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AI-Powered Logistics and Digital Marketing for Business Optimisation

Abstract
The purpose of the work is to determine the characteristics of the use of artificial intelligence in logistics systems and digital marketing strategies of companies. The aim of the study is to determine the impact on companies of the simultaneous use of logistics and digital marketing based on artificial intelligence in the promotion and sale of products on domestic and foreign markets. The methodology used in this study includes a statistical analysis of the dynamics of the logistics market and the artificial intelligence market, as well as specialised software for digital marketing. A comprehensive study of scientific works has made it possible to identify the main trends in the development of artificial intelligence, logistics and digital marketing. The processes of globalisation and digitalisation are encouraging companies to actively adopt innovative technologies in order to secure a highly competitive position in the long term, which is stimulating relevant scientific research. The creation of personalised recommendations based on machine learning algorithms and the reduction of the time taken to deliver products to users, with the involvement of autonomous robotic couriers, make it possible to increase the popularity of the company on the market. AI engagement targets Generation Y, Z and Alpha users who are active consumers of products and interested in innovation in the promotion and delivery of goods and services. Stimulating demand on the internet using digital marketing tools based on artificial intelligence involves identifying highly specialised groups of users, interacting with them based on specific communication patterns and using relevant content. Thanks to AI, modern content can be generated and promptly placed on specialised social media, stimulating user interest in relevant brands. For modern companies, the combination of artificial intelligence, logistics and digital marketing is an important area of activity that relates to long-term strategic tasks and enables the achievement of optimal economic results.

Keywords
artificial intelligence, communications, digital marketing, logistics, target audience

JEL: C45, L81, L91, M31

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1 Introduction

The modern world is characterised by the processes of globalisation, which manifests itself in the integration of national economic systems into the international environment. The intensification of the movement of goods and services between countries is a consequence of the technological development of the 20th and 21st centuries, the liberalisation of international economic relations, the formation of complex production and supply chains between several countries, as well as the increase in the standard of living of the population. The achievements of scientific and technical progress have made it possible to increase the production of goods and services in volumes that significantly exceed national needs and allow to export their significant volumes to foreign markets. The creation of liberal trade conditions in accordance with the framework of the World Trade Organisation stimulates the strengthening of the movement of goods and services between countries by the needs of the global economic environment and allows to form national economic systems optimal development vector. The development of transport links makes it possible to speed up the movement of goods,

semi-finished products and raw materials between different countries, thus stimulating the development of international trade. At the same time, digital products are being actively developed under the conditions of digitalisation, which can be quickly delivered from manufacturers to consumers thanks to the use of the global Internet network based on high-speed communication lines and specialised software. An important element in the promotion of products from producers to consumers in conditions of significant competition on national and international markets is digital marketing, which makes it possible to attract the target audience and establish long-term communication. The optimisation of the use of marketing strategies in the digital environment and of tools for setting up logistics systems is possible thanks to the use of artificial intelligence algorithms, which make it possible to process large volumes of disparate information and to identify hidden relationships. The interdependencies identified allow the identification of optimal models of marketing interaction between companies and users in the digital environment and the adaptation of logistics systems to market needs.

The aim of the study is to identify new directions for the development of the company's marketing strategy in the digital environment and the transformation of the company's logistics system based on modern algorithms of artificial intelligence, which will allow to achieve a multiplicative effect thanks to the simultaneous integration of the presented approaches into the company's activities. In order to ensure the company's competitive advantage in the national and international markets, it is necessary to constantly identify innovative technologies and incorporate them into business processes.

2 Related Works

The scientific work of Ukrainian and foreign scientists is devoted to the study of artificial intelligence, which is used to improve the efficiency of enterprises at the national and global levels. The improvement of machine learning algorithms and the expansion of the practice of using powerful mathematical methods allow scientists to conduct complex scientific researches that contribute to the intensification of the development of digital technologies and increase the efficiency of enterprises and economic systems. The fields of digital marketing and logistics studies are very popular in the scientific community, and accordingly there is a large number of theoretical and applied scientific studies on these processes. Evaluating the impact of the simultaneous use of artificial intelligence, logistics and digital marketing is one of the promising areas of research that needs to be developed and the results implemented in the real economy.

The growing role of artificial intelligence in the fourth industrial revolution is highlighted in (Mhlanga, 2021). The need to develop and implement appropriate mathematical algorithms in line with sustainable development goals is demonstrated. The perspective of the use of artificial intelligence for different countries is outlined; the approaches to big data processing are especially important for developing countries, as it is possible to achieve intensification of economic development and a significant increase in the standard of living of the population. An increase in the funding of programmes focused on the development of artificial intelligence and its implementation in real economic processes is expected, not only from private companies, but also from the governments of various countries around the world.

The paper (Shah, Jhanjhi & Ray, 2024) reveals the characteristics of using artificial intelligence to ensure the security of logistics systems. The authors give examples of the development of logistics systems based on advanced innovative technologies of data processing by large companies in different countries of the world. The expediency of using artificial intelligence in the process of developing the information infrastructure that ensures the efficiency of logistics systems at the national and international level has been proven. The concept of "intelligent logistics" is presented, which requires active research and intensification of the introduction of advanced technologies in the field of artificial intelligence.

The advantages of integrating artificial intelligence into the company's digital marketing strategy in the process of interacting with the target audience are presented in the paper (Van & Stewart, 2021). The research is devoted to considering the issue of providing personalised approaches when integrating machine learning algorithms into the digital marketing tools used by the company. The authors raise the ethical issues of replacing digital marketing specialists with automated systems based on artificial intelligence. The risks of replacing workers with software, which could lead to a reduction in the number of marketers, are considered. It also discusses the possibilities of using artificial intelligence to perform routine tasks, freeing up highly skilled marketers to focus on more creative tasks.

The paper (Nasiopoulos, Sakas & Trivellas, 2021) proves the expediency of using digital marketing in the system of supply of goods and services. It emphasises the need to use digital tools for product promotion, to establish communication with potential customers and to create an effective logistics system that allows to deliver the appropriate product to the consumer within a short period of time. The authors predict the development of digital channels and changes in the popularity of web

resources based on agent-based modelling, which will allow logistics companies to optimise the development of distribution systems according to the changing influence of internal and external environmental factors.

3 Logistics and AI

The development of the global economic system is impossible without innovative transformations of international logistics chains. The increase in population in various regions of the world and the improvement in the standard of living of the population stimulate the intensification of the production of various goods and the need to move them between borders, thanks to the involvement of specialised companies for the transport of goods by sea, land and air. In 2023, about 80% of international transport will be accounted for by maritime container shipping. Between 1980 and 2022, the volume of freight transported worldwide will increase from 0.1 billion tonnes to 1.95 billion tonnes. The creation of demand for sea transport has led to an increase in the number of logistics companies operating in this market and a significant increase in the tonnage of container ships. The current leaders in the maritime container transport market are Mediterranean Shipping Company (MSC), APM-Maersk, CMA-CGM, China Ocean Shipping Company (COSCO) and Hapag-Lloyd. At the same time, logistics systems for other types of transport are actively developing, as evidenced by the emergence of large trading networks and marketplaces that are able to quickly deliver goods to consumers in different countries around the world. Amazon, eBay, AliExpress and Rakuten are leaders in the global sale of goods and have effective logistics systems.

In 2022, the global logistics market was worth around 8 billion USD and is expected to grow in this decade. Figure 1 shows the volume dynamics of the global logistics and artificial intelligence markets from 2022 to 2030. The forecast values indicate a significant development of the global logistics and artificial intelligence markets during the study period.

The existence of complex logistics systems, which involve the movement of large volumes of various goods between countries throughout the year, requires the use of specialised software. It is advisable to use modern algorithms of artificial intelligence for complex analysis of large amounts of data that are constantly generated by the logistics system. Thanks to modern applications of mathematical algorithms, it is possible to find ways to optimise the functioning of transport companies. The main areas of artificial intelligence application in logistics are as follows:

A. Demand forecasting. By determining the demand for goods in future periods, it is possible to optimise the process of providing food stocks. Complex mathematical models of inventory management allow to minimise the risks of shortage of goods in a certain region and economically unjustified surplus. At the same time, companies have the opportunity to shape the direction of

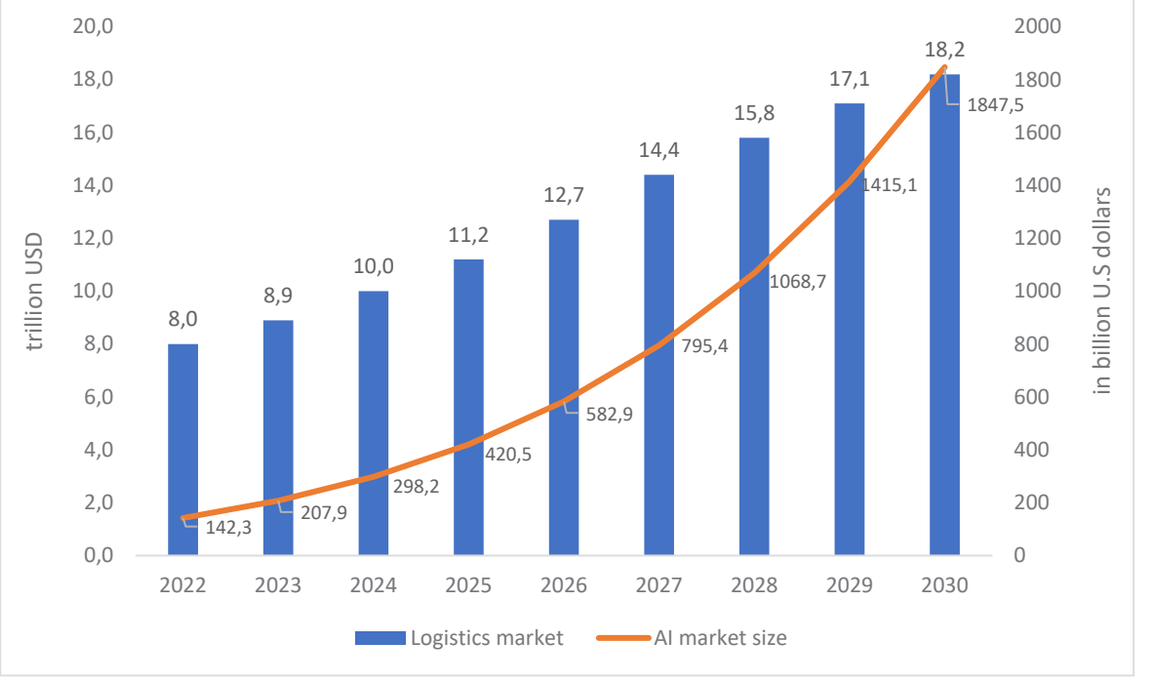

FIGURE 1 Global logistics and artificial intelligence market size from 2022 to 2030 (Statista, Precedenceresearch)

development of warehouses and transport fleet. Identification of more promising sales markets allows logistics companies to adjust their strategies and achieve more effective results in the future.

B. Route optimisation. Modern logistics companies have complex networks that include a large number of warehouses and points of sale. At the same time, the system of direct delivery of products to consumers is actively developing. Thanks to the use of artificial intelligence algorithms, problems of optimising the use of financial, material, human and time resources are solved. Adjusting the functioning of the logistics system takes into account a large number of factors, among which the weather conditions, the level of loading of road routes, the cost of fuel, etc. stand out. In the conditions of limited resources, logistics companies get the opportunity to redistribute available resources in order to achieve the maximum economic effect and level of customer satisfaction.

C. Warehouse management. The presence of a significant range of goods in warehouses requires the automation of the balance control process and the management of key processes. Thanks to artificial intelligence, it is possible to monitor key processes in warehouses and make effective management decisions. The integration of robotic systems in warehouses allows companies to move and place goods according to optimisation models, resulting in the rational use of available space and the achievement of effective time consumption.

D. Real-time tracking and monitoring. RFID (Radio Frequency Identification), GPS navigation, Internet of Things, Blockchain, barcodes, video surveillance and specialised mobile applications are used to track the movement of all elements of logistics systems. The approaches presented allow continuous monitoring of the system as a whole and its elements. The integration of artificial intelligence into the presented system of monitoring the logistics system makes it possible to identify ways to improve the process of moving goods and minimise the occurrence of risks related to cargo damage and unnecessary economic costs.

E. Automating delivery. In the final stage of delivering goods to customers, known as the "last mile", a large number of companies are starting to introduce unmanned vehicles. The main technological solutions introduced by companies are drones, autonomous vehicles and robots. The integration of artificial intelligence into the technical means presented makes it possible to achieve a high level of autonomy and create an automated delivery system that does not require the involvement of employees. The use of unmanned aerial vehicles in delivery systems makes it possible to provide services to customers 24 hours a day without interruptions and without the need to spend additional funds on staff motivation.

4 AI-Based Digital Marketing

The active development of the Internet and various gadgets has stimulated the reorientation of many consumers towards the use of the digital environment in everyday life. The Z and Alpha generations, born during the period of intensification of the digitalisation processes and who consider natural models of social interaction thanks to the use of smartphones, tablets, laptops and other specialised devices, show a particularly high interest in the Internet and innovative technologies. Generation Y, who are economically active and active consumers of modern goods and services, are also characterised by a high level of involvement in the digital environment. Social media is one of the most popular digital channels, allowing users to communicate and interact with different brands.

To meet the needs of consumers, many companies are implementing effective marketing strategies on the Internet. Depending on the specifics of the target audience, effective digital marketing tools are chosen that allow for the identification of optimal approaches to establish long-term communication and ensure a high level of conversion. For each of these marketing tools, there is specialised software that allows companies not only to automate the process of implementing targeted actions, but also to evaluate their effectiveness on the basis of collected statistical data. Figure 2 shows the dynamics of the digital marketing software market for 2021–2030.

The collection of heterogeneous information in the digital environment in the process of using marketing tools allows for a comprehensive analysis of the target audience, market functioning, competitors, etc. Big data should be used to identify existing relationships using modern modelling approaches. Artificial intelligence plays an important role in improving the use of digital marketing tools, which should be used in the following areas:

A. Data analysis. Evaluating the effectiveness of the implementation of the marketing strategy in the digital environment and the use of certain tools based on web analytics data allows companies to increase the level of competitiveness and interact with users who are more likely to purchase relevant goods and services. Artificial intelligence makes it possible to identify the best model of interaction between the company and the target audience in the digital environment in a given period. The multiplier effect of combining certain digital marketing tools is also analysed and the optimal option is selected.

B. Personalise interactions with users. Based on artificial intelligence, users are divided into groups and specialised marketing strategies are developed for each part of the audience. Through the use of effective digital marketing tools and relevant content,

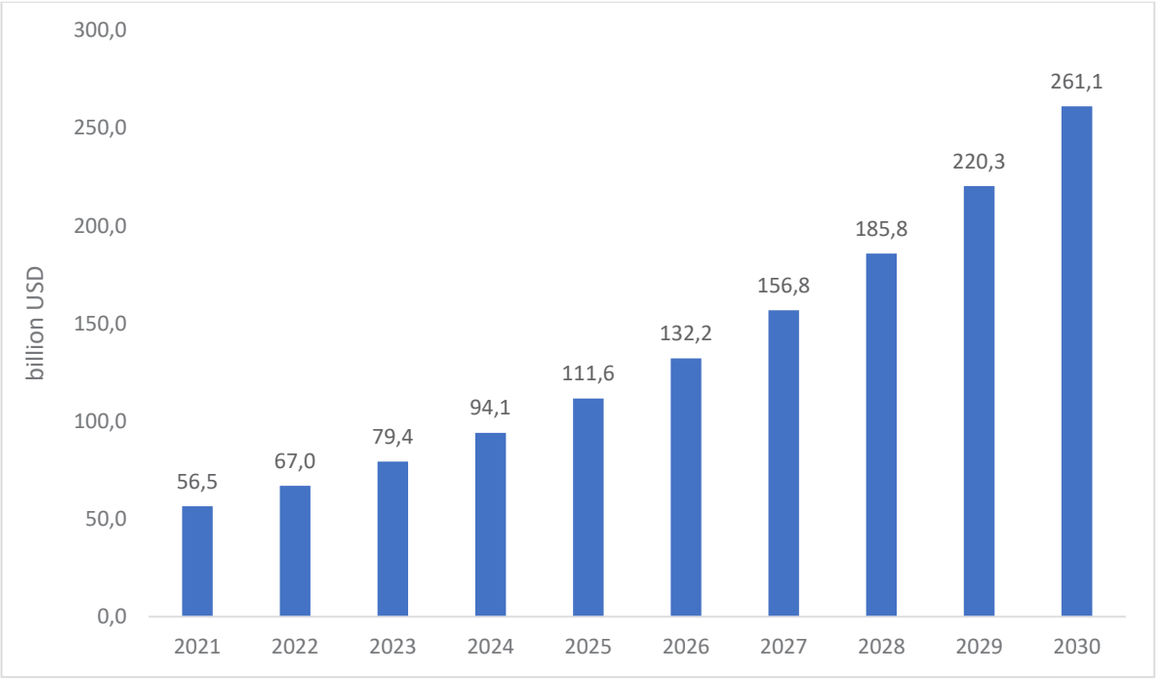

FIGURE 2 Digital marketing software market dynamics from 2021 to 2030 (Visionresearchreports)

the individual user perceives brand communication as a personalised approach. Predicting the needs of a specific user based on machine learning algorithms influences the formation of a positive image of the company among the target audience.

C. Content generation. Modern companies based on artificial intelligence are creating services that enable the generation of textual and visual content. The OpenAI company has created ChatGPT, which enables the generation of text content to fill the web resources of brands and attract the target audience. In addition, it is possible to use Dall-E 3 to generate complex graphical objects based on a text description, allowing companies to quickly create images and place them on websites and social media pages. By quickly creating relevant content, companies can keep their target audience engaged and promote their products.

D. Chatbots and virtual avatars. Chatbots can be used to communicate with users, answering their questions in text or voice. Thanks to their self-learning capabilities, chatbots can quickly improve interaction models with the target audience and increase the quality of responses to the requests of different visitor groups. In parallel, artificial intelligence-generated avatars are becoming increasingly popular. Featured thought leaders interact with users on social media using human-like behaviours. Thanks to the powerful capabilities of modern graphics, digital avatars have a believable appearance that can be adapted by artificial intelligence according to the interests of the target audience. Adapting virtual avatars to the behavioural patterns of interlocutors can significantly increase the number of followers and help to build long-term relationships in the relevant social media.

5 Combining Artificial Intelligence, Logistics, and Digital Marketing

The interaction between companies and consumers on national and global markets is mainly carried out in the digital environment and involves the implementation of a complex stage. The presence of a large number of companies on the market requires the implementation of complex marketing strategies that make it possible to identify the target audience and implement a system of measures to stimulate demand for the corresponding product. Once a decision has been made to purchase a product, the company has to deliver it to the consumer as quickly as possible, thanks to an efficient logistics system. The use of artificial intelligence at all stages allows brands to optimise intermediate processes and ensure the economic efficiency of the company's operations. Figure 3 shows the scheme of integration of artificial intelligence into the logistics system and digital marketing tools of agiven company with the formation of influence on the target audience and its transformation into customers.

6 Conclusions

The development of information technologies and the growth of cloud services are leading to the evolution of artificial intelligence. More effective machine learning algorithms will make it

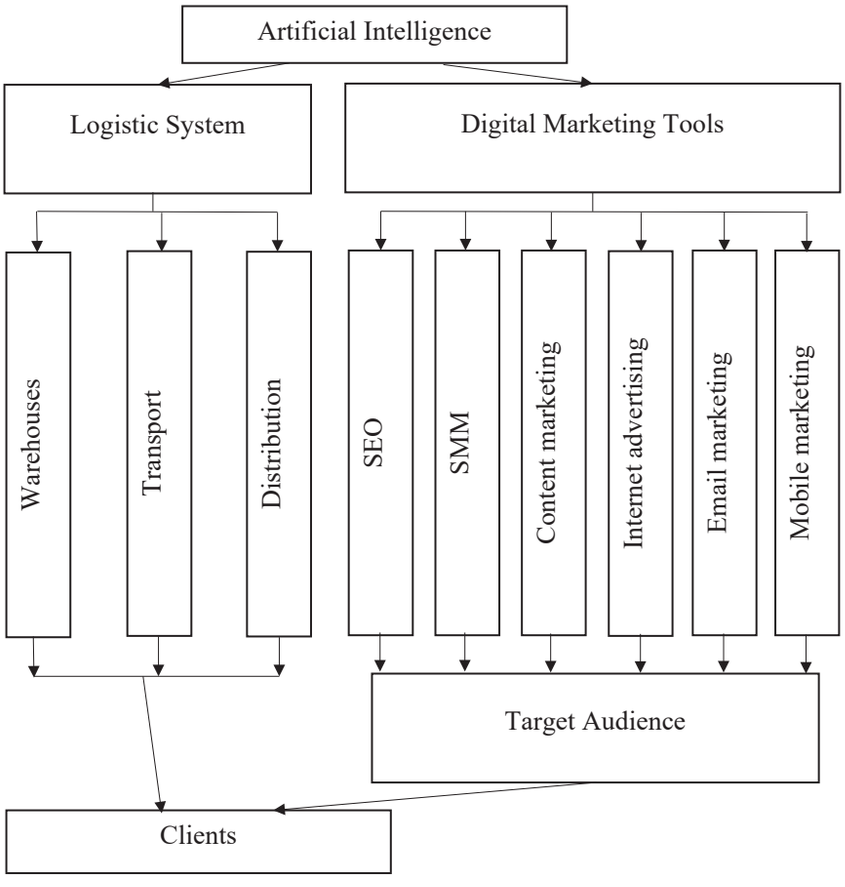

FIGURE 3 AI-powered logistics and digital marketing
for company-customer interactions (Peter & Dalla 2021)

possible to identify hidden relationships between existing factors, opening up new opportunities for businesses. The strengthening of digitalisation processes and innovative transformations will create more efficient logistics systems, in which drones and unmanned transport based on artificial intelligence will play a key role. The improvement of digital marketing based on machine learning algorithms will make it possible to increase the level of personalisation, which will lead to the prediction of the real needs of users and will accordingly affect the development of companies' logistics systems.

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