Research Article

The use of artificial intelligence in the resource management process to increase the efficiency of the enterprise

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ABSTRACT

This article presents an interdisciplinary approach to solving problems related to the introduction of digital technologies in industry, with a special focus on artificial intelligence. The author develops a methodological framework based on the principles of creating artificial intelligence and machine learning methods, which makes it possible to overcome the shortcomings identified during the research. Artificial intelligence is a system of intelligent machines with the necessary computing resources and algorithms that ensure their ability to learn. To improve the efficiency of production processes, the author proposes a project that combines the principles of Industry 4.0 with advanced digital technologies, such as artificial intelligence, at the enterprise level. The result of this work was the successful implementation of a carefully developed digital platform model that integrates artificial intelligence within Industry 4.0.

Keywords: artificial intelligence; digital platform; industry 4.0

1. Introduction

The 21st century has seen a profound transformation in the industrial landscape, primarily driven by the rapid advancement of artificial intelligence (AI) [1, 2].

This transformation, often referred to as the Fourth Industrial Revolution or Industry 4.0, is centered on digital connectivity, automation, and intelligent decision-making[3, 4].

The business environment is undergoing a significant transformation due to both temporary and structural factors, such as global market integration, technological advancements, and particularly digitalization. These changes go beyond the mere introduction of new tools based on information and communication technologies into organizational structures and processes. They represent a fundamental shift in the way businesses operate and compete in the market [5].

The key to success lies in the people, their skills, and their commitment. While tools and technical expertise are important, research has demonstrated that soft skills are even more critical for project success.

The initial step in the process of digitalization is to gain a clear understanding of the current state of an organization's digital transformation. This involves creating a detailed assessment of the organization's

strengths, weaknesses, and areas for improvement [3, 4].

Digitalization can involve enhancing existing processes, exploring new avenues within the existing business areas, or discovering novel opportunities beyond the current business scope.

It is worth noting that the analysis of the literature revealed some gaps and discrepancies in the research related to the implementation of Industry 4.0. [6, 7, 8]. These gaps are primarily due to the fact that some works address the issues of digital technologies individually, but they do not provide a clear recipe for how these technologies can be combined to improve the efficiency of enterprises and achieve results [9-11].

Additionally, some articles focus on the use of artificial intelligence for specific problems, but their use and implementation issues are not well represented by practical examples from industries [11, 12]. Finally, there are studies that describe the elements of Industry 4.0, but the lack of practical examples makes it difficult to understand how they can be applied in real-world scenarios [13, 14].

To improve and optimize processes within the enterprise, it is necessary to address issues related to the development stages of models that take into account the integration of digital technologies such as artificial intelligence when operating a digital platform within the context of Industry 4.0. These issues have not been sufficiently studied. This requires addressing the aforementioned problems.

In response to the knowledge gap, this study aims to provide an in-depth analysis of the impact of Industry 4.0 on enterprise performance. The study also explores opportunities to improve operational efficiency, which forms the basis for these improvements.

This two-way research provides both a theoretical understanding and practical guidance for business leaders. It helps them to optimize production processes and make strategic decisions, which in turn helps increase the competitiveness of industrial enterprises.

Based on the above, we present the structure of our article, which will assist you in comprehending our approach.

The article is divided into four main sections. 1. "Introduction". In this section, we will provide an overview of the problem and a summary of the existing literature on the topic. 2. "Methods". This section outlines the key stages of our research and highlights the theoretical and methodological aspects that were not addressed in previous studies. 3. "Results and Discussions". This section presents the findings and their potential application in the field. 4. "Conclusion". Finally, we will summarize the key points and propose areas for future research.

2. Methods

The following approaches were used in the course of the study:

1. The generalization method allowed us to create a holistic view of digital technologies, such as artificial intelligence, and their importance in the concept of Industry 4.0.

2. The analysis method helped to determine the place and importance of digital platforms in the structure of the company under study.

3. The interpretation method allowed us to expand the classification and propose our own definitions for the term "digital platform for an industrial enterprise".

4. The visualization method was used to create a digital platform model that combines artificial intelligence and Industry 4.0, as well as to demonstrate the role of digital platforms in the structure of an industrial enterprise.

Figure 1 shows the main stages of the study, which were aimed at achieving this goal.
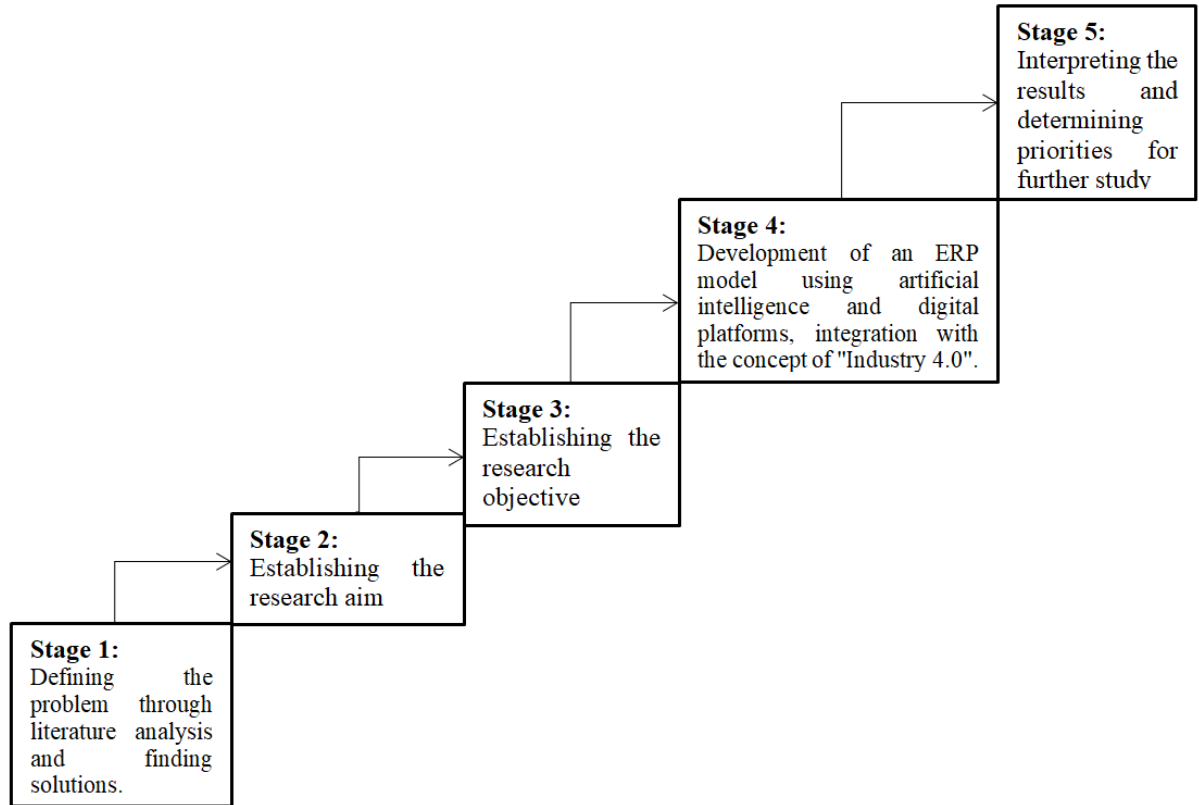
Figure 1. Research stages.

As illustrated in **Figure 1**, the critical phases of the procedure encompass: delineating the issue at hand, articulating the research objective and specific goals, analyzing the findings, and establishing priorities for future investigation in this domain.

3. Results and discussion

Recent research has shown that the concept of Industry 4.0, which utilizes artificial intelligence, is a crucial factor in enhancing the operational efficiency of production systems. This finding is supported by numerous scientific publications that emphasize the significance of digital transformation and the incorporation of artificial intelligence into manufacturing processes.

A number of articles describe in detail the advantages of the concept of Industry 4.0 based on the use of artificial intelligence. This solution is said to be a key factor in improving the operational efficiency of production systems. This conclusion is confirmed by numerous scientific publications that emphasize the importance of digital transformation and the introduction of AI into production processes [15-18].

As part of one of the studies, the authors propose using artificial intelligence to solve problems in various fields. In their work, they propose methods that can help companies optimize business processes, improve the quality of products and services, reduce costs and increase profits [18].

In their work, the authors propose using artificial intelligence to solve various problems in different industries, such as energy and gas processing. They suggest applying digital technologies like big data, digital twins, the Internet of Things, and artificial intelligence. According to them, these technologies can help optimize business processes, improve product and service quality, reduce costs, and increase profits [19].

According to some experts, the use of digital platforms can significantly improve the efficiency and accuracy of accounting information systems. This, in turn, contributes to improving financial performance and expanding opportunities for accounting professionals. The implementation of accounting systems based on artificial intelligence allows organizations to achieve impressive financial results [20].

Some writers in their works propose the use of a visual strategy, which is based on the practical application of AI technologies [21, 22].

Another article discusses in detail the impact of artificial intelligence on enterprise resource planning (ERP) systems. These powerful tools help organizations effectively manage complex business processes such as finance, manufacturing, accounting, human resources, and logistics. By combining key business functions into a single platform, ERP systems significantly increase productivity, profitability, and overall efficiency for companies. The integration of AI into ERP systems opens up new possibilities. These systems become more adaptive and user-friendly thanks to self-learning capabilities and forecasting. Top ERP providers like Luce, SAP, and Oracle are actively developing AI-powered applications that can be integrated into existing systems. These applications improve the accuracy of various metrics compared to human analysis [23, 24].

Integrating AI technologies such as machine learning, natural language processing, predictive analytics, and cognitive computing into ERP systems represents a significant advancement in enterprise management. These technologies enable ERP systems to analyze data, improve user experience, facilitate proactive decision-making, and mimic human thought processes [25].

Based on the analysis, a number of significant conclusions can be drawn that will help successfully integrate artificial intelligence into Industry 4.0. The study demonstrates that artificial intelligence can significantly simplify the solution of complex tasks in various spheres of public life and the economy.

However, for the correct operation of artificial intelligence systems in specific conditions, it is necessary to conduct their objective testing. This is an important step towards creating a model that will use artificial intelligence technologies. Currently, artificial intelligence is actively used in various fields, including energy, gas processing, transport, medicine, manufacturing, education, and agriculture [26, 27]. However, its use carries risks that can lead to serious economic, social and political consequences for security. Artificial intelligence, including machine learning methods, has a number of unique characteristics that make its application in real conditions particularly effective[16].

It can be said that artificial intelligence is capable of automating the solution of complex tasks in various fields of economics and public life. It also has the ability to integrate into various processes. However, in order to use artificial intelligence in various fields, it is necessary to make sure that it works correctly under certain operating conditions of the digital platform. This is an important condition for creating a model that includes artificial intelligence technologies. Currently, artificial intelligence is being successfully applied to intelligent data processing on a digital platform. However, the very concept of a "digital platform" does not yet have a clear definition, as it includes a number of specific characteristics that make its use in real life effective.

In this regard, we will consider the concept of a digital platform from the point of view of its versatility and possibilities of use in various fields.

In today's economy, companies that have successfully implemented digital technologies can become part of the business ecosystem. They use digital platforms for this. There is no single definition of this business model yet, but digital technology experts are working on its concept. It will be developed and

improved as it is applied in practice in real projects. A digital platform is a system of algorithmic relationships between multiple independent participants in an industry or field of activity. These relationships take place in a single information space and reduce transaction costs. This is achieved through the use of digital data processing technologies and a change in the division of labor[14, 15, 19].

To confirm this, let's take a closer look at the three main types of digital platforms: instrumental, infrastructural, and applied. Their characteristics are shown in **Table 1**.

Table 1. Classification of digital platforms and their distinctive features.

Type of digital platform	Instrumental	Infrastructural	Applied
Base	Programs and hardware and software complexes (products) for creating application solutions	IT services that apply end-to-end digital data technologies to information sources and are used within ecosystems	Business models for the exchange of values between a significant number of market participants, allowing transactions to be carried out in a single digital environment
Participants	Developers of platforms and solutions	Information providers, developers and platform operators, developers and consumers of IT services	Suppliers of goods, services, resources, consumers, platform operators, and regulators
Process	Technological information processing operations	Information processing for decision-making at the level of business entities	Processing information about transactions between several economic entities
Examples	Java, SAP HANA, Android OS, iOS, Intel x86, Bitnx, Amazon Web Services, Microsoft Azure, Tensor Flow, Cloud Foundry и др.	General Electric Predix, ESR1 ArcGIS, ESIA, CoBrain Analytics,ERA-GLONASS, etc.	Uber, AirBnB, Aliexpress, Booking.com, Avito, Boeing supplier's portal, Apple AppStore, AviaSales, Facebook, Alibaba, Yandex Taxi, Yandex Search, Predix Developer Network Appstore etc.

It is worth noting that this classification is rather arbitrary and general, as existing digital platforms may not fully meet the criteria of a particular category, and often, a company can create and market several different types of digital platforms simultaneously, as discussed in the literature [14, 15, 19].

The implementation of intelligent solutions in industry through digital platforms is a complex process that is accompanied by technical and operational challenges. To overcome these difficulties, a deep understanding of both the theoretical foundations of artificial intelligence and the practical aspects of industrial environments is needed.

In addition to technical difficulties, it is important to take into account various logistical and human factors during the implementation process. Such factors include data confidentiality, security, and compliance with regulatory requirements [5].

From this list of questions, several important conclusions can be drawn about the use of artificial intelligence in industry. This process requires attention to several aspects: from data management to choosing the right algorithm for the system. Deploying AI systems poses its own unique challenges, such as ensuring compatibility, scalability, and addressing critical security issues [16, 17, 18].

As part of this research, we propose an innovative idea for a digital platform that will combine artificial intelligence with Industry 4.0 technologies.

To implement this project, we need to carefully study and identify the obstacles that hinder the implementation and development of Industry 4.0.

The following list presents some of the main challenges that digital businesses face today. These challenges hinder the creation of a robust digital platform.

1. Enterprise integration.

Due to the rapid growth of business data and the increasing variety of enterprise systems, integrating structured and unstructured information is becoming a difficult task. Without optimal integration, it will be challenging to make sense of this data. Businesses should gather data from various sources to enable their digital platforms to provide relevant information to users. Extracting valuable data from both structured and unstructured resources is a key challenge for digital companies.

2. Process modeling and optimization

As businesses expand into new markets, the complexity of their business rules and internal processes tends to increase. Creating models for these processes using workflows is another major challenge.

3. Meeting digital consumer and market expectations

Digital consumers who are tech-savvy and increased competition present a new set of challenges for digital businesses. Modern digital customers expect dynamic, Omni-channel, and rich user experiences that are highly interactive and responsive. They want to be actively involved in collaboration, knowledge sharing, and other related processes. Digital consumers share their experiences on online forums, which can influence the wider community. Managing customer expectations and streamlining processes and operations is another significant challenge.

4. Collaboration challenge

Organizations face difficulties in creating collaborative platforms and self-service solutions due to the lack of standardized integration interfaces. Implementing cultural change and related processes to foster collaboration is one of the main challenges.

5. Consolidation challenge

Consolidating functionality, technology stack, and content spread across different systems, locations, and formats is a major concern. Eliminating redundant content and increasing content reuse are key drivers for digital transformation.

6. Enterprise integration with ERP systems

These elements can be incorporated into a unified ERP framework or operated independently in real-time. ERP frameworks aim to unify various organizational systems across all departments. Consequently, adopting an ERP framework presents both advantages and obstacles. To begin with, ERP frameworks provide dependable sources of data, enhancing data management, oversight, efficiency, and expediting decision-making. However, implementing an ERP framework can be a time-consuming process

for businesses, particularly for startups. ERP frameworks encompass features and modules that can be difficult to comprehend and utilize. Common obstacles include compatibility with evolving hardware and software, intricate integration, and ensuring seamless data flow between modules. One of the primary difficulties encountered by ERP systems is the dynamic nature of the business environment. The expansion of the market results in increased client expectations, business requirements, and competitive pressures. Consequently, companies are constantly under pressure to reduce expenses and optimize operations. To address the needs of businesses and adapt to market changes, ERP providers are continuously improving and enhancing their systems. In the past, ERP systems were lauded for their reporting capabilities. However, today, executives and decision-makers require Business Intelligence (BI) tools. These tools enable informed decision-making by analyzing the vast amounts of data collected by ERP systems [28, 29, 30].

In addition, enterprises face other challenges such as non-standard interfaces, varying compliance requirements, and technological difficulties related to content duplication, migration, and distribution [31, 32].

After examining various opportunities offered by digital technologies and common business challenges, we will focus on the means to fill the gap. In the next section, we will explore the role of digital technologies in this process.

3.1. Case study: ERP-model that is built on a digital platform using key Industry 4.0 technologies and artificial intelligence

In **Table 1**, we have reviewed the classification of digital platforms for industrial enterprises. In this table, we have identified the key features of the infrastructure platform, which is based on modern end-to-end data processing technologies and serves as the basis for analyzing information at the level of business entities.

With this information in mind, let's take a closer look at the model that reflects the possibilities of enterprise integration with ERP systems.

When integrated into enterprise resource planning (ERP) systems, AI can use large amounts of data to generate insights and assist businesses in making better decisions. This integration can enhance resource allocation, reduce costs, and optimize complex business processes. Leading global companies are utilizing AI in their ERP systems to manage geographically distributed operations, including manufacturing, sales, and procurement [33, 34, 35].

AI's capacity to process vast amounts of data makes it a powerful tool for monitoring goods and managing supply chains. Procurement companies, in particular, benefit from AI as it can help them manage inventory efficiently and track shipments. By utilizing AI, these companies ensure they have the right products in stock at the right time, reducing waste and improving customer satisfaction. Real-time analysis of customer behavior and habits simplifies inventory management and allows for the creation of personalized offers that meet customer expectations more effectively.

Figure 2 shows the ERP-model that is built on a digital platform using key Industry 4.0 technologies and artificial intelligence.
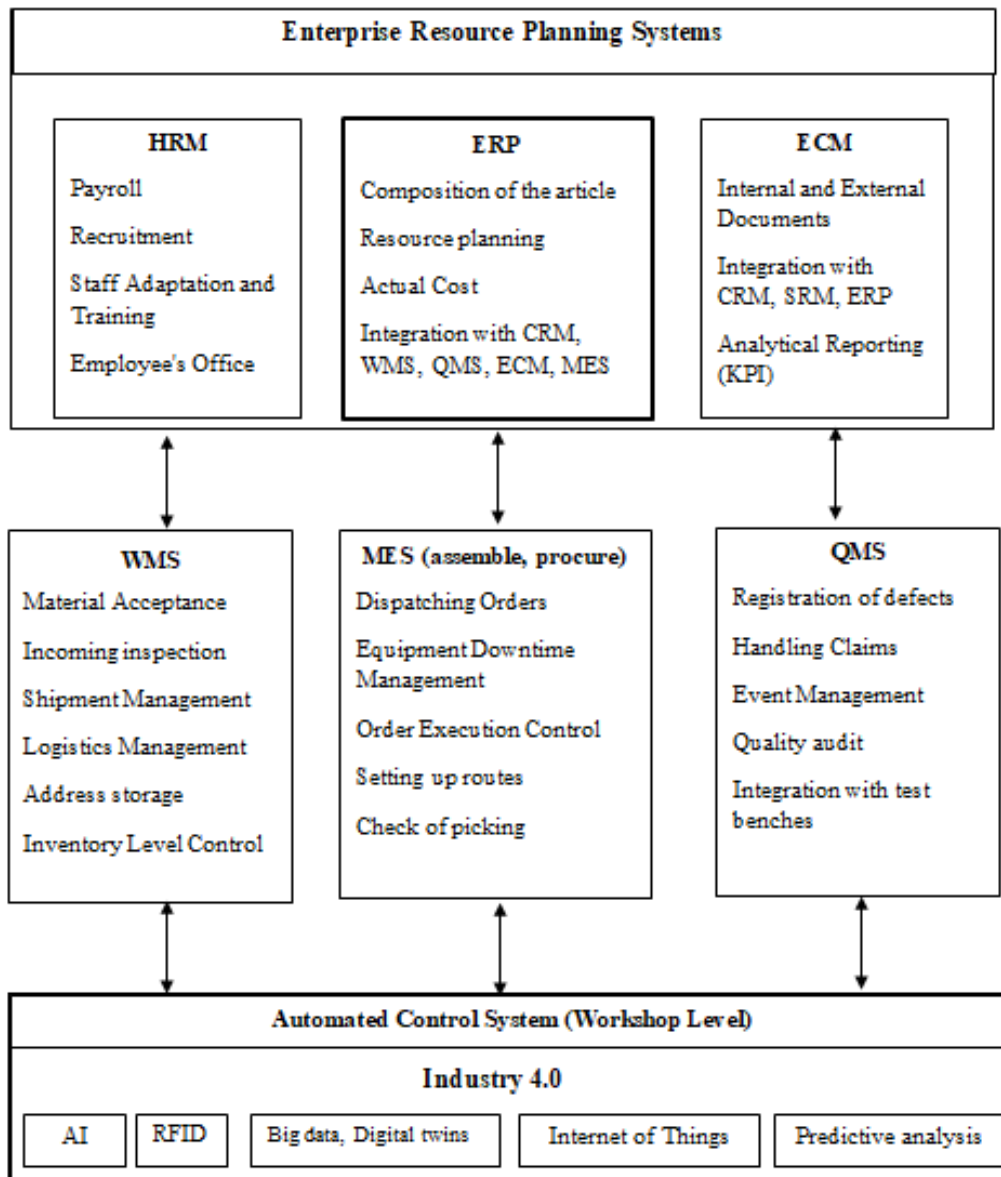
Figure 2. ERP-model that is built on a digital platform using key Industry 4.0 technologies and artificial intelligence.

In light of the above, we would like to present a model that is based on the key technologies of Industry 4.0 and artificial intelligence. This model has been developed on a digital platform and is of considerable scientific and practical interest.

This model presents the integration capabilities of the proposed ERP system, which is the basis for planning and controlling production processes. It sets the procedure for launching products into production, effectively manages stocks of materials and consumables, ensuring the continuous supply of necessary components to workplaces.

Our production planning model, implemented on the basis of a digital ERP system platform, is based on experience-based learning methods. However, in the future, we expect that various types of neural networks will become particularly important.

Artificial intelligence makes significant changes to the production process, in particular, to production management systems (MES) and related processes. The concept of Industry 4.0, which includes innovative

technologies such as artificial intelligence, big data, digital twins, predictive analytics, automation and robotics, is at the heart of our model aimed at digitalization and optimization of production operations.

With these technologies, we can collect and analyze a huge amount of operational data related to production. This opens up new horizons for us:

- Online tracking of key performance indicators (KPIs), including cost of production, unit cost, scrap quantity and product quality.

- Timely identification and resolution of production problems contributes to the improvement of the overall production process.

- Prompt detection and troubleshooting of equipment ensure uninterrupted operation.

- Forecasting possible disruptions in the supply chain makes it possible to prepare in advance for their consequences.

The integration of artificial intelligence into enterprise resource management ERP solutions opens up many opportunities for companies, including:

Increased efficiency: Automation and optimization of AI-based processes significantly simplify operations, minimizing the number of errors that could be made manually and generally increasing overall efficiency. By automating repetitive tasks and optimizing workflows, artificial intelligence helps organizations reduce operational costs, increase productivity, and improve customer service.

Improved Decision Making: AI-powered analytics and predictive analytics empower organizations to make informed decisions based on data, leading to better results and competitive advantages. With the help of such analytics, enterprises can identify new opportunities, manage risks and optimize supply chain processes, which contributes to a more efficient functioning of the entire business.

Accelerated adaptation: Artificial intelligence-based solutions enable companies to quickly adapt to changing market conditions, customer requests, and regulatory requirements. By implementing artificial intelligence, organizations can respond to changes with lightning speed, increase customer satisfaction, and maintain their market position.

Cost reduction: Artificial intelligence automates routine tasks, optimizes processes, and reduces operational costs. This, in turn, helps to increase profits.

Thus, we have presented a description of the model, which is an ERP system implemented on a digital platform using advanced industry 4.0 technologies and artificial intelligence.

4. Conclusion

In this article, we will focus on how artificial intelligence is integrated into enterprise resource planning systems through a digital platform in the era of Industry 4.0 and how this affects businesses. Our goal is to deepen your understanding of AI and its many applications in various industries.

In our study, we looked at how ERP systems are used in various business operations and how they contribute to improving the efficiency of companies. Artificial intelligence is central to ERP, providing a valuable flow of information and automating routine tasks. Natural language processing and machine learning methods are actively used to improve and optimize ERP systems.

Today, AI has become an integral part of our daily lives, opening up huge horizons for our future development. We actively use it, without even noticing it, in a wide variety of fields.

The Enterprise Resource Management System actively uses artificial intelligence in its applications and successfully integrates it into various business areas. For example, AI helps to track production schedules, purchase components, optimize interaction processes on platforms, and automatically generate feedback.

The development of artificial intelligence has become a real breakthrough in the business world, especially in the field of enterprise resource management. Although there are currently only a small number of ERP applications based on AI, research in this area is actively continuing.

In future works, the author plans to focus on other aspects, such as the integration of the digital platform, evaluation of its effectiveness and business intelligence.

The author's contribution

Conceptualization, methodology, practical implementation of the project.

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Data Availability Statement

The data is contained in the article.

Conflict of Interest

The author declares that he has no conflict of interest.

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