Artificial Intelligence and Big Data as Tools to Optimize the Enterprise Management in the Conditions of Global Digital Transformations

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Abstract

In the article, features of development of modern digital technologies used to optimize the enterprise management are studied. The main measures for optimizing the enterprise management based on the use of the AI and Big Data have been formed. Based on the study of the theoretical basis, stages of implementing AI-based technologies into the enterprise management have been developed. The impact of digital technologies (outsourcing, e-commerce) on optimization of the enterprise's business processes has been determined. Urgency and necessity of implementing digital technologies at Ukrainian enterprises to ensure their competitiveness and optimize production processes has been substantiated. The algorithm for diagnosing effective implementation of digital tools in the enterprise management has been determined. Modern trends in the AI use in enterprise activities have been studied.

Keywords: Artificial Intelligence, Big Data, E-Commerce, Outsourcing, Digital Marketing, Digital Logistics, Managerial Decision-Making, Management, Enterprise, Digitalization, Digital Technologies.

Introduction

Modern conditions of the increased competition require enterprises to find new methods and ways to increase their efficiency. In this aspect, development of digital technologies and using the artificial intelligence is one of the progressive methods of developing business processes, ensuring competitiveness and adapting enterprises to changing environmental conditions. Introduction of digital technologies into social processes contributes to restructuring business models of companies, which in the future will concern all enterprises. Since in the conditions of increased competition, it is precisely innovative processes that are the driving force for success in the long term. Transition to the innovative model of forming business structures is currently one of the main directions for ensuring their development for most enterprises. However, today this transition is quite difficult for enterprises, since there is no single approach to the analysis and assessment of innovative

development, procedures for using artificial intelligence, Big Data and cloud technologies, which requires development of appropriate programs to ensure competitiveness.

The purpose of the article is to investigate the use of the Big Data and artificial intelligence as tools for optimizing enterprise management in the context of global digital transformations.

Literature review

Research on the directions of implementation of technologies based on the AI and Big Data is widely covered in works of the leading scientists.

Miao Chang et al. (2025), Tian Zhen (2024). Wu Weizheng (2025) analyze how artificial intelligence contributes to the energy management and optimization of financial costs in hybrid manufacturing enterprises, features of optimizing enterprise complaint management systems based on the artificial intelligence, and challenges in risk management processes and optimization of corporate projects are highlihted. Klich Leszek et al. (2025), Yang Huabinet al. (2025), Wu Liangzheng et al. (2025) focused their research on studying optimization and integration of the enterprise resource management based on the AI use, investigated the optimization of the development system of economic indicators in project management, and also proposed the model for the carbon footprint management of the electric power industry based on the use of artificial intelligence technologies.

Zhang Xiayi et al. (2025), Cao Zhihao (2025), Liu Man et al. (2025), Shkarlet S. et al. (2019)consider the use of algorithms of the stochastic frontier analysis to optimize the corporate capital structure, application of the blockchain technology and optimization algorithms in the enterprise supply chain management, optimization of the enterrise digitalization of the human resource management, and financial services markets of the Eastern Europe in the context of digital change.

Articles Zhang Jun et al. (2025), Zhang Jing (2025), Zhou Tingting (2025), Dubyna M. et al. (2025) are devoted to building the linear regression model and optimizing the path of digital transformation of financial management of the enterprise, developing the optimization model and assessing risks of the management mode of the enterprise's supply chain, optimizing the enterprise's management accounting, and analyzing the AI role in the insurance market development.

Yi Jing et al. (2025), Wang Sujuanet al. (2025), Reznik N. et al. (2025), Marhasova V. et al. (2023)investigated the strategy of coordination and optimization of the C2B supply chain of the enterprise for the e-commerce management in the Internet of Things, proposed the model for optimizing financial management of the enterprise, outlined ways to optimize logistics business processes, and analyzed the impact of digitalization on sustainable development of Ukraine.

Wang Dalin et al. (2024), Lei T. et al. (2024), Stopková M. et al. (2024), Cosmulese C.G. et al. (2019) investigated optimized strategies of the cash flow management of enterprises based on the Big Data analysis, proposed the optimization model and carried out the dynamic analysis of the inventory management in manufacturing enterprises, developed the optimization criteria for effective inventory management in the industrial enterprise, and also investigated the impact of the digital revolution on the education system of EU countries.

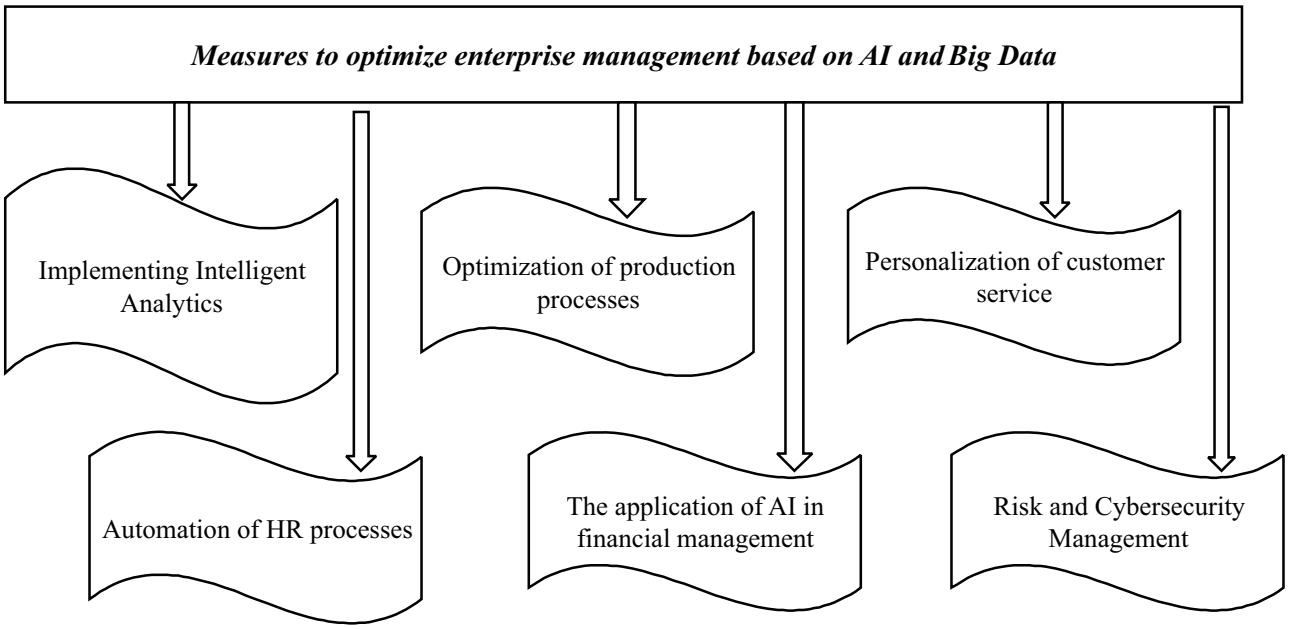
Cao Jian et al. (2024), Zhang Li-Sen (2024), ZhongJuanfang et al. (2024), Hu Haiboet al. (2024)are devoted to the study of optimization of management decisions based on machine learning and application of intelligent algorithms in enterprise management systems, using of cloud enterprise resource planning systems, enterprise management based on the particle swarm optimization algorithm are analyzed, and the path to optimize the blockchain technology in economic and financial management of the enterprise is investigated.

However, today the issue of using digital technologies, including the AI and Big Data, in activities of enterprises, require more in-depth research, as they significantly optimize business processes and are relevant for implementation.

Results

Introduction of digital technologies is an important component for enterprises directed to optimize their activities, as they are aimed at reducing costs, accelerating processing of large amounts of data, and increasing labor productivity. In modern conditions of transformation, it is the use of the AI technologies that have the ability to optimize all aspects of production activities. Dynamic development of the modern world economy, despite the crisis phenomena associated with restrictions (COVID -19, economic instability), is characterized by the increase in the volume of information, which affects the speed of its processing and leads to conclusion of managerial decisions. In this aspect, it is the AI and data-processing technologies (Big Data) is the basis for optimizing the enterprise management, ensuring increased efficiency and flexibility of its operation. The main measures for implementing these technologies in the enterprise are presented in Fig. 1.

Figure 1. Main measures for optimizing the enterprise management based on the use of the AI and Big Data



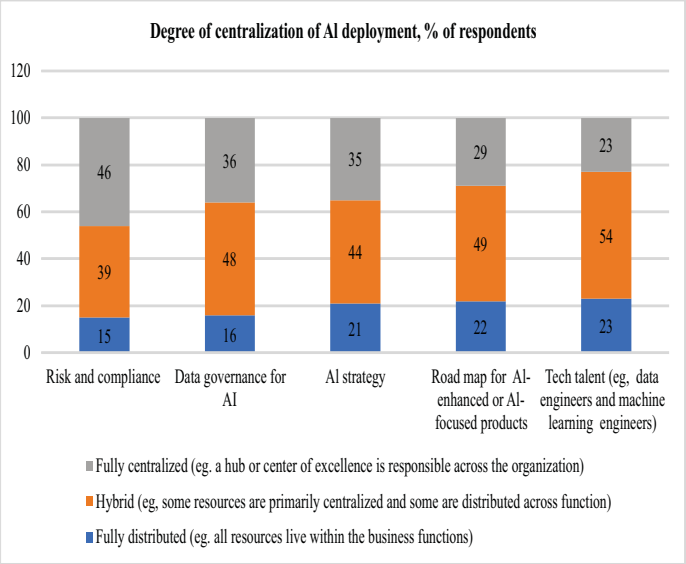
Source: compiled by the authors.

The main measures to optimize the production management include implementation of intelligent analytics tools used to make management decisions. Business intelligence systems are being implemented to analyze large amounts of data. Intelligence, which are based on the AI and is able to quickly process large amounts of data in real time. Forecasting using the Big Data analytics, taking into account multifactorial nature of processes, which allows for more accurate risk-based forecasts.

Implementation of the production management technologies using the AI algorithms can identify bottlenecks and optimize supply chains. To increase the service life of production facilities, forecasting systems of technical re-equipment are used in production, which allow early detection and prevention of equipment breakdowns. Various systems are used to check the product quality, which allow this to be determined in real time.

Analyzing the survey results, companies form the AI implementation models in different ways. By minimizing and eliminating risks, companies mostly use a fully centralized model, such as a center of excellence. In the context of the AI implementation, they more often use the hybrid or partially centralized model (Fig. 2).

Figure 2. Centralization in the implementation of the artificial intelligence in activities of enterprises

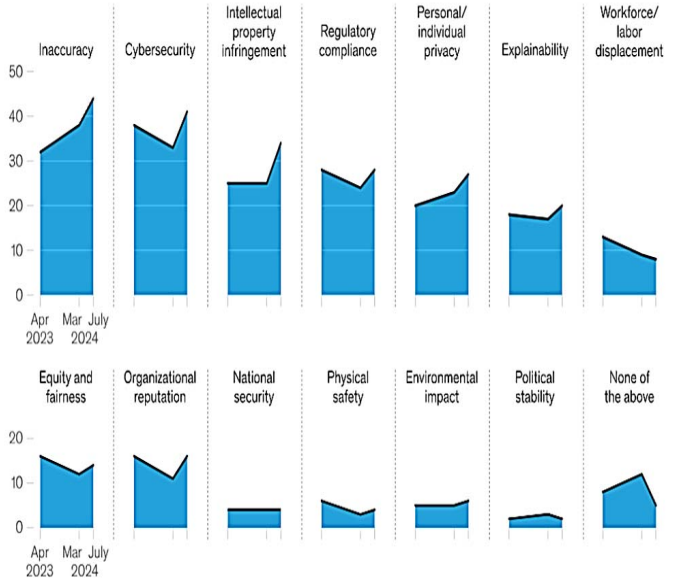


Source: McKinsey & Company (March 12, 2025)

In the customer- centric environment, most companies focus on consumer needs to form a market offer. To obtain data on consumer preferences, data is collected and analyzed to adapt products and services. To improve service, chatbots and personal assistants are used, which communicate with customers 24/7. Large companies use the AI algorithms to form personalized commercial offers. Implementation of these measures is not possible without appropriate staffing. Today, in HR technologies, testing methods and resume screening are actively used, which significantly automates and simplifies recruitment. To optimize work and increase labor productivity, internal analysis systems are used that allow identifying strengths and weaknesses in staffing, reserves for increasing labor productivity. Using the AI, individual training programs can be formed both to improve the level of qualification in specialization and to train in digital technologies.

The main risks that arise in enterprises when using the AI technologies are inaccuracy, cybersecurity and violation of intellectual property rights. That is why methods and algorithms for minimizing these risks are of utmost importance to eliminate negative impact on the enterprises' performance (Fig. 3).

Figure3. Features of solving problems related to the artificial intelligence technologies, % of respondents

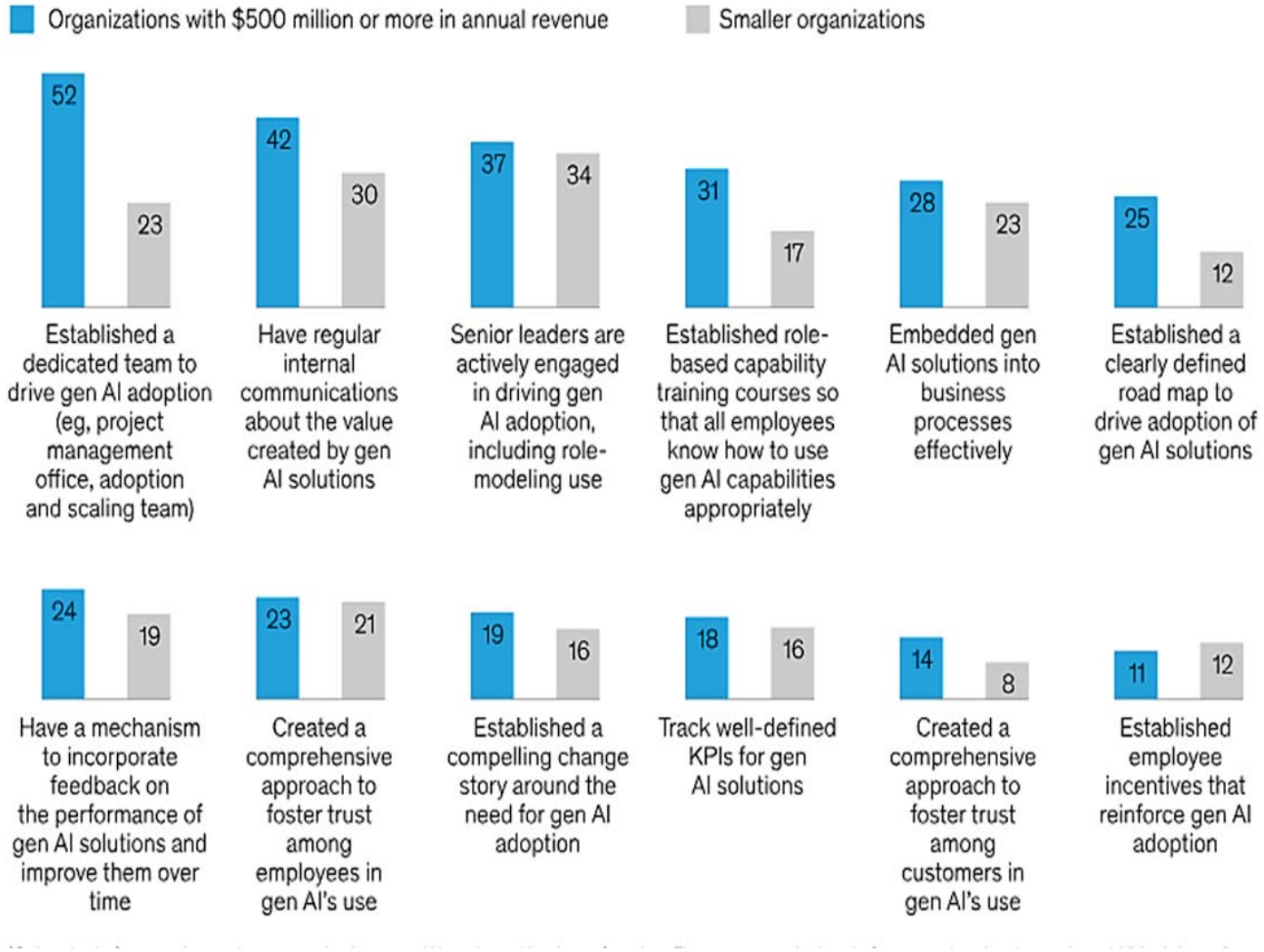


Source: McKinsey & Company (March 12, 2025)

The AI systems for financial management are actively used at enterprises, which solve issues of budgeting, optimizing cash flows, modeling financial development of the enterprise, taking into account the influence of external factors (inflation, currency fluctuations). If for large enterprises and financial institutions, these technologies, by tracking anomalies in algorithms, can detect fraudulent actions and prevent them in time. Digitalization and implementation of the latest technologies are not possible without using effective software to prevent cyberattacks, since protection of personal data and trade secrets is one of the key aspects of ensuring competitiveness. Banking and financial institutions actively use the AI programs to assess creditworthiness of clients, which significantly reduces the risk of non-return of funds.

It should be noted that large enterprises have begun to develop roadmaps to stimulate implementation of the AI-based solutions and are implementing measures aimed at stimulating the AI implementation (Fig. 4).

Figure 4.Directions for training employees using the AI technologies in large and small enterprises, % of respondents



Source: McKinsey & Company (March 12, 2025)

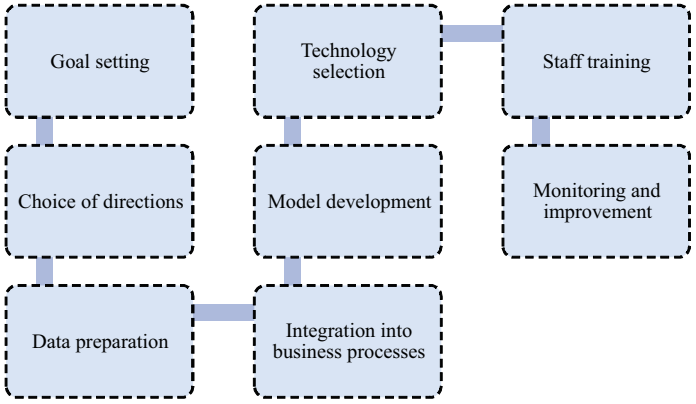
Domestic enterprises are faced with the problem of low digital culture, which requires organization of training for personnel using digital technologies, development of internal policies on the AI tools with the emphasis on the ethics of use. In general, relevant stages of implementation of the AI and Big Data for the production optimization (Fig. 5).

The first stage includes setting goals and determining current state of the enterprise, since depending on the resource capacity, it is necessary to form directions for implementing digital solutions (optimization, automation, increasing labor productivity, etc.).

The second stage is characterized by selection of areas for automation of production and economic processes with determination of expected results from their implementation.

The third stage is implemented based on formation of the information and analytical basis, which must be structured, ensured and preserved. Based on this prepared basis, models for the AI systems are trained. Depending on the formed base of analytical tools, machine-learning technologies (systems, platforms) are selected.

Figure 5.Stages of implementing the AI technologies in the enterprise management

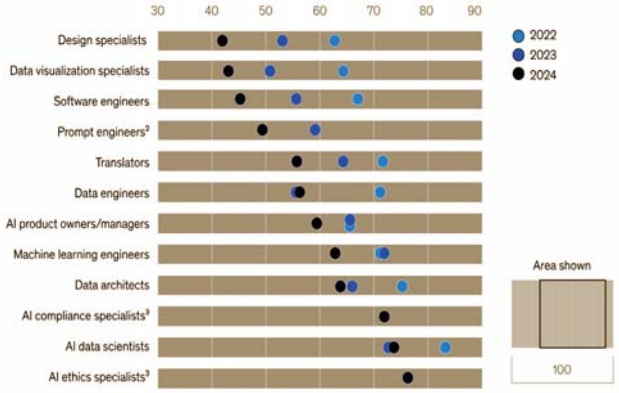


Source:summarized by the authors

After the training stage, models are developed and tested, which can be based on prototypes or a controlled environment to verify the adequacy and effectiveness of the developed model. If the testing is successful and the model is recognized as working, the next stage is the integration of models into business processes. Such implementation occurs gradually in the real environment, which allows changes to be tracked in a timely manner. To do this, it is necessary to have personnel who can work with new tools and technologies, which requires enterprises to respond in advance to the need for training and training such personnel. In general, the problem of most domestic enterprises (especially industrial sectors) is the difficulty of implementing a new corporate culture based on innovative principles of developing relationships and understanding business ethics. The last stage includes monitoring and improving the implemented models depending on changes and needs of the business environment. Timely identified shortcomings allow minimizing negative consequences and implementing appropriate solutions to stabilize the situation.

The modern business environment is undergoing significant changes under the influence of AI technologies, which significantly affects the transformation and optimization of business activities. The integration of AI into the activities of enterprises allows not only to increase the efficiency of work at the current stage of operation, but also to ensure strategic development, helping to identify new opportunities, adapt to changes in demand and respond to market challenges. Data processing specialists are in significant demand, which are currently lacking in most enterprises (Fig. 6).

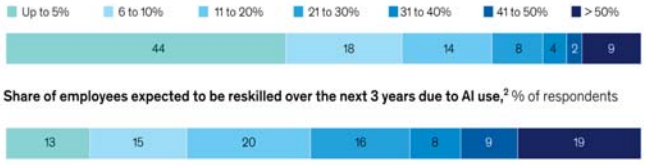
Figure 6. Demand for specialists in various areas of the activity using the AI, % of respondents



Source: McKinsey & Company (March 12, 2025)

Given current challenges of rapid development of the AI technologies, company leaders note that they are actively engaged in retraining employees within the framework of the AI implementation (Fig. 7).

Figure 7. Retraining employees within the framework of the AI implementation, % of respondents



Source: McKinsey & Company (March 12, 2025)

There is a certain range of digital tools that companies use depending on their needs (field of activity, company size, market segmentation). Active development in digital technologies has been achieved in the areasas follows: e-commerce and outsourcing.Table 1 shows the share of Ukrainian enterprises conducting Big Data analysis out of the total number of enterprises by sources and analysis methods in 2024.

Table 1. Share of the number of Ukrainian enterprises conducting "Big Data" analysis of the total number of enterprises by sources and methods of analysis, 2024

	Share of the number of enterprises conducting "big data" analysis of the total number of enterprises, %	*Of them*									
		by sources, %								*by methods of analysis, %*	
		data analytics on data from transaction records such as sale details, payments records	*data analytics on data about customers such as customer purchasing information, location, preferences, customer*	*data analytics on data from social media, including from enterprise's own social media profiles*	*data analytics on web data*	*data analytics on location data from the use of portable devices*	*data analytics on data from smart devices or sensors*	*data analytics on government authorities' open data*	*data analytics on satellite data*	*employees of the enterprise*	*by other enterprises or organizations*
Manufacturing	14,1	6,4	5,3	5,8	4,1	4,6	2,7	7,9	2,1	17,4	6,0
Manufacture of food products, beverages and tobacco; textile production, production of clothing, leather, leather products and other materials; manufacture of wood, paper and printing activities	17,0	7,3	6,3	7,5	5,0	6,2	3,6	9,3	3,0	20,6	7,5
Manufacture of coke and refined petroleum products; production of chemicals and chemical products; production of basic pharmaceutical products and pharmaceuticals; production of rubber and plastic products; production of other non-metallic mineral products	14,6	6,7	6,2	5,9	5,0	5,7	3,0	8,2	2,1	17,7	4,9
Metallurgical production, production of finished metal products, except for machines and equipment	7,5	4,9	3,1	3,5	2,5	2,9	2,0	4,8	1,5	11,0	5,7
Engineering; manufacture of furniture, other products, repair and installation of machinery and equipment	12,5	5,6	4,2	4,4	2,8	2,4	1,6	6,9	1,1	15,4	4,9
Eelectricity, gas, steam and air-conditioning supply	18,7	9,1	8,0	3,6	4,0	4,7	6,1	12,5	1,1	21,7	8,4
Water supply; sewerage, waste management and remedation activities	12,1	2,9	2,6	3,5	0,7	5,5	3,6	7,3	2,2	15,9	4,5

Source: ukrstat.gov.ua

Today, e-commerce should be considered as a tool that transforms the company's internal and external processes, ensuring effective development of the business model. Implementation of these solutions allows enterprises to automate sales processes, provide personalization with customers, and significantly improve the service level, which has positive impact on competitiveness.

E-commerce systems are effectively integrated with CRM and ERP systems , forming the single digital ecosystem that can ensure transparency of business processes, control over production and interaction between suppliers. Implementation of these technologies allows you to quickly respond to changes in the external environment directed to the assortment policy, marketing approaches, pricing. Using the e-commerce has positive effect on reducing transaction costs, based on reducing the use of physical infrastructure, the paper document flow, and optimizing human resources, which is an important advantage in the conditions of increased competition.

At the same time, despite active development of digital technologies, most enterprises use outsourcing tools, that is, transferring part of business functions to third-party organizations for execution. These actions allow enterprises to pay more attention to the key positions of their operation, and secondary or specific tasks are transferred to third parties. Today, in addition to traditional forms of outsourcing (accounting, legal support, HR technologies), companies use IT outsourcing, which characterizes transfer of development of the appropriate software to third-party organizations. These actions allow enterprises to adapt more quickly to new conditions of digitalization by ensuring cybersecurity , setting up cloud infrastructure by other organizations. These solutions allow significantly reducing time and financial resources for training and education of their own personnel.

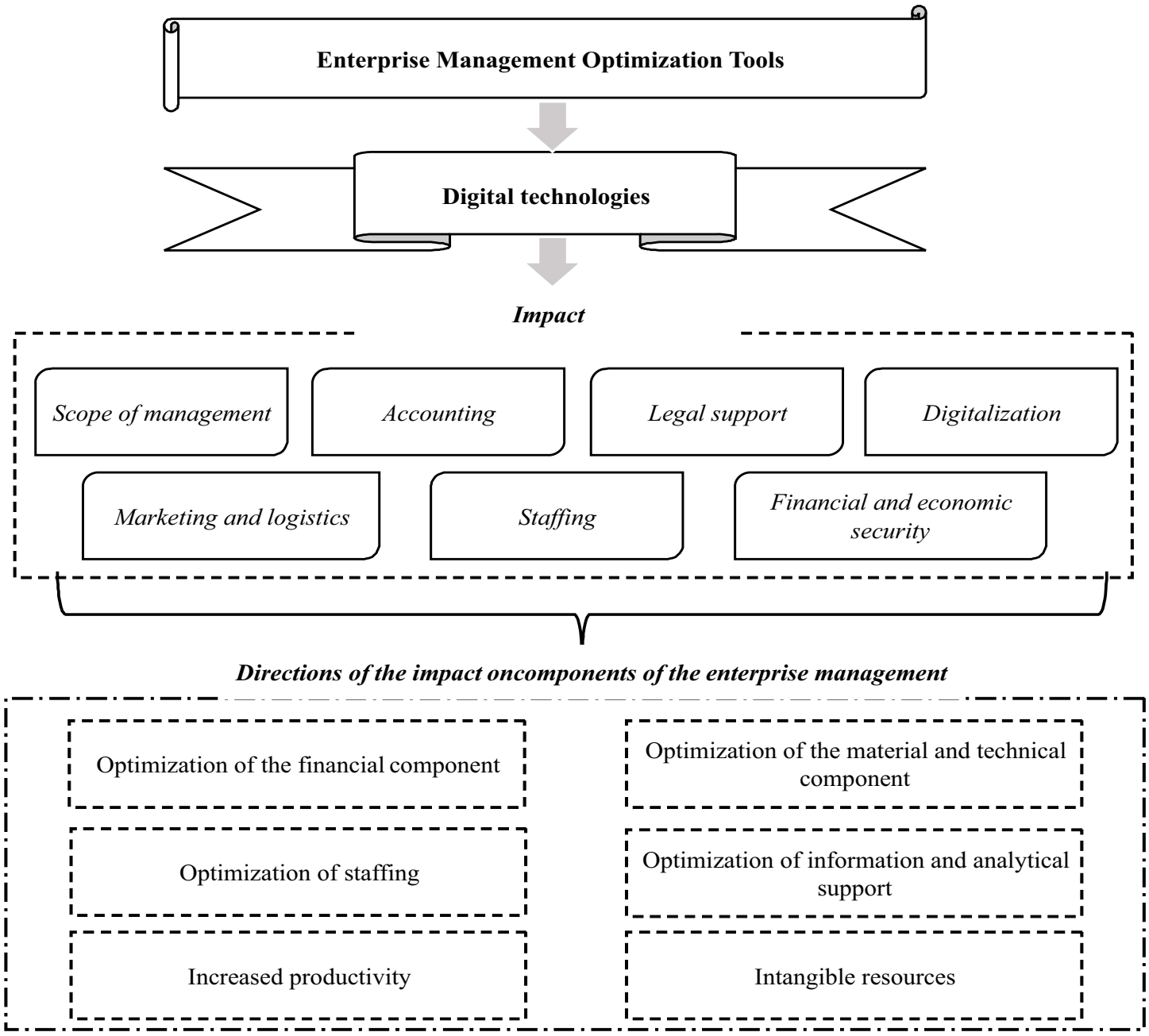
However, it should be borne in mind that effectiveness of these technologies depends on the quality and reliability of partners to whom relevant functions have been outsourced. To ensure competitiveness, enterprises can combine the above-mentioned tools for the purpose of the business efficiency. Combination of these tools allows for flexible scaling of business processes, rapid response to changes in the market situation, minimizing risks associated with human resources, etc. The main tools for optimizing the enterprise management based on digital technologies include the following components (Fig. 8).

Optimization tools can be introduced at different stages of the enterprise's production and economic activities and include the impact depending on the timing of its implementation (tactical plans, strategic, transformational).

Thus, within implementation of tactical plans, the enterprise may encounter a number of problems that need to be resolved, namely: insufficient financial capacity, lack of human resources, low labor productivity. In strategic perspective, the goal of outsourcing is to ensure long-term development of the enterprise, which is implemented based on formation of long-term joint plans, contracts, and business projects.

During this period, the enterprise can optimize its capacities and transfer non-core or unprofitable activities to third-party organizations, and use free funds to activate strategic activities. Using transformational outsourcing is usually carried out at the stage of the enterprise restructuring, when conventional business optimization tools do not work on the required scale.

Figure 8. Impact of digital technologies on optimization of the business process management of enterprises



Source:summarized by the authors

The main advantage of outsourcing for enterprises is cost reduction, which will positively affect the pricing policy and profitability of the enterprise. The advantage of outsourcing is optimizing the use of the resource capacity for the enterprise, which helps maintain competitive advantages. In general, outsourcing services are most often used when attracting external sources is less expensive than training and using internal ones.

At the same time, optimization of business processes is carried out at the expense of free funds that the enterprise invests in key areas, which effectively affects its development. The enterprise that transfers part of its

functions to third parties becomes more flexible and adaptive to changing environmental conditions. In addition, transfer of part of functions to third-party organizations allows you to effectively use their potential due to competencies and experience of specialists who perform these functions.

The main functions that are most often outsourced to third parties include accounting and management accounting, legal services, IT, marketing and logistics, human resources, financial and economic security, etc. That is, these are the functions that can be performed by third-party organizations remotely, which significantly improves effectiveness of these activities.

The impact of outsourcing on business processes is characterized by optimization of the financial component, due to redistribution and control over financial flows, optimization of the budgeting system. Optimization of staffing by saving funds and increasing labor productivity. Transferring certain functions to the external organization that has certain experience and necessary competencies is much more profitable for the enterprise than training its own specialists, taking into account unfavorable circumstances of the external environment.

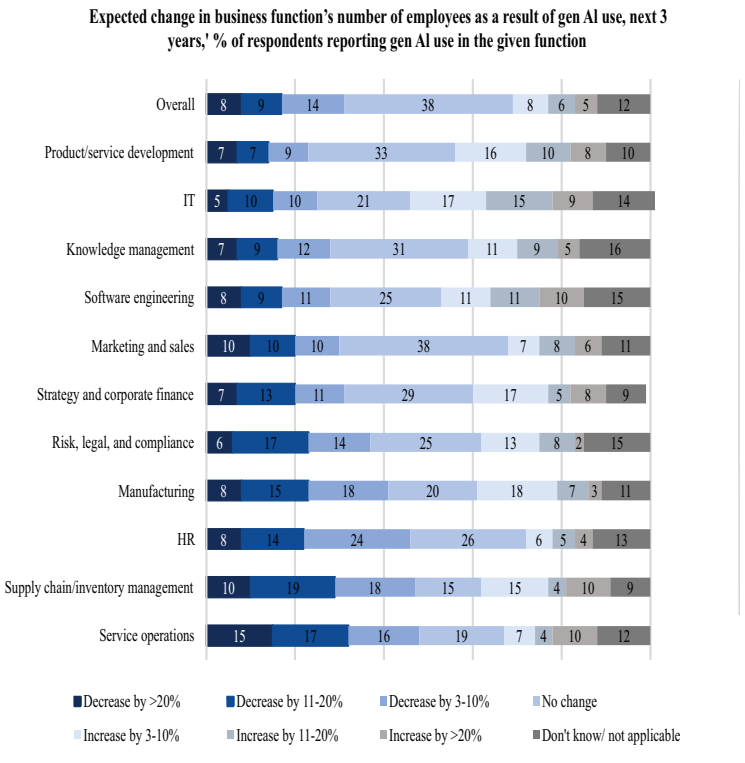
Introduction of digital technologies (AI, Big Data) accelerates data analysis, which has positive effect on making management decisions, both in terms of speed and content. Innovative development is closely related to modernization of the material and technical component of the functioning of enterprises, therefore, due to implementation of the latest technologies in modern production processes and equipment modernization processes, they lead to transformation of all enterprise processes. In the long term, this contributes to the increase in the level of competitiveness and adaptability to external conditions.

The AI technologies transform traditional ways of working, changing not only business processes themselves, but also the role that employees play in organizations. First, this allows you to automate routine tasks, increase efficiency of decision-making, modernize the organizational structure of the enterprise, increase work productivity, improve communications and cooperation between different divisions and departments of the enterprise, etc. (Fig. 9).

Optimization of information resources in times of dynamic development of world economies and open access to global networks is an urgent task. The increase in information flow does not always correspond to the quality and significance of the information received, therefore it is the tools for optimizing information support that will allow managers to make informed management decisions, relying on the speed and accuracy of data processing.

Optimization of intangible resources is primarily associated with improving regulatory and legal support for the use of relevant products and services. The intellectual and human resource potential of domestic enterprises is quite powerful, but imperfections of modern legislation lead to the outflow of qualified personnel and innovators, which negatively affects general trend of development of enterprises and the state as a whole.

Figure 9. Changes in the employee's business functions influenced when using the AI technologies



Source: McKinsey & Company (March 12, 2025)

Therefore, each enterprise using certain digital technologies may encounter certain difficulties and receive corresponding benefits. Thus, advantages of implementing digital technologies at Ukrainian enterprises include the following aspects:

— protection resources by using resources of the third-party organization to perform certain work;

— reducing costs, especially in conditions of limited own resources, by outsourcing some functions;

— flexibility and adaptability to external environmental conditions by optimizing financial capacity, which allows enterprises to be more agile in changing conditions;

— increasing productivity of internal specialists, since automation of significant part of production processes significantly simplifies and speeds up information processing by specialists;

— access to global databases and the latest technologies based on participation in the global economic space;

— improving the quality of business processes is achieved by improving the skills of employees, some of whose functions have been outsourced;

— risk reduction by involving relevant specialists who implement personal data cyber protection programs, and by leveraging competencies of specialists who solve these tasks.

Effective implementation of digital technologies largely depends on reliability and competence of third-party organizations. The higher the experience, competence, and knowledge of specialists, the better the result of the business optimization will be.

Despite significant advantages of using these tools, they have their own certain disadvantages, among which we can highlight:

— risk of the decrease in the quality of business processes due to unscrupulous performers, which may lead to the loss of functions;

— loss of control over delegated functions, since it is quite difficult to constantly monitor the processes performed by third parties, taking into account conditions of transfer of the specified functions;

— reduction of the company's information security, risk of information leakage, as third parties may gain access to personal data and trade secrets, who may use the information obtained for their own benefit or for the benefit of competitors;

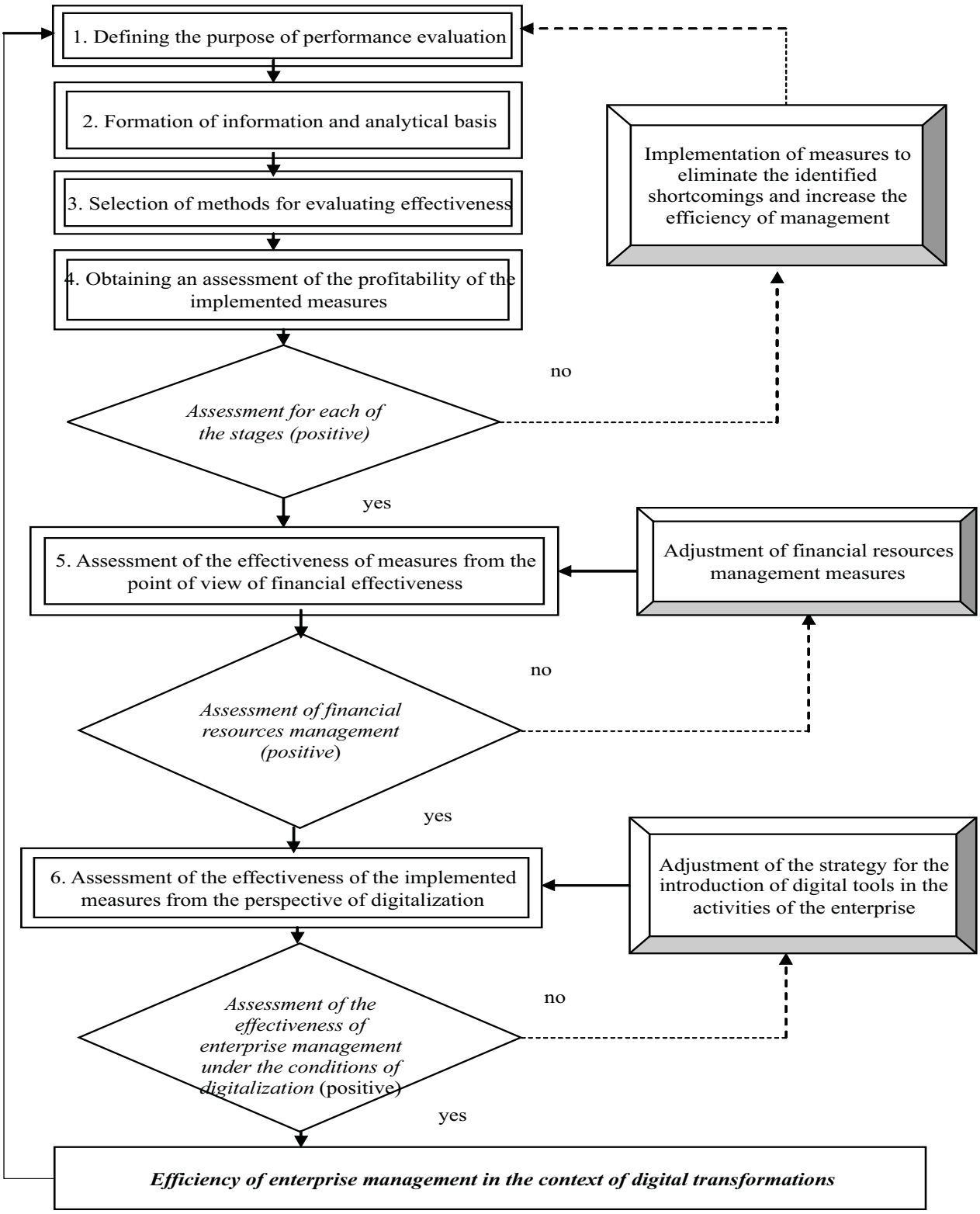
— emergence of dependence on the third-party organization due to importance of the transferred functions, which can affect all key business processes, which can lead to loss of control over the business;

— complication of communication between units that perform outsourcing functions and directly business processes, which may affect the quality and timeliness of obtaining necessary information and responding to it;

— limiting opportunities for professional growth of the company's own personnel due to transfer of key functions to external specialists, which reduces the need for personal growth and acquisition of necessary skills and competencies among employees.

The indicated advantages and disadvantages are of the nature that is more general and can be adapted to the specific enterprise, taking into account various external and internal conditions. To determine effectiveness of the implemented digital tools for optimizing enterprise management, it is necessary to form an appropriate algorithm for diagnosing effectiveness of measures (Fig. 10). The main direction of introducing digital technologies into activities of enterprises is formation of the appropriate business model, which is most often formed from four categories (product development, demand generation, meeting needs, planning and management of the enterprise's activities).

Figure10. Algorithm for diagnosing effectiveness of the AI and Big Data implementation in the enterprise management



Source:systematized by the authors

The proposed algorithm for diagnosing effectiveness of the implemented measures is divided into several stages, which have key points.

The first direction is to determine the purpose of the assessment, since it is on this that interpretation of the results will depend. Thus, the fourth stage is characterized by assessment of effectiveness of the implementation of measures, if the result is positive, then you should proceed to the next stage of the measures implementation. The next key point is effective implementation of directions from the position of optimizing management of the enterprise's financial resources.

If the model efficiency is positive, the next stage includes efficiency of optimization in terms of implementation of digital technologies. If the result is positive, then processes are evaluated after a certain period of time to identify possible deviations from the established performance thresholds.

At the same time, if assessment for each of the stages is negative, then you should return to the first position to eliminate shortcomings and review feasibility of implementing the selected management optimization tools.

At the stage of negative implementation regarding optimization of financial resources, measures are adjusted from perspective of financial performance. Assessment of effective implementation of digitalization technologies based on negative result requires adjustment of the strategy for implementing digital tools in activities of enterprises and business processes. The specified diagnostic algorithm is universal and can be used to assess effectiveness of any economic processes, including those based on the use of digitalization tools.

Conclusions

The conducted research on using digital tools to optimize the enterprise management in modern conditions of global digital transformations allowed us to identify certain features of these processes. Despite the variety of digital tools for improvement and development of enterprises, domestic business is at the stage of implementing these tools in its activities. This issue is especially acute in established industries (industry), due to the lack of financial capacity to implement these measures.

The study of the theoretical basis for optimizing enterprise activities allowed us to formulate the main measures for optimizing the enterprise management based on the use of the AI and Big Data.

Stages of implementing the AI technologies into the enterprise management were substantiated, which allowed us to identify eight stages (setting goals, choosing directions, preparing data, choosing technologies, developing models, integrating into business processes, training personnel, monitoring and improvement).

It was determined that today the most effective measures for domestic enterprises to optimize management are outsourcing and e-commerce. The impact of outsourcing on business processes of enterprises was determined, which allowed us to identify advantages and disadvantages of using these methods to optimize the enterprise management. The main problem of domestic enterprises is low financial capacity, which complicates implementation of innovative technologies, which are the key to ensuring competitiveness. Shortage of the qualified personnel who would have necessary competencies in implementation of digital technologies in optimizing business processes.

The algorithm for diagnosing effectiveness of implementing digital technologies in the enterprise management was generalized, which made it possible to identify risks and threats in more detail during implementation of selected business models in activities of enterprises. Based on the identification of the key control points, management decisions to stabilize the situation and reduce risks of losses are effectively produced.

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