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THE ROLE OF DIGITAL TECHNOLOGIES IN THE TRANSFORMATION OF LOGISTICS AND PRODUCTION CHAINS IN TOURISM

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РОЛЬ ЦИФРОВИХ ТЕХНОЛОГІЙ У ТРАНСФОРМАЦІЇ ЛОГІСТИЧНИХ ТА ВИРОБНИЧИХ ЛАНЦЮГІВ В ТУРИЗМІ

In today's world, digital technologies play a key role in transforming various sectors of the economy. From financial services to healthcare, from industrial production to the service sector, cutting-edge technological advancements are significantly altering traditional methods of operation, enhancing process efficiency, and fostering the creation of new business models. The tourism sector is no exception, as digital technologies are substantially transforming logistical and production chains within it, leading to their evolution, development, or transformations that enhance efficiency, transparency, and security. Therefore, the article aims to determine the role of digital technologies in transforming logistical and production chains in the tourism industry. The research findings demonstrate that the role of digital technologies in logistical and production chain transformation in tourism is multifaceted. It has been proven that digital technologies enhance the efficiency of logistical and production processes (through the automation of service booking, data analytics, and artificial intelligence used for optimizing transportation routes). It has been demonstrated that digital technologies enhance the transparency and security of services and transactions through blockchain technology. It has been proven that digital technologies improve service quality through personalized client services and the Internet of Things (IoT). It is worth noting that digital technologies contribute to reducing logistical and production costs through Big Data analytics used for demand forecasting and resource management. It has been demonstrated that digital technologies provide increased flexibility and responsiveness of businesses to changes through customizable mobile services and the variability of tourism products and services. The presented findings allow identifying ecological aspects of digital transformation in tourism as further research prospects. Specifically, it is important to analyze how digital technologies can contribute to the environmentally sustainable development of tourism, for example, by reducing paper usage through electronic tickets, reducing the number of trips through virtual conferences and meetings, etc.

У сучасному світі цифрові технології відіграють ключову роль у трансформації різних галузей економіки. Від фінансових послуг до охорони здоров'я, від промислового виробництва до сфери послуг, новітні технологічні

розробки значно змінюють традиційні методи роботи, підвищують ефективність процесів та сприяють створенню нових бізнес-моделей. Не винятком є і туристична сфера, де цифрові технології суттєво змінюють логістичні та виробничі ланцюги, що призводить до їхньої еволюції, розвитку або перетворень. Ці зміни підвищують ефективність, прозорість та безпеку в туристичній індустрії. Таким чином, метою статті є визначення ролі цифрових технологій у трансформації логістичних та виробничих ланцюгів в туризмі. За результатами дослідження було доведено, що роль цифрових технологій у трансформації логістичних та виробничих ланцюгів в туризмі є багатоаспектною. Доведено, що цифрові технології сприяють підвищенню ефективності логістичних та виробничих процесів через автоматизацію бронювання послуг, використання аналітики даних та штучного інтелекту для оптимізації транспортних маршрутів. Доведено, що цифрові технології сприяють покращенню прозорості та безпеки послуг та транзакцій (шляхом використання блокчейн-технологій). Доведено, що цифрові технології сприяють покращенню якості обслуговування через клієнтську персоналізацію сервісів та послуг, а також за допомогою використання Інтернету речей (IoT) для підвищення комфорту туристів. Констатовано, що цифрові технології сприяють зменшенню логістичних та виробничих витрат внаслідок використання аналітики Big Data для прогнозування попиту та управління ресурсами. Доведено, що цифрові технології забезпечують підвищення гнучкості й швидкості реакції бізнесу на зміни через налаштування мобільних сервісів та змінність туристичних продуктів та послуг. Наведені положення дозволяють як подальші перспективи дослідження визначити екологічні аспекти цифрової трансформації в туризмі.

Keywords: service booking, transportation route optimization, demand forecasting, resource management, tourist transportation, logistics.

Ключові слова: бронювання послуг, оптимізація транспортних маршрутів, прогнозування попиту, управління ресурсами, перевезення туристів, логістика.

Target setting. In today's world, digital technologies play a key role in transforming various sectors of the economy. So, from financial services to healthcare, from industrial production to the service sector, cutting-edge technological developments significantly change traditional methods of operation, enhance process efficiency, and foster the creation of new business models. The tourism sector is no exception. Within it, digital technologies significantly alter logistical and production chains, leading to their evolution, development, or transformations that enhance their efficiency, transparency, and security.

The implementation of innovative solutions based on artificial intelligence, the Internet of Things, blockchain technology, and big data contributes to the creation of new business models that meet the growing needs of customers and enhance the competitiveness of tourism companies in the market. Considering this, further research will have scientific value.

Analysis of research and publications. The problems of using digital technologies in logistic systems (including supply chains) and the production chains of the tourism sector are addressed in numerous publications and research studies, including those by Kozhukhivska R.B., Krush P.V., Meged Y.V., Mashika H., Zelic V., Kiziun A., and Maslyhan R. The majority of works address the issue of transforming logistical and production chains in tourism, which is driven by the influence of digital technologies.

However, the specific question of identifying the role of digital technologies in the transformation of such chains requires further research, as the tourism industry is unique and complex. It encompasses a wide range of services and goods, which can vary greatly, from transportation and accommodation to entertainment and dining. Such a diverse range of services and goods complicates logistics and production processes and requires an individualized approach to the implementation of digital technologies.

Moreover, the tourism industry faces unique challenges such as seasonality, demand variability, and instability of conditions. These characteristics can affect the effectiveness of using digital technologies and may require innovations to be adapted to the specifics of the tourism business.

The wording of the purposes of article (problem). The article aims to determine the role of digital technologies in transforming logistical and production chains in the tourism industry.

The paper's main body with full reasoning of academic results. Within the scope of the outlined research, the authors have noted that for businesses operating in the tourism sector, their logistical and production chains are the most significant for effective business operation.

Furthermore, the authors have stated that logistical chains in tourism encompass all processes related to the planning, coordination, and execution of transporting tourists and their luggage, as well as ensuring their stay and service during the journey. Therefore, the outlined chain encompasses [1; 3; 6]:

1. Transportation of tourists by aviation, railway, road, and maritime transport.
2. Organization of transfers from airports, and train stations to accommodation and tourist attractions.
3. Management and tracking of tourists and their luggage movements.
4. Provision of hotels and other accommodation facilities (supplying necessary materials and products).
5. Coordination of excursions, tours, car rentals, and other services provided to tourists during their stay.

Therefore, it is evident that logistical chains in tourism encompass various processes related to the transportation of tourists and ensuring their comfort during the journey. It should be noted that such chains differ from regular logistical chains due to the unique characteristics of the tourism industry (including seasonality and unpredictability of demand, a large number of participants, and the need for special services [2]).

Figure 1 presents a schematic representation of such a chain.

Regarding production chains in tourism, they encompass all stages of creating and providing tourist products and services, from planning and development to implementation and servicing. Therefore, the outlined chain encompasses [4-5]:

1. Development of tourist products (specifically planning and creating tours, excursions, entertainment programs, and developing service packages including accommodation, meals, transportation, entertainment, etc.).

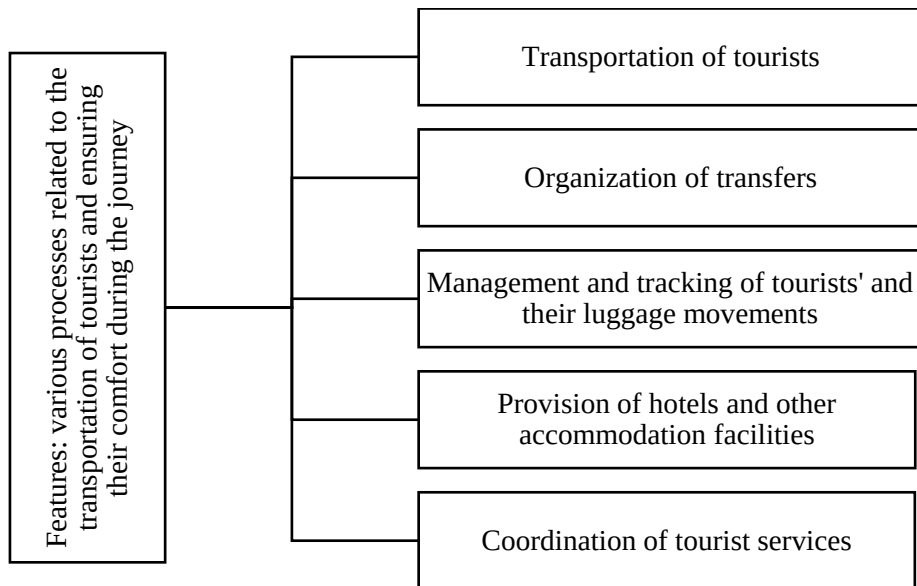


Figure 1. The scheme of logistical chains in tourism

Source: formed based on [1;3; 6]

2. Booking and sales (they include hotel booking systems, airline tickets, tours, and other services, marketing, and selling tourist products through various channels, including online platforms).
3. Tourist services (specifically providing accommodation services, organizing meals and transportation, conducting tours and other activities).
4. Quality management (this is quality control of services, gathering and analyzing tourist feedback to enhance products and services).
5. Development and maintenance of tourist infrastructure (they include development and maintenance of tourist infrastructure such as hotels, tourist attractions, and transportation hubs).

Therefore, production chains in tourism differ from regular production chains due to their intangible nature and the importance of impressions and emotions (as significant attention is paid not only to meeting tourists' basic needs but also to creating unforgettable experiences and positive emotions [5]). Additionally, these chains are highly dependent on the human factor. Therefore, these chains encompass actions and processes necessary for the successful provision of tourist services.

Figure 2 presents a schematic representation of such a chain.

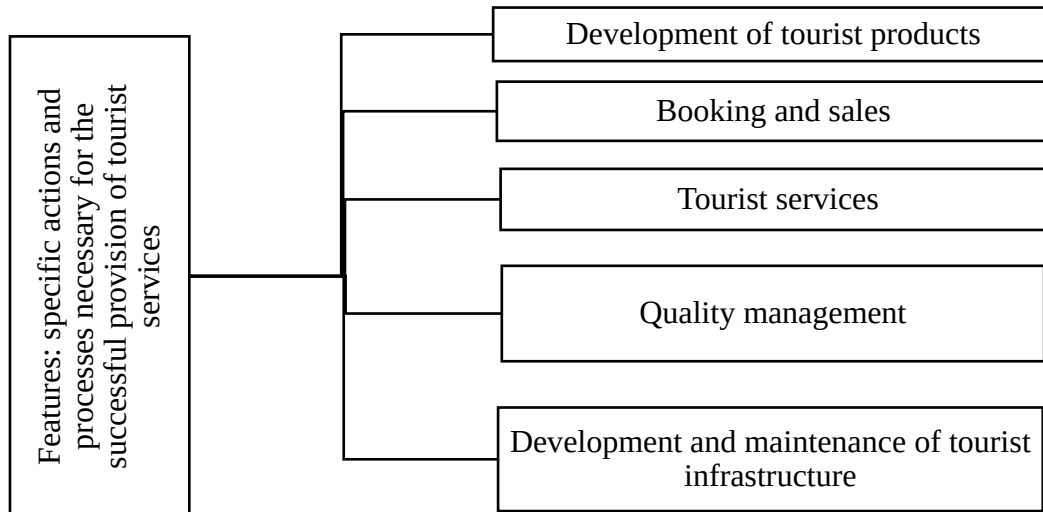


Figure 2. The scheme of production chains in tourism

Source: formed based on [4;5]

According to the specified characteristics, logistical and production chains in tourism differ from regular logistical chains due to the unique characteristics of the tourism industry. Such a diverse range of components complicates logistics and production processes and requires an individualized approach to digital technology implementation. Furthermore, the tourism industry faces unique challenges such as seasonality, demand variability, and conditions instability. Therefore, such chains are characterized by high flexibility and adaptability in sets of actions (which to market needs, technological developments, and changes in consumer preferences adapted [6]).

The outlined features provide the opportunity to adapt to changing conditions and ensure a competitive advantage for tourism enterprises. For example, with the advancement of new technologies such as artificial intelligence or blockchain, new opportunities may arise for automating booking and enhancing transaction security in logistical chains. At the same time, changes in consumer preferences may lead to the necessity of developing new tourist products or services that align with modern trends and customer needs [3].

It should be noted that digital technologies facilitate transformations in logistical and production chains in tourism that enhance their flexibility (allowing tourism companies to quickly respond to changes in the economic, technological, and socio-cultural environment, thus remaining competitive in the market [4]).

Considering the outlined specificity, the role of digital technologies in transforming logistical and production chains in tourism is multifaceted. It includes the following:

1. Increasing the efficiency of logistical and production processes, achieved through the automation of hotel bookings, airline tickets, and other services, as well as payments and optimization of transportation routes. Overall, this contributes to reducing human error and optimizing working time, helping to decrease costs in logistics and production of tourist products and services. Additionally, digital technologies significantly enhance the efficiency of interaction among all modes of transportation [5]. In this regard, the role of digital technologies in improving the efficiency of logistical and production processes in tourism is further outlined in Table 1.

Table 1.

The role of digital technologies in enhancing the efficiency of logistical and production processes

The direction of transformation	Features of transformation	The impact of digital technologies
Enhancement of efficiency in logistical and production processes.	Automating hotel bookings, airline tickets, and other services helps reduce human error and optimize time.	Helps avoid human errors and significantly reduces the time spent on processing bookings. Promotes increased productivity and enhances the overall efficiency of logistics and production processes.
<i>It means increasing productivity, reducing time and resource costs, optimizing workflow processes, and achieving better results in the final product or service.</i>	Using data analytics and artificial intelligence to optimize transportation routes.	Allows analyzing large volumes of data on traffic, weather conditions, geographical factors, and other parameters to optimize routes, and reduce delivery time, and transportation costs.
	Using data analytics and artificial intelligence to ensure the interconnectedness of logistic chains.	It contributes to increasing the efficiency of logistic processes in tourism.

Source: formed based on [3; 5]

One of the latest technological tools for enhancing the efficiency of logistic and production processes through automation and optimization is Hotel Property Management Systems (PMS). PMS allows hotels to automate and optimize a wide range of operations, including reservations, client accounting, room service,

inventory management, financial accounting, and reporting. For example, through a PMS, a hotel can automatically accept bookings via websites, electronic platforms, or mobile applications, significantly reducing the need for manual data entry and minimizing the risk of errors.

One of the latest technological tools for optimizing transportation routes in tourism is real-time geolocation technology and routing algorithms. Such technologies enable tourism enterprises and service providers to effectively manage the movement of vehicles, considering various factors such as traffic, road conditions, weather conditions, and even real-time events. It allows for route optimization, avoidance of traffic jams and other obstacles, reducing delivery time, and increasing overall efficiency in transporting passengers within the tourism industry.

2. Improvements in transparency and security of logistic and production processes occur through the use of blockchain technologies to ensure transparency and immutability of services and associated transactions, tracking tourists' movements and their luggage in real time [4]. Overall, the use of blockchain technologies in tourism can significantly enhance the level of transparency and security in logistic and production processes, thereby enabling tourism companies to ensure the reliability and trust of their clients. So, a more detailed description of the role of digital technologies in improving the transparency and security of logistic and production processes in tourism is outlined in Table 2.

One of the latest technological means to ensure transparency and immutability of services and transactions is the use of modern booking platforms for hotels and airline tickets as LockTrip, Winding Tree, and TravelBlock. One of the latest technological tools for tracking tourists' movements and their luggage in real-time is the integrated system "SITA Smart Path," which utilizes technologies such as facial biometric recognition, RFID tags, and blockchain for tracking and managing passenger flows.

Table 2.

The role of digital technologies in improving transparency and security of logistic and production processes

The direction of transformation	Features of transformation	The impact of digital technologies
Improving transparency and security of logistic and production processes. <i>It's the implementation of measures aimed at ensuring greater transparency, verifiability, and security at all stages of these processes</i>	The use of blockchain technologies to ensure transparency and immutability of services and transactions helps prevent fraud and ensures the security of clients' data.	Blockchain ensures unparalleled transparency by recording each transaction in blocks that are stored in a chain. Moreover, transactions stored in the blockchain cannot be altered or deleted, ensuring data immutability and preventing falsification and manipulation.
	Tracking tourists' movements and their luggage in real-time ensures a higher level of security and control.	With blockchain, every journey and every step can be recorded in blocks, ensuring precise location tracking. It enhances security by enabling the ability to track lost or stolen luggage and providing information about tourists' locations in case of danger or emergencies.

Source: formed based on [1-2; 5-6]

3. Improving service quality through personalized services and leveraging IoT to enhance tourist comfort. Essentially, these technologies help create a unique and comfortable environment for tourists, increasing satisfaction with the journey and fostering long-term customer relationships [4-5]. So, a more detailed description of the role of digital technologies in improving service quality in tourism is outlined in Table 3.

Table 3.

The role of digital technologies in improving the quality of tourist services

The direction of transformation	Features of transformation	The impact of digital technologies
Improvement in service quality <i>It ensures customers are provided with a higher level of satisfaction and meets their needs and expectations</i>	Client service personalization through data analysis helps increase customer satisfaction and enhance loyalty	Utilizing data on previous travels, interests, hobbies, demographic information, and other parameters helps create personalized offers regarding excursions, routes, hotels, restaurants, and other services.
	Utilizing the Internet of Things (IoT) to enhance tourist comfort. For example, automating climate control systems in hotels.	The implementation of smart security and monitoring systems that can alert personnel about any issues or emergencies and provide a swift response.

Source: formed based on [1;4-5]

The latest technological tools for client service personalization include artificial intelligence systems (as they analyze data from previous travels, internet browsing history, social networks, and other sources to recommend individually tailored travel offers), facial and voice recognition systems (suitable for identifying clients and providing personalized service during hotel stays or excursions), chatbots and virtual assistants based on artificial intelligence (specifically those capable of interacting with clients on websites, mobile apps, or social media, providing personalized advice and information).

4. Reducing logistic and production costs and enhancing business competitiveness through the utilization of Big Data, machine learning algorithms, and statistical analysis to forecast demand and manage resources. In general, digital technologies in tourism allow for the optimization of various business aspects, resulting in cost reduction, increased efficiency, and competitiveness in the market [4-5].

So, a more detailed description of the role of digital technologies in the outlined improvements is provided in Table 4.

Table 4.

The role of digital technologies in reducing logistic and production costs and enhancing business competitiveness

The direction of transformation	Features of transformation	The impact of digital technologies
Enhancing business competitiveness <i>This means the ability of a business to attract and retain customers within its market segment, allowing it to maintain or increase its market share compared to competitors</i>	Expanding demand forecasting capabilities	Big data analysis allows for more accurate forecasting of demand for tourist services and products.
	Expanding capabilities to identify trends and patterns in consumer demand	Machine learning algorithms and statistical analysis can be used to identify trends and patterns in consumer demand.
	Personalized pricing	Big Data analysis allows for the creation of personalized pricing offers for customers, helping attract new tourists and retain existing ones.
Reducing logistic and production costs <i>This means optimizing processes and resources to decrease overall expenses in these areas</i>	Resource management, such as personnel, transportation, equipment, etc.	Big Data analysis allows for more efficient resource management.
	Optimizing resource utilization	During peak seasons or events, resources can be allocated on time for optimal utilization through load forecasting.

Source: formed based on [1;3-4; 6]

The latest technological tools for utilizing Big Data, machine learning algorithms, and statistical analysis for demand forecasting and resource management include [4]:

1. Internet search analysis (using data from search engines like Google Trends to determine popular travel destinations).
2. Social media analysis (analyzing hashtags and discussions on platforms like Twitter or Instagram).
3. Hotel, restaurant, or other tourism establishment load forecasting, price optimization (automatically adjusting prices based on demand and other factors), and more.
5. Increasing the flexibility and responsiveness of businesses to changes through customizable mobile services, rapid response to market changes, and adaptability of tourism products and services to customer needs. Overall, digital technologies play a key role in ensuring a response to changes in the tourism market and adapting tourism businesses to the evolving customers' needs and preferences [4]. So, the role of digital technologies in enhancing the flexibility and responsiveness of businesses to changes is further detailed in Table 5.

The latest technological tools for increasing flexibility and responsiveness to change are mobile applications that allow for quick and convenient booking of tours, travel packages, excursions, and other tourist services [5]. The latest technological tools for tailoring product ranges and services to the customer's changing needs are personalization programs for tourist packages and offers, which travel companies use to adapt and individualize offers for their customers. For example, if such a program detects that a particular customer frequently chooses excursions to mountainous areas, the travel company can offer special deals on trips to mountain resorts. If another customer frequently chooses beach vacations, they can be offered tours to beach resorts or cruises. The latest technological tools for monitoring market trends and analyzing data are Big Data processing platforms (such as Apache Hadoop, Apache Spark, or Amazon Web Services (AWS) EMR), data analysis tools with

machine learning libraries (e.g., Python with sci-kit-learn, TensorFlow, PyTorch libraries), R, SAS, and data visualization platforms such as Tableau or Power BI, etc.

Table 5.

The role of digital technologies in enhancing business flexibility and responsiveness to changes

The direction of transformation	Features of transformation	The impact of digital technologies
Increased flexibility and responsiveness to changes. <i>It is the ability of a business to quickly respond to changes in the market, technology, and customer needs.</i>	Use of customizable mobile services.	Businesses can create mobile applications that allow customers to quickly and conveniently book hotels, transportation tickets, tours, and other services.
Rapid response to market changes. <i>It is the ability of a business to quickly adapt to new conditions, trends, and consumer needs.</i>	Monitoring market trends and analyzing data using machine learning algorithms and Big Data for rapid detection of changes and timely response.	Digital technologies enable the collection, processing, and analysis of large volumes of data to identify emerging market trends and demands, allowing for rapid response in the shortest possible time.
Adaptability of tourism products and services. <i>It is the ability of a business to quickly and effectively change its offerings in response to customer needs and preferences, as well as to changes in the external environment.</i>	Tailoring product range and services to changing customer needs, rapid adaptation to new trends and requirements.	Utilizing analytics and data collection to understand customer needs and demands, along with rapid changes and modifications to tourism products and services based on this data.

Note

* As a result, customers can access necessary information and make bookings in real-time, ensuring flexibility and speed throughout the travel planning process.

Source: formed based on [2-3; 5]

Together, the aspects mentioned above demonstrate how digital technologies are helping to transform logistics and production chains in tourism, providing competitive advantages and meeting the growing customers' needs.

Conclusions from this study and prospects for further exploration in this area. Based on the above statements, it is proven that digital technologies have a significant impact on the transformation of logistics and production chains in tourism, providing them with flexibility and improving the efficiency, safety, and quality of services. Given this specificity, the role of digital technologies in transforming logistics and production chains in tourism is as follows:

1. Enhancing the efficiency of logistics and production processes, through the automation of hotel bookings, air ticket purchases, and other services, as well as using data analytics and artificial intelligence to optimize transportation routes.
2. Enhancing transparency and security of services and transactions through the blockchain technologies to ensure their transparency, immutability, and real-time execution status.
3. Enhancing service quality through customer personalization of services and offerings through data analysis and the Internet of Things.
4. Reducing logistics and production costs through the Big Data analytics to forecast demand and manage resources.
5. Increasing business flexibility and responsiveness to change through customizable mobile services and the variability of tourism products and services.

The aforementioned points allow us to identify the ecological aspects of digital transformation in tourism as a promising direction for further research. Specifically, it is important to analyze how digital technologies can contribute to the environmentally sustainable development of tourism, for example, by reducing paper usage through electronic tickets, reducing the number of trips through virtual conferences and meetings, etc.

Література

1. Кожухівська Р. Б. Логістичний Інтернет-провайдинг у туризмі. *Держава та регіони. Серія : Економіка та підприємництво*. 2019. № 4. С. 196–200.
2. Круш П. В., Мегедь Ю. В. Сучасні інноваційні технології в логістичній діяльності. *Східна Європа: економіка, бізнес та управління*. 2018. № 2(13). С. 103–106.
3. Марусей Т. Логістичні інновації в туристичній галузі. *Економіка та суспільство*. 2022, № 41. URL.:

<https://economyandsociety.in.ua/index.php/journal/article/view/1524>. (дата звернення: 17.05.2024)

4. Mashika H., Zelic V., Kiziun A., Maslyhan R. et al. Services sphere cluster management: virtualization and methodological aspects. Odesa: KUPRIENKO SV., 2023.

5. Мельниченко С.В., Шеєнкова К.А. Управління бізнес-процесами в туризмі: монографія. Київ: Київ. нац. торг.- екон. ун-т, 2015. 264 с.

6. Тарасюк Г.М. Логістичні рішення та управління постачаннями в компанії: виклики часу. Економіка, управління та адміністрування. 2021. № 4(98). С. 42–48.

References

1. Kozhukhivs'ka, R.B. (2019), "Logistics Internet-providing in tourism", *Derzhava ta rehiony. Seriya : Ekonomika ta pidpryyemnytstvo*, vol. 4, pp. 196–200.

2. Krush, P.V. and Mehed', YU.V. (2018), "Modern innovative technologies in logistics activities", *Skhidna Yevropa: ekonomika, biznes ta upravlinnya*, vol. 2(13), pp. 103–106.

3. Marusei, T. (2022), "Logistic innovations in the tourism industry", *Ekonomika ta suspil'stvo*, 2022, vol. 41, available at: <https://economyandsociety.in.ua/index.php/journal/article/view/1524>. (accessed: 17.05.2024).

4. Mashika, H., Zelic, V., Kiziun, A. and Maslyhan, R. (2023), Services sphere cluster management: virtualization and methodological aspects, KUPRIENKO SV., Odesa, Ukraine.

5. Mel'nychenko, S.V. and Sheyenkova, K.A. (2015), *Upravlinnya biznes-protsesamy v turyzmi* [Management of business processes in tourism], Kyiv. nats. torh.- ekon. un-t, Kyiv, Ukraine.

6. Tarasyuk, H.M. (2021), "Logistics solutions and supply management in the company: challenges of time", *Ekonomika, upravlinnya ta administruvannya*, vol. 4(98), pp. 42–48.

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