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INDUSTRY 5.0 AND OPPORTUNITIES FOR USING ARTIFICIAL INTELLIGENCE IN BUSINESS PROCESS MANAGEMENT

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Abstract

The article summarizes various scientific data to determine how artificial intelligence and advanced digital technologies interact and how they contribute to the advancement of Industry 5.0 to a new level of industrial development. In line with the Industry 5.0 paradigm, the research aims to explore the revolutionary effects of combining cutting-edge digital technologies and artificial intelligence in intelligent manufacturing. The problem is that in today's economic conditions, we are not yet ready to fully entrust business process management, and even more so the decision-making procedure, to artificial intelligence. The article presents a new vision of the results of using advanced digital technologies combined with artificial intelligence, the interaction of which allows you to increase productivity, efficiency and efficiency of business process management. The results presented in this article will be of interest to companies seeking to use advanced digital technologies and artificial intelligence to optimize business processes and increase production productivity.

Keywords: Industry 5.0, advanced digital technologies, artificial intelligence, intelligent manufacturing, business processes.

Introduction

Industry 5.0, defined by the seamless integration of cutting-edge technologies into production processes, is the pinnacle of human-machine collaboration in the relentless pursuit of industrial excellence. The synthesis of artificial intelligence (AI) and advanced digital technologies is key to this progress, as their combined energy can transform intelligent manufacturing. In the context of Industry 5.0, this study is aimed at studying the relationship between the integration of advanced digital technologies and artificial intelligence and their significant impact on business processes and the efficiency of intelligent production.

Industry 5.0 heralds a new era in which people will interact with gadgets that support cutting-edge digital technologies, and an AI-powered ecosystem based on creativity, efficiency, and flexibility. At the center of this transition is a combination of artificial intelligence as a cognitive center capable of analyzing vast amounts of information, and advanced digital technologies represented by a vast network of connected devices. The processes of data collection, analysis and decision-making in real time became possible due to their integration, which affected the optimization of



business processes and rational allocation of resources, and ultimately led to the expansion of the possibility of intelligent production [1, 2].

At the current stage of development of advanced digital technologies, there are many different opinions on the introduction and use of artificial intelligence in production processes. So, in the study presented by Sokolov I. S. and Galdin A. A., artificial intelligence is explained as a tool that works autonomously, significantly different from human thinking, and in the near future will be successfully used in various spheres of human life [3].

In addition, according to Fedotov A.V., artificial intelligence is a "super-machine" that has the ability to independently develop and make decisions, without being guided by models and sets of rules previously provided to it for processing [4, 7].

Despite the fact that research on the possibilities of using artificial intelligence has been conducted since the 1970s, however, it has gained particular interest among enterprises and consumers only in the last ten years. This is primarily due to the search for ways to optimize costs in business process management and successful investment in AI, which affects the development of intelligent production [5, 7, 8].

The purpose of this study is to show the positive effect of the interaction of advanced digital technologies and artificial intelligence in decision – making and in the effectiveness of managing business processes that contribute to the transformation of the company's activities and the level of its productivity and competitiveness.

Despite the numerous opinions of various experts in the application of AI, the issue of combining AI and advanced digital technologies for making intelligent decisions in the development of Industry 5.0 remains open. In this regard, the scientific novelty of this study is to demonstrate the positive effect of integrating advanced digital technologies and artificial intelligence into intelligent production.

The study used expert assessment methods to summarize data demonstrating various directions and effects of integrating advanced digital technologies and artificial intelligence for making intelligent decisions.

The research is based on the use of analytical data processed by artificial intelligence, as well as data obtained using advanced digital technologies. This study will allow companies to make the right choice in the direction of actively using a combination of advanced digital technologies and artificial intelligence in the business process management system, leading to the transformation of Industry 5.0 [9, 10].

Materials and Results of the Study

As industries are now becoming more and more integrated into a common big data management network, there is an urgent need to combine the efforts of using advanced digital technologies and artificial intelligence in the decision-making process, ensuring a sufficiently high level of productivity, efficiency and overall speed. The interaction of these technologies will allow us to study their impact on real business processes using expert assessment methods.

The transformation of production processes towards Industry 5.0 is impossible without a combination of advanced digital technologies and artificial intelligence, which act as effective tools for optimizing business processes, autonomous management and service forecasting.



The data analysis was based on the following criteria:

1. Intelligent manufacturing using advanced digital technologies:

Advanced digital technologies have a direct impact on the transformation of existing business processes into intelligent production. They allow you to connect physical systems and devices, making it easier to collect and transmit data in real time. The development of digital technologies opens up opportunities for improving the monitoring, control and efficiency of business process management [11, 12].

2. AI in production:

In the manufacturing industry, there is a sharp increase in the use of artificial intelligence, especially in the field of machine learning and deep learning. Artificial intelligence (AI) allows systems to independently evaluate large amounts of data and make judgments, which contributes to improving the efficiency of business process management, cost optimization, and predictive maintenance [13].

3. Integration of advanced digital technologies and AI:

Combining cutting-edge digital technologies and AI has become the driving force behind Industry 5.0. AI collects, analyzes, and interprets data from digital devices to enable independent decision-making based on the data obtained. The result of such synergy in intelligent production facilities is increased efficiency and flexibility of decisions made [14, 15].

4. Efficiency of business process performance and manageability:

A significant increase in productivity is one of the main advantages of integrating advanced digital technologies with artificial intelligence. With real-time data analysis, you can make proactive changes to business process management, minimizing downtime and maximizing the use of available resources.

5. Product quality improvement:

Through real-time forecasting and monitoring, modern digital technologies and artificial intelligence help to improve the quality of manufactured products. Manufacturers are able to detect defects at early stages of the production process, which leads to an increase in the quality of finished products [15].

6. Coordination of the decision-making process:

Data-driven intelligent decision-making is carried out by bringing decision-making processes in line with information obtained as a result of the use of advanced digital technologies and analysis conducted by artificial intelligence. This synergy ensures that decisions made in real time are linked to the company's strategic goals [11].

7. Implications for Industry 5.0:

In intelligent manufacturing, the use of advanced digital technologies and artificial intelligence not only increases the operational efficiency of business processes, but also contributes to the



successful development of companies in the era of Industry 5.0. This combination of technologies gives an advantage over competitors in a constantly changing industrial environment [16, 17]. The criteria highlighted here address important areas where such technology integration has the potential to increase the productivity, efficiency and competitiveness of the industrial sector. To ensure the reliability of the study, standardized data collection methods, proven artificial intelligence algorithms, and a methodological approach to analyzing the decision-making process are used. The results of the study were obtained on the basis of experimental measurements made at one of the industrial facilities.

Let's consider the main stages of the study.

Stage 1. Data collection. The main source of data is provided by advanced digital devices integrated into an intelligent production environment. Real-time data collection includes characteristics, equipment condition, and production efficiency. Sensors and equipment that support advanced digital technologies, thoughtfully located throughout the production area, provide the required data.

At the same time, analytical systems controlled by artificial intelligence analyze data obtained by means of advanced digital technology devices. These systems use deep learning models and machine learning algorithms to find patterns and obtain information used in the process of making intelligent decisions. Methods such as documentation analysis, expert surveys, and observations are used to collect data. These include decisions made in response to information received from advanced digital devices and suggestions based on artificial intelligence, as well as the timing and alternatives underlying these decisions [16].

Stage 2. Planning experiments. The current study has an experimental plan with stages before and after implementation. So, data collection occurs at the pre-implementation stage in the current industrial environment, after which advanced digital technologies and artificial intelligence are integrated, during which data collection continues throughout the entire post-implementation stage. As a result of the study, the integration effect obtained through the joint interaction of these technologies is recorded.

Stage 3. Data analysis. Based on the collected quantitative data, using statistical analysis, hypotheses are tested and a descriptive assessment is made of how the integration of advanced digital technologies and artificial intelligence affects the quality of manufactured products, production efficiency and optimization of business process management. Percentage changes are calculated to determine statistical significance in the current study.

On the other hand, content analysis techniques are used to study high-quality data in order to identify repetitive data and patterns in how decision-making methods coincide with AI-based recommendations and ideas obtained using advanced digital technologies.

At the end of the study, the following results were obtained:

1. Data analysis of devices used by advanced digital technologies and related to intelligent production shows positive changes in the production process. Thus, the duration of the production cycle was slightly reduced from 12 to 11 hours, which indicates more efficient production planning. However, the largest increase was recorded in production efficiency, which on average increased from 92.3% to 93.7%, which is 1.52% more than expected. This percentage change



indicates a favorable impact of the integration of advanced digital technologies and artificial intelligence on production efficiency [18].

2. According to the results of the analysis of data obtained in the course of product quality control using artificial intelligence, its noticeable improvement is also observed. After integrating advanced digital technologies and AI into the production process, the average number of detected defects in a product was reduced from three to two, indicating a more accurate quality control procedure. Quality indicators improved by 0.76%, on average from 92.4 to 93.1. The positive impact of quality control using artificial intelligence on compliance with strict product quality requirements is confirmed by this percentage change [18].

3. Analysis of production efficiency indicators showed a significant increase in productivity and efficiency. After implementation, the percentage of production efficiency increased from 91.2% to 92.3% in the morning shift and from 92.1% to 92.6% in the afternoon shift. This improvement is indicative of improved productivity on both shifts. In addition, following the implementation of the system, the production volume increased from 415 to 423 units in the day shift and from 420 to 428 units in the morning shift. This growth highlights the benefits of integrating advanced digital technologies and artificial intelligence for manufacturing and improving its efficiency [18].

It should be noted that the presented research results in the context of Industry 5.0 show us that a noticeable improvement in the production environment in such key areas as product quality and production efficiency could not have been achieved without the joint use of advanced digital technologies and AI.

Conclusions

In Industry 5.0, a study showed that for fast data processing and interpretation in real time, as well as autonomous decision-making, the specific effect of sharing advanced digital technologies and AI is emphasized. In the future, we can witness the transformation of Industry 5.0 in the field of intelligent manufacturing and human-machine interaction.

In modern conditions of digitalization, the synergistic effect of sharing advanced digital technologies and artificial intelligence demonstrates:

- ability to reduce the number of errors when processing a large data set;
- reducing the duration of work performed;
- maximum increase in labor productivity;
- a positive impact on the decision-making process and the effectiveness of business process management.

Based on the identified positive effects of sharing cutting-edge digital technologies and artificial intelligence, it should be assumed that in the future this will completely change the 5.0 Industry.

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