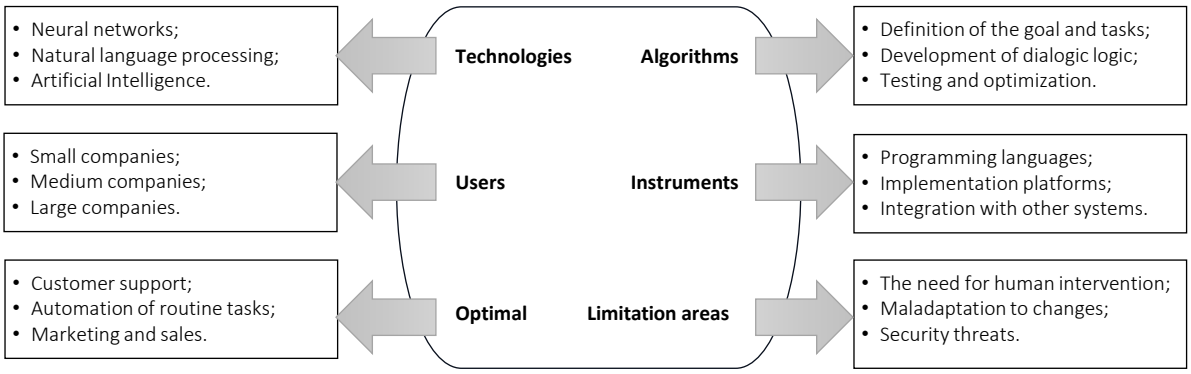

Figure 1. System of the variability of chatbot components

service higher than a human can achieve. In particular, banking chatbots respond to inquiries an average of 4 minutes faster than traditional call center operators (Social, n.d.). Chatbots allow businesses to reduce production costs (in particular, due to savings on employee wages) and increase operational efficiency. At the same time, customers benefit because the quality of service increases. According to Kostenko et al. (2024), chatbots and other cloud technologies could be used to improve the resilience and security of society.

Based on the analysis of the use of chatbots in various types of business processes, the variable components of chatbots substantiated the system of the variability of chatbot components (Figure 1). By changing their parameters, one can optimize the profile of chatbots, depending on the conditions of their use and the desired result in business processes.

In particular, Table 2 shows the optimal areas for applying chatbots. Companies can combine different technologies to achieve their business goals depending on the specific business scenario, requirements, and strategic goals. At the same time, it is necessary to consider the specifics of the industry and the needs of customers.

Some of the leading companies in this direction demonstrate impressive achievements in creating effective chatbots that revolutionize interaction

Table 2. Optimal areas of application of chatbots

Scope of application	Examples of chatbots	Features
Customer service	1. MyKAI 2. Eno 3. GYANT	Typically used to handle simple customer inquiries, such as checking balances or tracking orders.
IT	1. GitHub bot 2. Stack Overflow bot 3. Jenkins bot	Can help automate the writing of chat code, track errors in it, answer technical questions, and even manage development processes.
Education	1. Smodin 2. July 3. Duolingo	Can help with studying, doing homework, or even writing or translating texts.
Health	1. Ada 2. OneRemission 3. Babylon Health	May provide medical advice based on symptoms provided by the user.
Tourism	1. Zendesk 2. Botsonic 3. Yellow.ai	Can help with booking hotels, flights and other services.
Banking	1. Erica 2. Cleo 3. Plum	Can help with money transfers and other banking transactions, as well as 24/7 banking support and help to save money.
Marketing	1. Drift 2. ManyChat 3. MobileMonkey	Can help with lead generation, marketing campaign automation, advertising bottling, logo creation and other tasks.
HR and Recruitment	1. Mya 2. Job Pal 3. Wade and Wendy	Can help with the hiring process by answering candidate questions and automating resume reception.

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with customers. The market is actively engaged with companies that are known for their advanced technologies in the field of artificial intelligence-based chatbots. The number of innovative solutions and the development of functionality is constantly increasing, which adds new aspects to the use of this technology in various areas of business and customer service.

2. RESULTS

The paper made it possible to substantiate the parameters of the system components of chatbots and the use of chatbots in business processes based on the optimization of their system components depending on the complexity of the tasks, the type of services, the specifics of customers, and other characteristics.

Various factors can determine the use of chatbots by large and small companies due to differences in business needs, resources, and strategies. Based on Fokina (2024), SlickText (2023), and Bocian (2024), the study evaluated the degree of implementation of chatbot technology by different companies depending on their size (Figure 2).

Figure 2 shows that small enterprises are more willing to adopt chatbot technologies than large enterprises since small businesses usually have limited resources and staff. The use of chatbots can be seen as a way to optimize communication with customers and internal interaction. Small businesses, compared to large corporations, are more flexible in quickly implementing new technologies, including chatbots, without multi-stage bureaucracy, additional agreements, and obstacles. Small businesses tend to face more competition and a desire to stand out from the crowd. Therefore, the introduction of new technologies, such as chatbots, can be used as a competitive advantage. With these factors in mind, small businesses can be more prepared and faster to adopt chatbot technology to improve efficiency and provide better customer service.

At the same time, several challenges prevent some small businesses from planning to use chatbots. First, there is a limited budget for the implementation of technological solutions, including chatbots. Second, some small businesses may lack the training and understanding of how chatbots can be applied to their business. Small companies may not have in-house IT specialists or a software development department, making it difficult to develop and implement complex technologies, such as chatbots. Third, small businesses, particularly in areas where personal contact with customers is important, may prefer individual service, believing that a chatbot cannot provide this level of interaction.

Despite these challenges, small and medium-sized businesses are actively using chatbots to automate certain processes and improve customer service. A particularly significant effect of the use of chatbots is observed in areas where the speed of reaction and accuracy of information are crucial.

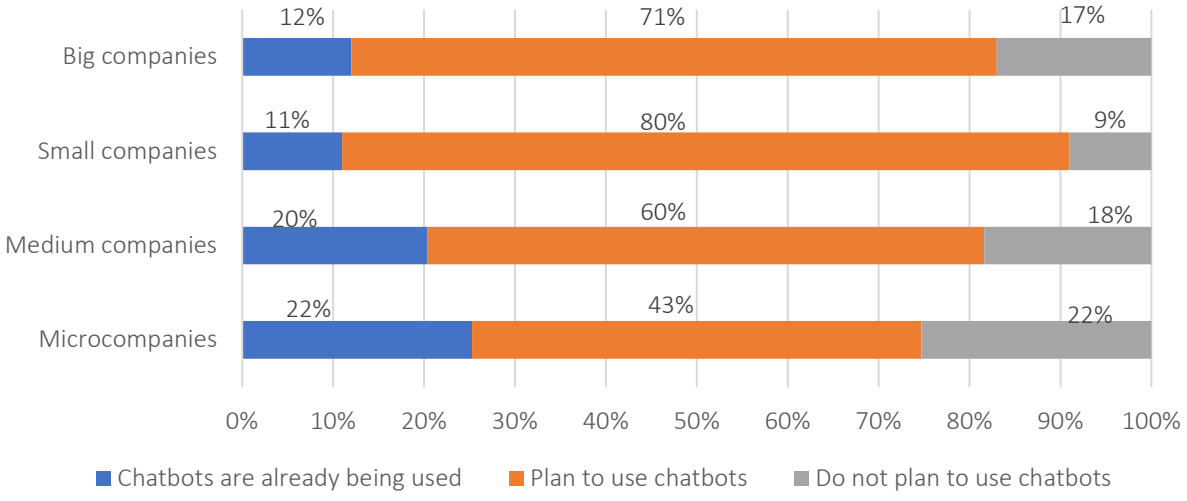

Figure 2. Implementation of chatbot technology by companies depending on their size

Figure 3 systematizes five key functional groups of chatbots that have the greatest impact in a specific business area. Each of these functions affects the optimization of processes, the improvement of communication, and the provision of an analytical basis for further strategic decisions.

The use of chatbots in e-commerce can significantly increase efficiency and improve interaction with customers. The capabilities of chatbots allow customers to find products, find out about their availability in stock, get information about promotions, and make a purchase directly through the chatbot. Using machine learning algorithms, chatbots can adapt to a customer's individual needs and provide personalized advice and information. Also, chatbots can integrate with various platforms and communication channels, such as websites, messengers, and social networks, which expands their ability to interact with customers. All of these improve user experience, satisfy customer needs, increase conversion, and lead to improved performance (Connolly, 2023).

In the financial services industry, chatbots are used to provide customers with information about account status, payment making, investment advice, and financial planning. In real time, banking chatbots powered by artificial intelligence can send customers alerts and instructions on how to counter fraudulent activities, as well as notifications when pre-defined spending limits are reached. Chatbots also learn consumer preferences and send them personalized offers to increase revenue. Thus, chatbots are an important tool for convenient financial management without the need to visit bank branches (Dilmegani, 2024).

Chatbots in the financial sector are a tool to improve efficiency, ensure customer satisfaction and increase the profitability of a financial organiza-

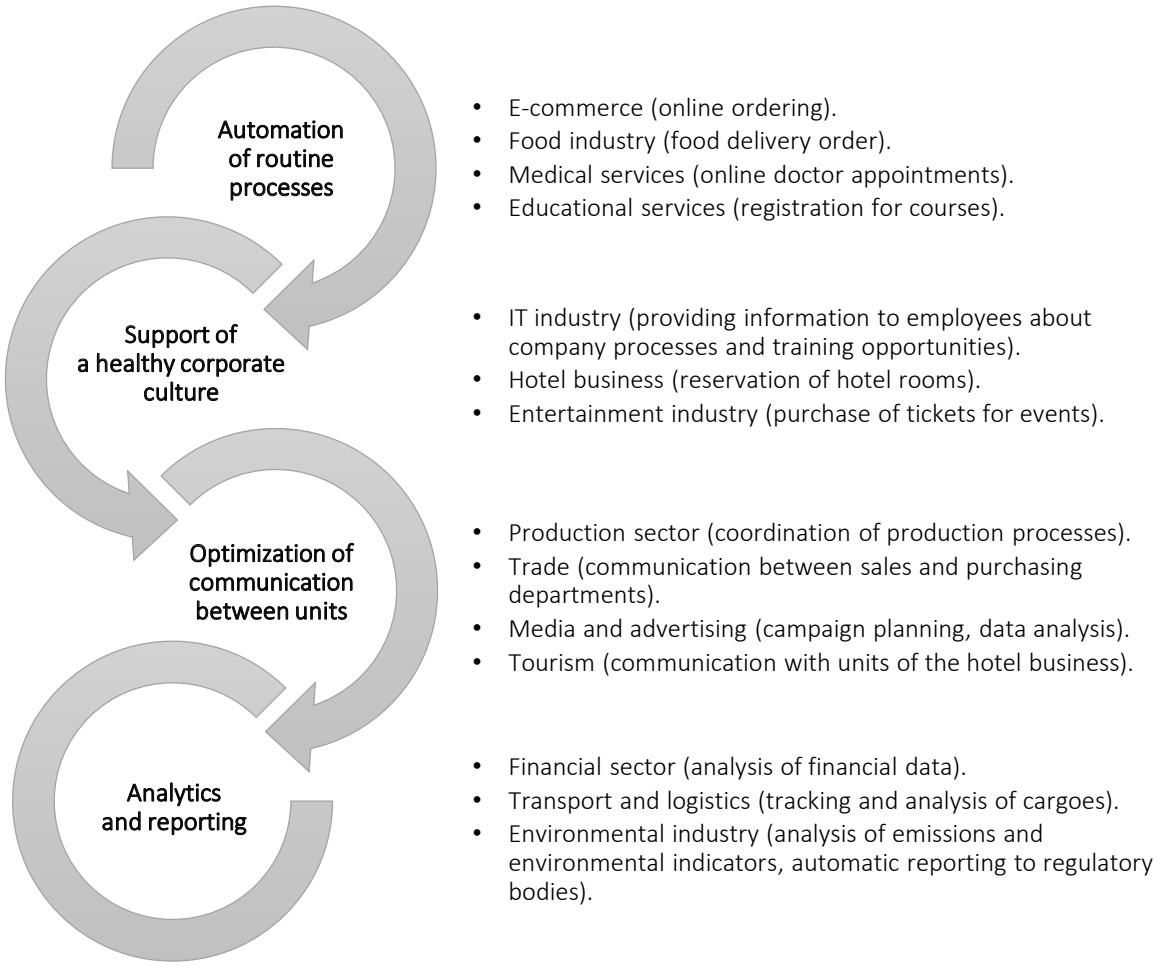

Figure 3. Integration of chatbot functions in business areas

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tion. Their ability to provide fast and personalized service makes them an important part of today's financial environment.

In the field of services, chatbots help to receive and process requests for services, reservations, and orders and provide instant availability of information that improves the overall service experience. A chatbot can track customer feedback, provide quick responses to their comments or questions, and provide personalized recommendations. It helps build positive communication with customers and provides a simple and effective way to interact with the business. The effectiveness of chatbots in the service industry lies in their ability to simplify and automate many routine tasks while ensuring a high level of service and customer satisfaction (SAS, n.d.).

Chatbots can have different levels of complexity, including simple rule systems or highly sophisticated agents that use deep learning and neural networks to improve their functions. Each level of complexity reflects the chatbot's ability to adapt to new information and various scenarios of interaction with the user, which have their own advantages and limitations. The choice of a specific approach depends on the specific task of the chatbot, the volume of data, and users' needs. Based on Grensing-Pophal (2023) and Belda-Medina and Kokošková (2023), the study formed the key characteristics of the processes of using chatbots (tools, functionality, limitations) for different levels of complexity of chatbots (Table 3).

Based on the classification, the study evaluated the characteristics of chatbots according to the level of complexity and functionality (Figure 4), which is key to their successful implementation in business. The first level of complexity can be associated with simple rules and static answers (Rule-Based), which limits their ability to adapt to new situations. At the second level, chatbots that use machine learning to learn and improve their responses over time, but require more time and resources to train. The most flexible and functional are hybrid chatbots that combine rules and machine learning, which allows them to adapt to different situations and provide personalized responses.

Table 3. Key characteristics of chatbots by level of complexity

Kind	Toolkit	Functional	Limitation	Example
Rule-Based	Uses fixed rules and scripts to determine how to respond to specific user questions or commands.	Ease of use, the ability to accurately determine the expected behavior.	Limited in adaptation to new information, cannot effectively solve complex tasks.	Automated customer support systems that provide information based on specific keywords or phrases.
Machine Learning	Uses machine learning algorithms to analyze and learn over time. Can adapt to new data.	Ability to improve answers over time, greater flexibility in working with different types of questions.	Requires a large amount of data for effective training and may face the «black box» problem.	Personal assistants can learn responses based on user interactions.
Hybrid	Combines elements of a rule-based approach and machine learning to improve efficiency and flexibility.	Combines the advantages of both methods, allowing more adaptability to a variety of requirements.	May require more complex algorithms to effectively manage both approaches.	Banking chatbots that use rules for standard questions and machine learning to recognize new scenarios.
Self-affirming	Possesses the ability to be aware of its condition and capabilities, intellectually learns from experience.	Adapts to the context in user questions or commands. Analyzes own actions and learning based on own experience.	High requirements for computing power; ethical issues may arise, in particular, in cases where bots have the capacity for self-awareness.	Google Assistant uses neural network technologies to understand and interact with the user. Siri uses AI technology to provide a personal assistant on Apple devices.
Contextual AI	Uses machine learning, natural language processing (NLP), and neural networks to understand and respond to user queries.	Analyzes and takes into account the context of the interaction, allowing for more accurate and personalized responses.	When the context is complex or ambiguous, or when there is no relevant data for training.	An implemented banking sector chatbot could be DBS Bank's chatbot, which provides financial services and customer support. This chatbot uses contextual data from previous customer interactions to better understand their needs and provide personalized responses.

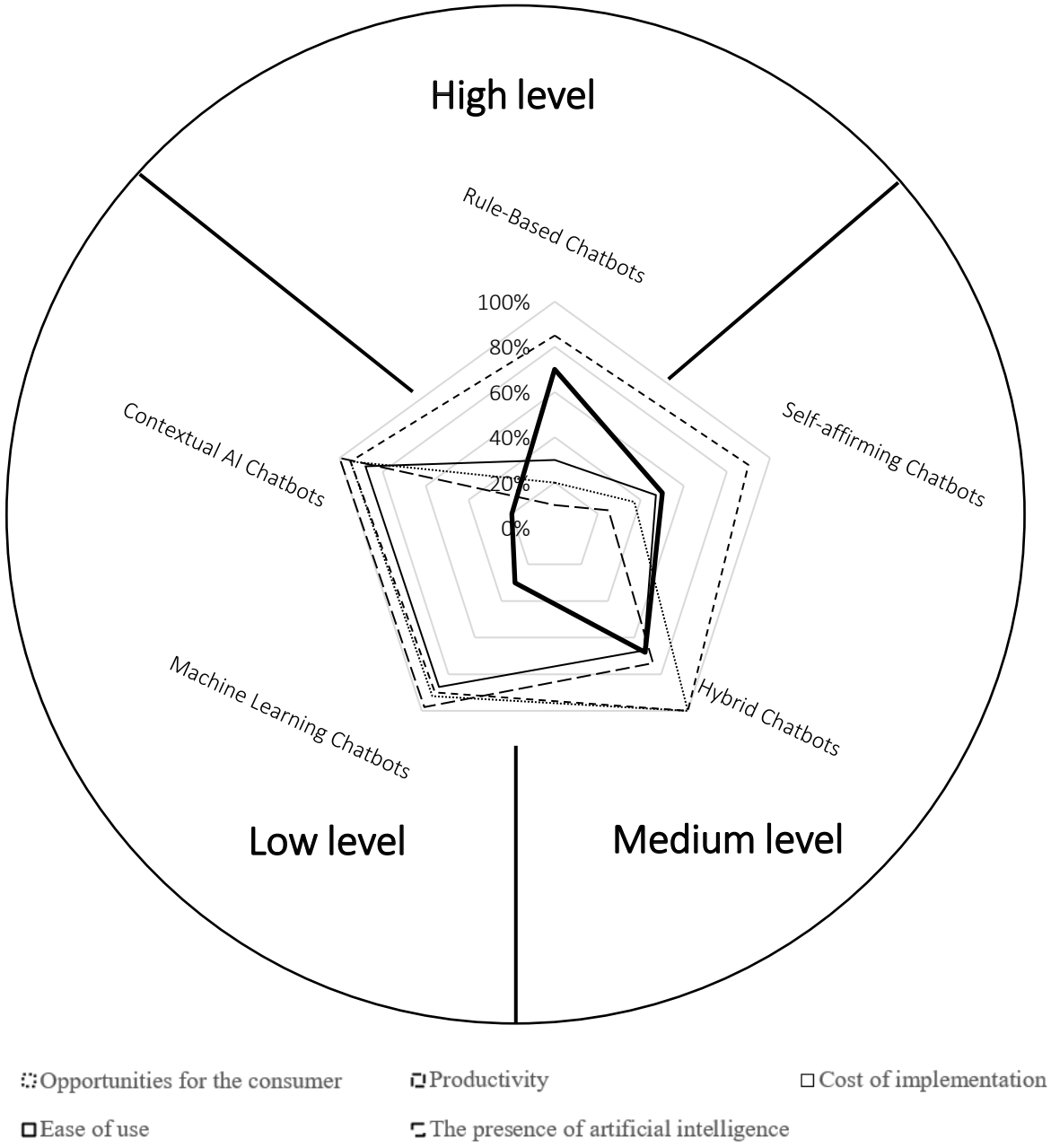

Figure 4. Evaluation of the characteristics of chatbots by the level of complexity and functionality

The chatbot toolkit forms a complex and diverse ecosystem that includes various technologies and resources to create, develop, and optimize interactive bots. Based on Reynoso (2023), Dudziak (2023), Oracle (n.d.a, n.d.b), the study developed an algorithm for introducing a chatbot into business (Figure 5).

At the initial stage of chatbot development, development platforms, such as Dialogflow from Google, Microsoft Bot Framework, and IBM Watson Assistant, are used. These platforms provide tools for language recognition, intent and entity detection, which allows one to effectively model and optimize dialogue scenarios. Programming languages, including Python and JavaScript (using Node.js), are used to implement the bot's logic and process input. They allow developers to create efficient and flexible chatbots that can interact with the user at different levels of complexity. Frameworks, such as Rasa or Botpress, empower developers by allowing them to create context-aware, memory-aware, and intelligent

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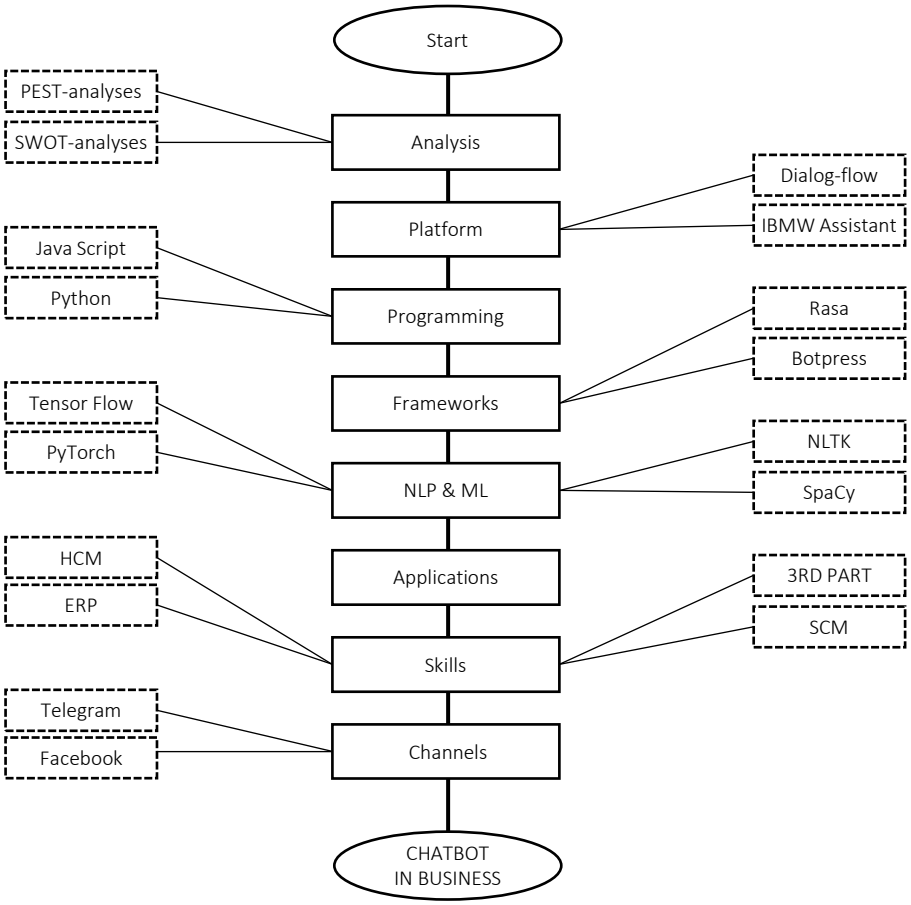

Figure 5. Algorithm for implementing a chatbot in business

language-processing bots. Libraries, such as NLTK and SpaCy, are used to improve natural language processing and text analysis. These tools help one to determine the semantic aspects of the text, identify keywords, and make the bot work more efficiently in terms of recognizing and responding to inputted content. Cloud platforms, such as Amazon Lex and Microsoft Azure Bot Service, provide convenient tools for deploying and managing bots in cloud environments, facilitating rapid chatbots development and scaling.

In order to improve the functionality of chatbots as much as possible, it is important to consider modern technological trends, particularly the use of machine learning. This can improve chatbots' ability to recognize and adapt to changing user requirements. Machine learning algorithms allow chatbots to learn and analyze data in real time, improving their responses and functionality. Libraries and frameworks, such as TensorFlow or PyTorch, can be used to implement machine learning in chatbots. To ensure the security and privacy of data, it is recommended to use encryption and authentication of interactions with the chatbot. Mobile optimization of chatbots is also important, given the mobile nature of business, which increases their accessibility and usability.

This diverse toolkit not only provides enhanced capabilities for developers but also contributes to the continuous technological development of chatbots, making them more accessible and effective in various industries.

The introduction of chatbots into business processes is a strategic stage that involves the analysis of various areas of use. The main areas of application are supply chain management (SCM), enterprise resource planning (ERP), human capital management (HCM), customer experience (CX), as well as integration with third-party services (3rd party). When considering the skills of a digital assistant, considering the specifics of each direction is vital. For ex-

ample, for SCM, relevant skills may include inventory management, purchase orders, and manufacturing. In the case of ERP, it is important to be able to manage global HR, submit expenses and expense approval. HCM requires talent management and absence management skills, and CX requires sales skills. For third-party services, location services are the main ones. When choosing specific skills for a chatbot, it is important to consider the needs of a specific business process and follow an optimization strategy. After the functionality is created, it should be integrated into one of the popular communication channels, such as Teams, Facebook Messenger, Telegram, and others, to ensure maximum user reach and optimize the use of the chatbot.

Thanks to this implementation algorithm, the chatbot will become an effective tool for optimizing business processes and improving interaction with customers and staff. In this way, the business will be ready for the challenges of the modern digital environment, providing users with fast and efficient support and giving various significant benefits to service users.

Chatbots help to solve customer service problems by providing effective and innovative solutions. This analysis makes it possible to highlight the most attractive for consumers and effective for entrepreneurs functionality of chatbots (Olujimi & Ade-Ibijola, 2023; Amaresan, 2023):

- immediate and automated responses to customer questions, improving response times and overall user experience;
- constant customer support, even outside working hours;
- automation of the process of ordering goods, booking services, and obtaining information about the availability of goods;
- personalized recommendations to customers that meet their needs and preferences;
- convenient obtaining of information thanks to a chatbot built into the website or mobile application;
- adaptation of answers, taking into account the client's emotional state.

Thus, chatbots can solve customer service problems by providing fast, efficient, and personalized interaction. Their capabilities are constantly expanding thanks to the development of artificial intelligence and machine learning technologies.

For businesses, chatbots help create a personalized approach to service, responding to the individual needs of each customer. This helps increase customer satisfaction and the desire to use services again or buy goods from this company. This means increasing customer loyalty as the basis for the growth of business profitability.

Chatbots also help businesses optimize customer support workloads. They can answer common questions and solve standard problems, freeing up help desk staff to focus on more complex or specific issues. This allows companies to use resources efficiently and reduce response times for customers, which also contributes to a positive perception of service.

In this context, this study considers the program code and the profile of a typical business assistant implemented on its basis based on the application of the machine learning method for classification and interaction with users. This software code can be uploaded to the platform (framework) and implemented in a real business by following the steps of the Algorithm for implementing a chatbot in a business (Figure 5). The implementation code was written in the Python programming language[1].

The conventional example of a hardware store shows the process of implementing a chatbot, which is designed to solve various tasks, starting from providing information about the address and conditions of purchases and ending with classifying products according to their characteristics. This chatbot is considered predictive because it can analyze input data and make predictions. To achieve this, a classification model trained by the k-nearest neighbors (KNN) method is used based on a training dataset with the characteristics of modern smartphones.

1 It can be viewed at the link: https://pastebin.com/XUcLy2L7

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The scenario of using a business assistant in a hardware store includes a number of functions. First, it can answer general questions from customers about the address of the store, the originality of the goods, and the possibility of buying on credit. In addition, the bot can provide personalized information for customers, including bonuses and purchase history. Also, thanks to the use of machine learning methods, the business assistant can classify smartphones by their characteristics (Screen_size (inches), Number of cameras, Smartphone condition (from 1 (awful) to 6 (perfect))), Battery capacity, %), helping customers to determine the price segment of a certain device. Secondly, the chatbot interacts with users through the Telegram social network[2], providing a convenient interface for selecting options and obtaining the necessary information.

This proposed example is an additional tool for optimizing business processes and ensuring competitive advantages. Its ability to quickly and effectively analyze data allows the company to quickly respond to changes in market conditions and implement strategies aimed at meeting customer needs.

Therefore, sales and customer service are the main areas where special attention is paid to automation, which will allow for significantly reduced costs due to the use of chatbots.

3. DISCUSSION

Like any innovative technology, the use of chatbots on a level with positive sides has its debatable sides. Analyzing Haughey (2023) and TechSense (n.d.), the study systematized the main types of factors that can create problems in the use of chatbots (Table 4). Debatable issues are the choice of certain parameters depending on the problems that arise.

Proper planning, training, and improvement can help overcome these shortcomings and ensure a successful enterprise chatbot implementation.

When using chatbots, significant problems can arise due to the lack of interaction between consumers and enterprises that use chatbots. At the level of obtaining additional benefits due to more convenient access to information and services, customers may face certain problems.

HubSpot survey (Dick, 2021; Bump, 2022; Fontanella, 2022) identified five main problems related to customer service (Figure 6).

The first two problems are waiting in line (33%) and repetition of information when the request goes from one department of the bank to another (33%). Slow response time is listed as 19%, followed by "Unable to solve my problem online" at 14%, and finally "Other" at 1%.

Table 4. Discussion issues of chatbot use in business processes.

A positive result of the use of chatbots in enterprises	Discussion issues
Improving the efficiency of customer service	Are chatbots effective in more complex than transactional business processes?
Saving time and resources	Is it appropriate to save time and resources if it does not affect the overall result of the business process and has limited functionality?
Constant availability	How realistic is the use of chatbots in business processes without a stable Internet connection and other network factors?
Improving the user experience	How does one train trainers and consumers to use chatbots effectively?
Large scale of application	How can one connect the increase in application scale with the facts of data security and privacy threats?
Tracking trends, collecting feedback, identifying opportunities to improve the service	How advanced is the level of implementation and understanding of natural language in chatbot systems for modern business?
Automatic customer segmentation and provision of information depending on their needs	Can all user needs be covered by introducing chatbots into business processes?
Delivery tracking and order status notification	How does the effectiveness of using chatbots relate to the size of companies?

2 via the link: https://t.me/My_smarter_business_bot

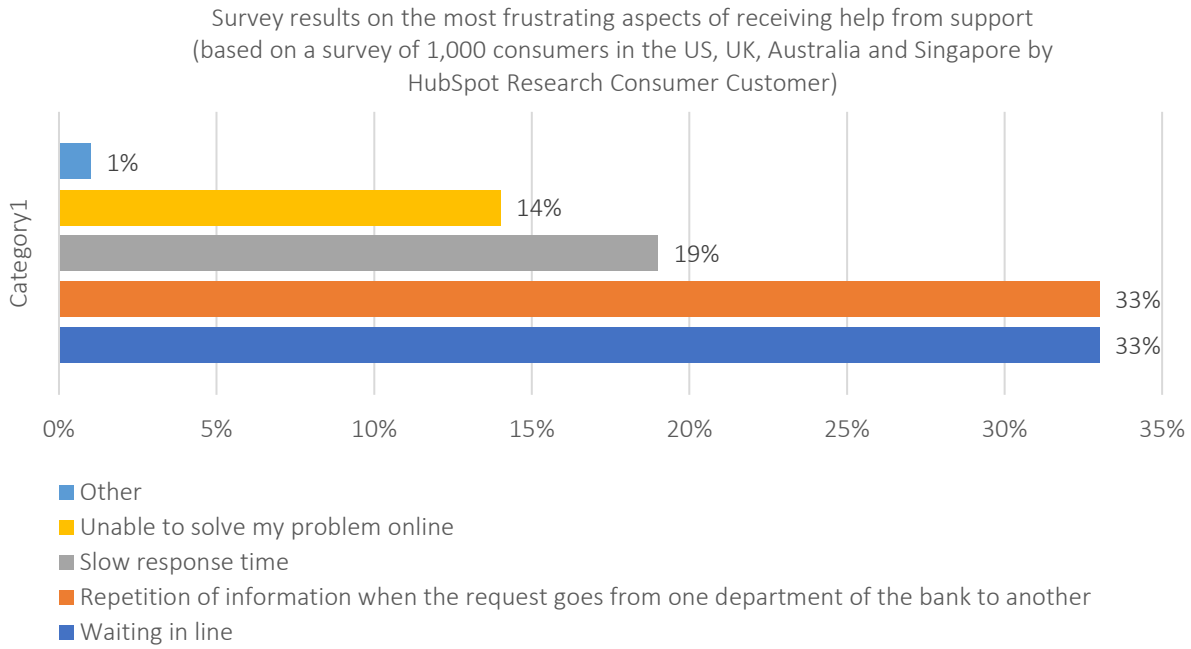

Figure 6. Customer service issues

Despite the problematic moments, the introduction of chatbots in customer service is recognized as a significant innovative step, which provides an opportunity to rethink the way business interacts with customers. This technology opens up new opportunities to improve efficiency and provide operational support at any time. Despite the challenges, it is important to note that continuous improvement and training of chatbots will allow to maximize their advantages in providing personalized and quality service, which will contribute to increasing the level of customer satisfaction, increasing profits and expanding business opportunities.

In 2023, chatbots based on artificial intelligence reached new heights in development and integration into various spheres of life. Table 5 summarizes the main achievements in the development of chatbot use by the world's leading

Table 5. Evolution of chatbots based on artificial intelligence for 2023

Name/Developer	Opportunities	Benefits to users
BingAI / Microsoft (ChatGPT Online, 2023)	Summarizing large web content, making comparisons, creating content and letters, searching the web quickly, and learning new skills.	Helps users summarize financial statements companies, convert Python code to Rust, and write posts for LinkedIn.
Gemini / Google (Google Gemini, n.d.)	Multimodality, tool and API integration, improved memory and scheduling.	Can generate text and images in applications such as Google Docs and Sheets, helping to add depth to ideas, provide fully developed spreadsheets, and improve data interpretation.
Bard / Google (Sekhar, n.d.)	Conversational assistant, generation of images by text calls, AI staff.	Can increase engagement and monetization, helping the company make more money. Over time, AI staff will be available to businesses and content creators.
LLaMA / Meta (Deci, 2024)	Pre-trained and refined large language models optimized for use in dialogues.	It can unlock significant potential for businesses and organizations to develop specialized AI-based solutions that meet their specific needs, from advanced chatbots to sophisticated data analysis tools.
GPT-4 / OpenAI (University of Central Arkansas, n.d.)	Improved capabilities compared to previous models, including greater reliability and accuracy.	Can be used to automate routine tasks, such as text rewriting, report generation, and data analysis, which can improve productivity and efficiency in business operations.
Claude / Anthropic (Anthropic, 2023)	Can process 100,000 tokens of text, which equates to approximately 75,000 words per minute.	It can automate large volumes of text-based tasks, which can increase productivity and efficiency in business operations.

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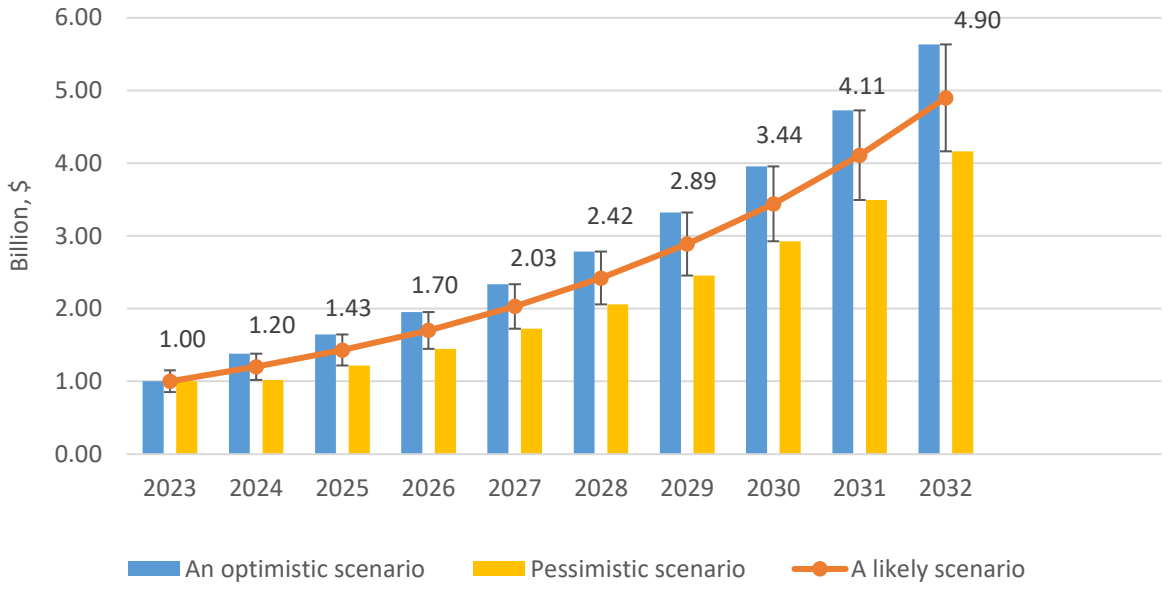

Figure 7. Global chatbot market size forecast 2024–2032

companies, which makes it possible to see the prospects for the development of chatbot use processes in various areas of business.

Today, chatbots have become an integral part of the daily interaction of users with technology. Using advanced machine and deep learning algorithms, chatbots have become more accurate and distinguished by their ability to perform more complex tasks. The use of natural language processing and facial recognition technologies allowed chatbots to understand and interpret user requests more efficiently.

To date, chatbots have covered only 5% of the potential possibilities they can offer businesses (Greyling, 2022). One of the main trends is the use of artificial intelligence to improve the language understanding and responses of chatbots. Of course, the complexity of developing a robot that follows a certain, pre-programmed script, even with the possibility of script variations, and a bot that can learn itself is a huge difference. However, some companies are beginning to actively invest in this technology with the expectation of obtaining a competitive advantage and profit in the future.

Chatbots are predicted to continue to evolve, becoming even more personal and intelligent. It is important to note that in 2022, the global market for chatbots was valued at US$0.84 billion, and by 2032, it is predicted that it may reach more than US$5 billion.

Based on the expectations in the field of the implementation of chatbots (Sundstrom, 2023; Grand View Research, n.d.; Precedence Research, n.d.), Figure 7 shows the trend of development and scope of research related to chatbots for 2024–2032.

Further development of artificial intelligence also requires efforts to create effective learning methods and adapt systems to rapidly changing conditions. A business must be ready to constantly update its technologies and train its staff to optimally use all the possibilities of artificial intelligence. Investing resources in research and development of new AI technologies is essential for businesses to stay ahead of the curve. Investments in startups (Zhou et al., 2023) and initiatives related to artificial intelligence can lead to the creation of unique solutions that will provide a competitive advantage in the future.

All these aspects determine the way to further improvement and effective use of artificial intelligence in business. The integration of artificial intelligence is becoming an important component of strategic planning, and successful companies must actively work to optimize their processes and adapt to changes in the technological landscape.

CONCLUSION

The paper's main idea is the possibility of forming a system profile of a conditional chatbot, which allows for optimizing the parameters of chatbot components depending on the conditions of the business process where it will be used. The purpose of the study is to form a system profile of the components of a conditional chatbot and propose mechanisms for optimizing their parameters depending on the conditions of the business process in which the chatbot should be used.

Based on the analysis of data on the use of chatbots in various types of business processes, six groups of system components of chatbots have been identified, due to the variability of which it is possible to optimize chatbot parameters for specific conditions of a business process. These groups of components include types of technologies, types of users, optimal areas of use, application algorithms, tools, and limitations. Such mechanisms for optimizing chatbot parameters depending on the conditions of business processes are offered for the first time. The proposed chatbot optimization system can be used in operational business processes. The latter relates to assessing customer needs, their capabilities, and optimal parameters of goods (products or services).

The proposed system of chatbot optimization makes it possible to reduce the response time to user requests, improve the quality of service, and personalize it. Costs are reduced and the efficiency of economic activity increases. Along with the positive aspects, certain problems may arise when using chatbots. The main ones are limited functionality, reduced efficiency in solving complex tasks in the absence of a stable Internet connection, the need for constant improvement following certain trends, significant costs for implementation and support, etc. The further evolution of chatbots is connected with the development of artificial intelligence, the solving of language recognition problems, and the adaptation of cultural traditions and habits of the local population. Chatbots are not only a tool but also a strategy that determines the further development of modern business. Companies that implement chatbots in their operations on time receive not only a technological advantage, gaining a leadership position of the company in their field but also the opportunity to manage the future, where chatbots become the key architects of an efficient and successful business.

The further evolution of chatbots is connected with the development of artificial intelligence, the solving of language recognition problems, and the adaptation of cultural traditions and habits of the local population.

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