Modernization of E-Commerce and Logistics Platforms of Enterprises Based on Artificial Intelligence Technology

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Abstract. E-commerce systems have become one of the global trends in the current era when large-scale technological innovations are rapidly applied to all fields of activity. In particular, in recent times, the digital transformation of the economy and society has created conditions for the massive replacement of traditional trade with electronic trade. The rapid development of e-commerce has led to the emergence of many modern trends in the activity sectors, the formation of new requirements for e-commerce systems, and the beginning of a new era in logistics and supply chain management. An overview analysis of relevant scientific research works was conducted and the state of problem solving was studied. Providing a personalized approach to customers, optimizing supply chain operations, and responding to customer inquiries in a timely and accurate manner are the problems that await their solution. For this reason, in the presented article, directions for improving the performance of e-commerce systems and optimizing supply chain management processes by applying innovative technologies such as artificial intelligence, the Internet of Things, and big data have been studied. A conceptual model of intelligent e-commerce systems has been proposed based on the application of these technologies. Appropriate recommendations were given for modernizing e-commerce and logistics platforms applied at the national, regional, and enterprise levels based on new digital transformation technologies.

Keywords: *digital transformation, e-commerce and logistics platforms, single window, artificial intelligence technologies*

1. Introduction

E-commerce systems involve the display of products and services to consumers through the Internet and the implementation of the online purchase and sale process. For this purpose, e-commerce systems and platforms based on various models are used. E-commerce systems operate as complex system that includes ICT technologies such as appropriate technical means, software products, Internet protocols, and human resources that enable the automation of numerous operations [1]. These systems, on the one hand, allow buyers to review a wide range of product catalogs offered by various companies and purchase the desired product through online payment at any time, from any location,

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simply by accessing the Internet. On the other hand, it allows enterprises to show their products to more customers at a lower cost, engage in trade on a global scale, and respond more quickly to the modern demands of the market [2]. For this reason, at present, almost many enterprises use e-commerce systems to display their products on the Internet. Thus, the sharp increase in the participants in the e-commerce market has led to the strengthening of competition in this sector, the emergence of new global trends, as well as deficiencies in the existing infrastructure of e-commerce systems [3]. Despite all the mentioned superior features, in the modern era, there is a need for the application of modern technologies such as artificial intelligence, the Internet of Things, and big data analytics in e-commerce to strengthen the position of e-commerce systems and technologies in the international economic arena, as well as to optimize the process of organizing e-commerce activities at the national, regional and enterprise levels. These problems are quite important, their solution is in the center of attention of the society as an urgent issue.

The purpose of the study. The main goal of conducting scientific research is to create a conceptual model for the modernization of information systems and other platforms of innovative production and sales enterprises on e-commerce and logistics based on the application of artificial intelligence methods and technologies, as well as to develop the basis of a scientific-theoretical and methodological approach to the study of prospective development problems. was. Here, on the basis of the wide application of the digital technologies of the Industry 4.0 platform, attention was paid to the development of recommendations on the overall improvement of the e-commerce platforms of enterprises and the modernization of its components. Digital technologies of Industry 4.0, including the application of artificial intelligence methods in various fields, have been studied. Based on the application of digital innovative technologies, the initial version of the conceptual model of the intellectualization of E-commerce systems has been developed.

The importance of conducting research is to transfer them to modern and effective e-commerce systems by improving e-commerce and logistics platforms based on the digital technologies of the Industry 4.0 platform, based on international trends and requirements. Effective management of the sales, logistics, and equipment chain in modern e-commerce systems and logistics platforms of enterprises, optimization of supply chain operations, prompt and accurate response to customer inquiries, and automation of technological processes performed at delivery points by means of IoT technology. Artificial intelligence methods are used to analyze sales records, current trends in the market, current trends in social media, etc. allows to perform intellectual analysis of such data. In this process, the improvement of e-commerce systems based on the principle of a single window with the application of artificial intelligence, a unified customer experience, intelligent search capabilities, customer support, managing customer inquiries of artificial intelligence chatbots, providing real-time support and assisting in the execution of tasks with various customer services, the formation of appropriate solution mechanisms in the processes of demand forecasting, fraud detection, and security assurance can be considered as important issues.

Research methods used. Systematic analysis, data analysis, correlation analysis, econometric modeling methods, multi-criteria expert evaluation method, information theory, algorithmization, CRM systems, artificial intelligence technology, and ICT in the modernization of e-commerce and logistics platforms of innovative production and sales enterprises, in the development of its prospective development directions and so on. such research methods were used.

Research methodology. In the article, the e-commerce and logistics platforms of innovative production and sales-type enterprises and the prospective development directions of their modernization are taken as the object of research.

The issue of effective application of artificial intelligence to e-commerce and logistics platforms is included in the research subject.

A systematic approach was implemented to determine the prospective development directions of the modernization of e-commerce and logistics platforms of enterprises on the basis of artificial intelligence technology. The methodological requirements of the application of the main technologies of e-commerce systems to the development of the digital economy on the Industry 4.0 platform have been taken into account. The scientific-theoretical and methodological foundations of the formation of intellectual systems were used in the development of the conceptual structure model of the intellectual e-commerce system. Methodical proposals and recommendations for increasing the level of stability of e-commerce systems have been developed. Global economic development trends, requirements of high ICT technologies, and methodological requirements of the main trends of the 4.0 Industry platform were also taken into account in ensuring the sustainability of electronic commerce systems.

2. An Overview Analysis of Relevant Related Scientific Research Works and the State of the Problem

E-commerce and logistics platforms of innovative production and sales enterprises increase their operational efficiency. The development of mechanisms for solving the problems of their modernization on the basis of artificial intelligence methods and technologies is distinguished by its importance, modernity, and relevance. Nevertheless, that field has not yet been properly formed. In the scientific literature, there is still no systematic development and multifaceted analysis of its conceptual foundations. Therefore, the existing theoretical and practical aspects of the problems of modernization of e-commerce and logistics platforms of enterprises on the basis of artificial intelligence technology should be further analyzed and researched. It is necessary to study the processing aspects and semantic content of the existing concepts in that field, as well as to study the perspectives and limitations of the transition of production and consumption to a new management system. It should be noted that the authors of the articles, like other researchers, have many publications in this field in different years, in different databases, including in different scientific journals indexed in the MECS database [1-6, 8-16].

In this regard, it should be noted that [4] in the post-coronavirus period, regulation of e-commerce systems and prospective development problems were studied. The advantages that lead to the strengthening of the position of e-commerce in the international economic space have been revealed. The functions of electronic business models corresponding to the commercial stages of the enterprise's activity have been explained. In the article, the issues of the application of modern technologies such as 3D modeling, the Internet of Things, artificial intelligence, and big data in electronic commerce systems were considered. The application characteristics and regulation mechanisms of E-commerce systems, which have a direct stimulating effect on economic growth, in real economic sectors have been investigated.

[5] is devoted to the development of ecobot intelligent conversational agent for e-commerce applications using the Deep learning method. The importance of this research is to reduce the system's human dependency and improve customer support by providing

human-like natural responses using a deep learning method on specially designed data. Here, based on the creation of a common data set that is used for all types of products, the user's intentions during queries are precisely determined by the bot through deep learning.

[6] have conducted studies on QR code behavior on commercial-based platforms using Machine learning. A "quick response" code, or QR code, is designed to quickly decode large amounts of information. Any controlled device, such as a smartphone, can hold it and it is easy to access by simply scanning the 2D matrix code. The dataset is analyzed using machine learning techniques, such as matrix calculus, which is used for the Bayesian algorithm. QR code generation is extended to cover all products. Customers are provided with advantages such as fast, error-free access and the ability to store large amounts of data. Generally, many people use online payment for any transaction and it can be done anytime anywhere. Cash is not a good option for large payments. Therefore, many retailers are joining e-wallet systems and making payments with flexible and faster transactions.

In [12], the trends of expanding the application of IoT technology in the development stages of e-commerce were analyzed. Along with the advantages of applying IoT technology in logistics processes in the e-commerce sphere, the challenges ahead from a technical point of view were also deeply investigated in the research work. An intelligent logistics system architecture based on the application of IoT technology is proposed for the optimization of logistics operations in e-commerce systems.

In [13], it is shown that the application of big data analytics, cloud computing, the Internet of Things, mobile Internet, social media, and other innovative technologies in e-commerce are quite relevant. With the application of these technologies, a unified architecture of intelligent e-commerce systems with higher operational efficiency and greater business opportunities has been proposed. The author has explored the main problems related to intelligent e-commerce systems and made recommendations on possible research directions.

In [14], the current situation of the logistics network in cross-border e-commerce was analyzed in-depth, and detailed information was given about the existing problems. In the research work, the issue of the application of the wide possibilities of artificial intelligence in logistics processes was considered, the effectiveness of the application of artificial intelligence in such directions as optimization of the delivery process, realization of unmanned delivery, intelligent management of the warehouse, intelligent management of transport in both domestic and cross-border e-commerce was carried out.

In [15], a comparative analysis of various logistics models applied in the e-commerce process in North America, Europe, Asia, and other regions and the technical equipment used in the implementation of these models was conducted.

3. Application of the Latest ICT and Artificial İntelligence Technologies in E-Commerce and Supply Chain Operations Optimization

It is known that the massiveness of E-commerce systems requires the collection of large amounts of data. Therefore, the demand for large-scale data processing in the management work of that field has increased [8].

The high demand for protection and management of all this data created by consumers and businesses is also driving the creation and development of data centers built on cloud providers [11].

In addition, one of the most important factors affecting customer satisfaction in the e-commerce sector in modern times is logistics performance. Thus, delays in the delivery of orders and other emerging problems cause great dissatisfaction among consumers. This ultimately leads to the loss of regular customers and a decrease in income. In this regard, one of the most important factors in organizing the efficient operation of e-commerce systems, in general, is the optimal management of the supply chain [14]. Supply chain management refers to the management of all processes from raw materials to product production and delivery of the manufactured product to the end user. These processes include 1) Execution of orders; 2) Inventory management; 3) Transportation; 4) Reception, storage, transportation, and packaging of goods; 5) Establishing a unified logistics network. In order to ensure the implementation of all these processes, Supply Chain Management (SCM) systems integrated into e-commerce systems are used. SCM systems coordinate the activities of suppliers, manufacturers, logistics partners, wholesale distributors, retailers, and end consumers, in short, all participants of the supply chain and control this wide network.

In contrast to traditional logistics, the concept of modern logistics, formed under the influence of the e-commerce environment, has a number of new features. So, if traditional logistics included the organization of inventory, storage, transportation, and distribution, modern logistics takes into account many factors such as operational flexibility, optimal management, technical and technological equipment, and economic efficiency. In this regard, the management of logistics processes to ensure the timely and accurate delivery of orders given by consumers is a very complex issue that requires the implementation of intellectual activity with the application of modern technologies [15].

Today, the Internet of Things technology, which is widely used in "smart" homes, transportation, health care, agriculture, military, commerce, and other fields, is a dynamic distributed environment and includes intelligent devices that can understand the processes happening around. The application of IoT technology in e-commerce, which enables the creation of a single infrastructure that connects all objects within the organization, plays an important role in improving logistics services, which are an integral part of the e-commerce process in particular [12]. Thus, thanks to IoT technology, interconnected physical devices record data related to physical processes occurring in the environment through special sensors and transmit those data to cloud resources for processing via wireless communication. Here, the process of obtaining information from raw data is carried out using big data analytical processing methods. Based on the resulting useful information, those physical devices can make automatic decisions, as well as interact with each other and people in real-time. The real-time analysis of the data obtained about the condition of the product at various stages of the supply chain allows the enterprise to ensure the transparency of the logistics process and minimize possible threats and cases of fraud. Also, by equipping products with special IoT tags, consumers have the opportunity to dynamically track the movement of their parcels [12]. At the same time, IoT technology enables the automation of processes performed at delivery points and thus allows to minimize of a number of problems such as incorrect placement of products in the warehouse, slow and incorrect delivery of the order, and incorrect packaging.

4. Prospects of Application of Artificial İntelligence Technology in E-Commerce and Logistics Systems

In modern times, artificial intelligence is one of the most widely used technologies in creating innovative mechanisms aimed at optimizing and improving operations performed not only in logistics but also in e-commerce as a whole. Thus, with the application of IoT technology, a very large amount of raw data is collected from various sensors, as well as from various other sources, and the only way to benefit from these data is their intelligent analysis. This can only be done with the application of artificial intelligence technology methods such as machine learning and deep learning methods. The application of this technology in logistics platforms, which involves the creation of intelligent computer systems that can think like humans, and perform human-like behavior such as problem-solving, decision-making, and reasoning, allows for improvements in the following areas:

- *Demand forecasting and inventory management.* Artificial intelligence allows for intellectual analysis of data such as sales records, current trends in the market, current trends in social media, etc. This, in turn, allows SCM systems to more accurately predict market demand and determine the amount of inventory corresponding to that demand. Such optimal inventory management allows for ensuring the constant availability of goods in high demand, as well as avoidance of unnecessary loading in the warehouse [16].

- *Real-time route optimization.* Through the application of machine learning and deep learning methods, determining the optimal route for delivery is ensured by taking into account a large number of different factors such as road conditions, weather conditions, priority destinations, vehicle capacity, etc. This allows to increase efficiency in logistics operations. Due to the continuous processing and analysis of data collected from various sources (sensors, systems) in real-time, the system dynamically generates the optimal route. This allows to reduce transportation costs and increase customer satisfaction. Thus, the system allows dispatchers to adapt to changing conditions and make informed decisions, significantly increasing the efficiency of distribution and also reducing traffic congestion [14].

- *Supplier Management.* Based on various indicators, intelligent assessment of the service quality of suppliers, and analysis of positive and negative trends in their activity, it is possible to identify reliable suppliers and predict potential disruptions in activity or quality-related problems in advance. This enables proactive management of suppliers in general by preventing potential risks, improvement of cooperative relationships established with suppliers, and selecting reliable suppliers.

- *Equipment optimization and maintenance forecasting.* Artificial intelligence can be used to monitor the performance of vehicles, machinery, and other logistics equipment, as well as technical failures. Intelligent analysis of data generated by machines, collected from various sensors and technical records with the application of machine learning algorithms will enable the prediction of potential technical failures that may occur in equipment operating in the warehouse, logistics, and production processes, as well as maintenance needs, and optimization of maintenance schedules. Thus, it is possible to minimize unexpected downtime due to technical failure in the work process, increase equipment reliability and optimize maintenance costs [17, 18].
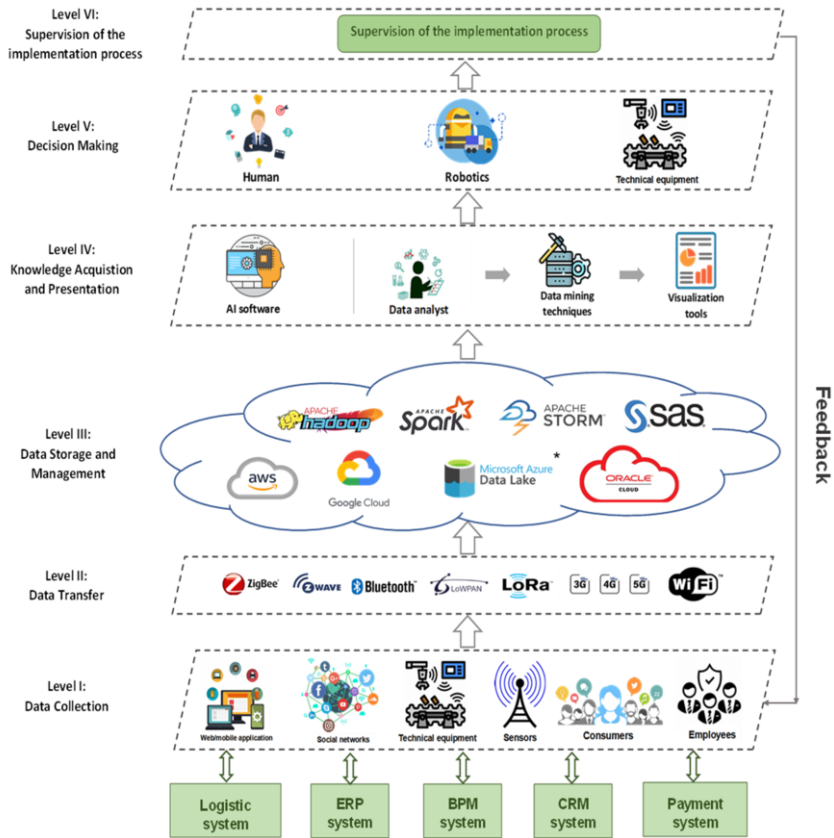
Fig. 1. Conceptual model of an intelligent e-commerce system

5. Conceptual Model Of Intellectualization of E-Commerce Systems

The rapid development of modern technologies and their application in e-commerce and logistics systems allow the intellectualization of traditional e-commerce systems. Due to the joint application of big data, the cloud, the Internet of Things, artificial intelligence, and other innovative technologies, a modern and intelligent e-commerce model with features such as high operational efficiency, intelligent information processing, and decision-making is being formed [13]. Taking into account the mentioned possibilities and perspectives, the conceptual model of the modern intellectual e-commerce system was developed as shown in Figure 1.

In the presented conceptual scheme, the architecture of intelligent e-commerce systems (IES) is described from the point of view of data flow. Here, the processes of converting data collected from various sources into information, information into knowledge, and making and applying decisions based on knowledge are reflected. In this regard, the conceptual scheme of IES has been built on a 6-level architecture:

Level I: Data Collection. This is the lowest level. According to the scheme, the data collected during the activity of the e-commerce ecosystem are mainly generated in the various subsystems that make up it. Thus, data comes from various subsystems, as well

as web/mobile applications, social media, hardware, sensors, mobile devices, consumers, employees, and other sources [9]. Thus, due to the application of physical and virtual sensors, data on the status of both consumers and individual structures (enterprises) that make up the e-commerce ecosystem are recorded in IES.

Level II: Data Transfer. Different methods of data transfer and different standards are used at this level, as the data is obtained from very different sources and there are inconsistencies between them. Examples of these are ZigBee, Zwave, Bluetooth, 4G/5G, WiFi, etc. can be noted. As you can see, both human-to-machine and machine-to-machine connections are supported here. As a result, a large number of communication modes are applied at the data transmission level.

Level III: Data storage and management. At this level, the storage and management capabilities of traditional e-commerce systems cannot handle the large volume of data generated. Therefore, at this level, cloud technology and other IT solutions are applied to store, manage, analyze, and visualize the results of large volumes of data. Currently, many large IT companies provide users with cloud services that include these capabilities [10]. Examples of these are Oracle Cloud, AWS (Amazon Web Services) Cloud, Google Cloud, Microsoft Azure Data Lake, etc. can be noted. In addition, Apache Hadoop, Apache Spark, Apache Storm, SAS, etc., provide big data processing and analysis in a distributed computing environment. various software tools, as well as unstructured data storage and management NoSQL type database management systems, are applied [7]. Thus, structured, semi-structured, and unstructured data collected from various sources are transferred to the cloud using various network standards and stored there, and processing of this raw data is ensured by the application of big data processing tools. Thus, the necessary information is obtained from the data.

Level IV: Knowledge acquisition and presentation. At this level, knowledge acquisition from the information obtained is done. Here, the acquisition of knowledge is performed by both human experts and various hardware and software based on artificial intelligence. Useful information, that is, knowledge, is obtained by applying various methods and algorithms of knowledge acquisition. Then, by using various visualization tools, the acquired knowledge is put into an understandable format for the decision-maker, visualized and presented in various reports, charts, personalized recommendations, etc. submission is executed.

Level V: Decision Making. This level is characterized by making decisions in real-time based on the acquired knowledge. It should be noted that, unlike traditional e-commerce systems, both human specialists (managers) and robots, and various technical equipment equipped with sensors act as decision-makers in IES. Decisions made at this level help employees at all other levels take action with more confidence.

Level VI: Supervision of the implementation process. Actions performed on the basis of previously made decisions at this level create feedback with the first layer, and as a result, new data are obtained. In other words, all these steps or processes are repeated throughout the activity of the e-commerce ecosystem.

Thus, the intellectual e-commerce model, built on a unified network that integrates traditional e-commerce systems with technologies such as cloud computing, the Internet of Things, big data, etc., supports various types of interactions, including human-to-human, human-to-machine, and machine-to-machine. By enabling real-time analysis of collected data, it facilitates the decision-making process based on knowledge.

In addition, we would like to make some predictions about the application of the latest achievements and trends in the ICT sphere. Thus, in modern e-commerce and logistics systems, within the framework of artificial intelligence technology, ChatGPT,

a new language model, can be effectively applied to improve customer support and experience, provide personalized recommendations, and help in product search and selection. Some of its main applications include the following:

1. Improving customer service. ChatGPT can handle customer inquiries and participate in real-time responses to inquiries. He can answer frequently asked questions, solve common problems, and guide customers through the purchasing process. This helps reduce the workload of human operators performing the same task and minimize response time.

2. Product recommendations. ChatGPT can analyze customers' preferences, purchase histories, and behavioral patterns to create personalized product recommendations. Thus, it can identify products that match the interests of consumers and increase the likelihood of sales by offering them to consumers.

3. Product search and selection. ChatGPT can help buyers find the right products by understanding customer requirements and making relevant offers. Thus, customers can describe their needs in plain language without dealing with different interfaces of different e-commerce platforms. A chatbot can help narrow down choices, suggest alternatives, or provide detailed information about specific products based on this description.

4. Involvement of consumers. Thanks to the aforementioned capabilities, ChatGPT provides customers with a more interactive and personalized experience, driving increased customer satisfaction and loyalty.

It is important to note that while ChatGPT can significantly improve an e-commerce system, it needs human supervision to ensure accuracy, manage complex situations, and protect data privacy and security.

6. Improvement of E-Commerce Systems Based on the Single-Window Principle with the Application of Artificial Intelligence

The single-window e-commerce model involves the creation of a single platform for customers that integrates various e-commerce services. Artificial intelligence can be applied in several directions in the improvement of e-commerce systems based on a single window:

1.A seamless customer experience. With the application of artificial intelligence, the analysis of existing trends in the market, as well as by use of customer data, personalized recommendations, discounts, as well as the automatic presentation of private content to each customer or customer group can be achieved.

2. Intelligent search capabilities. AI-powered search algorithms can improve the product search process within a one-stop e-commerce model. Advanced methods such as natural language processing and machine learning can improve search accuracy, offer relevant product suggestions, and help customers find the right products quickly and efficiently.

3.Customer support. AI-powered chatbots can handle customer inquiries, provide real-time support, and assist with various customer service tasks. Chatbots can be integrated into a one-stop e-commerce platform to answer customer queries, provide product information and resolve common issues. This reduces the burden on human agents and provides round-the-clock assistance for customers.

4.Demand forecasting. Artificial intelligence algorithms can analyze sales history, customer behaviors, and market trends to provide demand forecasting. By understanding

customer preferences and predicting future demand, a one-stop shop can optimize inventory management on an e-commerce platform, ensure product availability, and prevent stock-outs or excess inventory.

5.Fraud detection and security. Artificial intelligence can enhance the security of a one-stop e-commerce platform by detecting and preventing fraudulent activities. Artificial intelligence algorithms can analyze transaction data, user behavior patterns, and other relevant information to identify potential fraudulent activities such as unauthorized access or suspicious transactions and take appropriate measures to mitigate risks and protect sensitive customer information.

Integrating artificial intelligence technologies into a one-stop e-commerce model can improve customer experience, simplify operations, increase efficiency, and drive growth. It provides valuable information for decision-making to business enterprises while providing a more personalized, intelligent, and accurate e-commerce experience for customers.

7. Conclusion

In modern times, the acceleration of the digital transformation process creates conditions for the formation and development of a global digital environment and virtual relationships in many fields of activity. As this process affects most sectors of activity, it also affects the e-commerce sphere and causes the emergence of a number of global trends and the formation of the modern concept of commerce and logistics. There is a need to modernize e-commerce and logistics systems with the application of innovative technologies to ensure adaptation to these trends and meet the modern demands of the market. In e-commerce, the integrated application of artificial intelligence with modern technologies such as big data, the cloud, Internet of Things ensures the creation of a comprehensive service platform with automatic perception, identification, and visualization capabilities, and the seamless integration of transitions between separate transactions that make up the e-commerce process. It creates conditions for the effective distribution of resources at the national and regional level, optimization of inventory management, optimization of logistics processes in general, significant reduction of costs, and improvement of service quality.

Results and discussion. Wide application of artificial intelligence technologies is necessary to promote the sustainable development of e-commerce/commercial and logistics platforms in order to ensure the innovative development of the regional and national economy on an inclusive basis. Despite the acceptance of the worldwide consequences of such a global development trend, there is still a need to discuss this problem at the local, regional, and national level, and to be used by large groups of people and enterprises.

Modernization of e-commerce and logistics platforms on the basis of artificial intelligence technology, e-commerce systems on the Internet and their types, increasing the effectiveness of e-commerce systems on the Industry 4.0 platform, developing recommendations for strengthening the prospective development directions of e-commerce, should form the basis of future discussions and research.

Further modernization of e-commerce and logistics platforms on the basis of artificial intelligence technology should be among the main directions. In the development of e-commerce and logistics processes, the wide application of modern ICT corresponding to the Industry 4.0 platform should be stimulated. Payment and delivery on e-commerce

platforms, the Internet of Things, artificial intelligence and machine learning, big data analytics digital technologies should be the subject of a wide discussion in order to justify the improvement of the operational efficiency of e-commerce systems.

Contributions. Modernization of enterprises' e-commerce, including logistics platforms based on artificial intelligence methods and technologies can give a serious boost to the development and sustainability of the digital economy. In this work, a conceptual structural model of the intellectualization of the e-commerce system was proposed. In the presented conceptual model, the architecture of intelligent e-commerce systems is described from the point of view of data flow and analytical processing. Here is the conceptual structural model of intelligent e-commerce systems Level I-Data collection, Level II-Data transmission, Level III-Data storage and management, Level IV-Knowledge acquisition and presentation, Level V-Decision making, Level VI-Execution process built on a 6-level architecture model as a control. The main digital technology trend of the modern era, the solutions to the problems of the application of artificial intelligence methods and technologies can be considered as a tool or mechanism in the development of e-commerce and logistics platforms of enterprises in solving its existing problems.

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