

Review Paper

Project Management in Supply Chains in the Context of Digitalization Processes

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Received: 19-11-2022

Revised: 30-01-2023

Accepted: 07-02-2023

ABSTRACT

The modern development of digital technologies is transforming traditional approaches to project management. Therefore, there is a need to use unique platforms and applications that automate business processes and analyze data flows. Supply chains are a source of microeconomic stability for an enterprise in the global market. Uninterrupted business operation in the face of socio-economic and geopolitical instability is a critical factor in achieving competitive advantages in the chosen market segment. The article aims to study the peculiarities of project management in supply chains in the context of digitization processes as a local concept. It contains a clear procedural order and is divided into some stages, during which specific analytical and business processes occur. As the world becomes increasingly digitized, the complexity of the supply chain, logistics routes, optimal choice of tariffs, and other factors of supply chain organization are highly variable. This creates a demand for high-quality software applications that analyze information promptly and allow for the most rational decision-making. Under such circumstances, the study results show the current features of project management and local project management in supply chains. They are mainly based on using particular digital infrastructure or information platforms that facilitate the work with such applications. In the context of unstable geographical suppliers and changing geopolitical leadership in commodity markets, it is a strategically important task for any enterprise. Moreover, the article examines the peculiarities of organizing a supply chain project, as well as the key critical stages of its functioning and the modern digital infrastructure used to manage such projects. The results of the study results also outline the prospects for the formation of digital technologies to ensure the stable operation of the corporate sector in selected market segments.

HIGHLIGHTS

- The modern development of digital technologies in the world is transforming traditional approaches to project management. Therefore, there is a need to use special platforms and applications that automate business processes and analyze data flows. Supply chains are a source of microeconomic stability for an enterprise in the global market.

Keywords: Digital technologies, supply chain, project management, cloud technologies, project governance, digital infrastructure

How to cite this article: Arestenko, T., Harkava, V., Goncharenko, M., Ippolitova, I. and Lozova, G. (2023). Project Management in Supply Chains in the Context of Digitalization Processes. *Econ. Aff.*, **68**(01s): 319-327.

Source of Support: None; **Conflict of Interest:** None



The development of modern digital technologies is rapidly changing not only the processes of designing innovative solutions but also improving project management features. The supply chain is a complex system consisting of the stages of raw material circulation before its production and the actual provision of the final manufactured product to the consumer. Under such conditions, the modern corporate community uses digital technologies to extend the quality of design services and organize business processes. This can reduce personnel costs, minimize the risks of problems in transportation or logistics management, etc. In the scientific community, project management in the supply chain and logistics management are generally distinguished. The supply chain and the establishment of its functionality is a more complex and voluminous process that includes the regulatory framework, the use of economic solutions, adherence to the customer's corporate policy, and consideration of macroeconomic and global strategic factors. These are the characteristics of many businesses that use digital technologies to organize and customize their supply chain. The importance of using specialized software makes it possible to quickly manage available information and make effective decisions for the company. Moreover, such digital infrastructure can be used to diversify both the company's supplier base and its customers. The digitization of economic relations and the creation of technological innovations has made it possible to find a wider range of suppliers, a flexible resource allocation system, payment by tariffs, and the construction of an unconventional logistics route, with favorable carrier transfer conditions. In such circumstances, modern enterprises and, corporations, manufacturers, with the help of such digital technologies, can create effective means of implementing project management, usually of a local nature. Each supply chain management project is designed for a specific product and requires significant enterprise resources.

Literature Review

The issue of researching project management in supply chains is primarily due to the broad discussion among scholars about the role of logistics, transportation operations, and the management component, how these processes are integrated and

interconnected, and how operations are changing in line with the emergence of digital technologies. For instance, Arvis (2018) notes that project management in supply chains is primarily concerned with the quality of planning and administrative work between the components of the supply chain hierarchy. The scientist's view is confirmed by the fact that the peculiarities of the work of modern enterprises that are focused on an uninterrupted supply process should look for several quality suppliers and constantly improve their capacities because of their further competitiveness in the market, as well as their livelihoods, will depend on it. The success of a company's competitive advantages can be assessed by thoroughly assessing the strengths and weaknesses of the company's position in the competition and comparing the results of the analysis with those of competitors (Bondarenko *et al.* 2018).

According to Immonen (2021), project management in supply chains is a completely different process from logistics management. Setting up the functioning of the supply chain involves, first of all, the coordination of tariffs, the use of the regulatory framework, as well as the introduction of high-quality technologies for the further development of such means. The opinion of Klumpp (2019) differs from this statement. He believes that project management in supply chains is partly distinct from logistics management. However, it is closely related to the logistics department and operations. This implies a broader management model, as it requires not only the construction of logistics routes and transportation analysis but also a deeper understanding of how to implement these technologies in the enterprise activities. According to Guggenberger (2020), using information technologies is a feature of project management. They allow not only to improve the quality of business organization but also to create microeconomic security of the enterprise by establishing a constant supply flow. In the context of the socio-economic crisis and the change of strategic geopolitical leaders in the supply of raw materials, this is relevant for any enterprise. In addition, research by Nitsenko *et al.* (2020) indicate the importance of using a mathematical model to assess the integral risk of cargo transportation, which provides systematic support for decision-

making regarding the logistics of multimodal transportation. The mathematical model given by the authors allows changing the transport risk at a specific stage in real-time, to offer options for reducing the integral risk, to use it, in particular, when choosing other routes and types of transport. In this context, research should also be noted by Shvets *et al.* (2013). The authors offer a method by which you can choose the most rational solutions, build a mathematical model of multi-criteria choice, as well as forecast the identified landmarks and monitor further activities.

An essential view in the scientific literature is that of Govindana (2019), who believes that in the context of the development of modern digital technologies, any supply chain is a separate local project of the enterprise, which is organized using digital technologies, and should also be widely integrated into the global information system to search for suppliers and transport routes. Therefore, according to Noussan (2020), in the context of the development of digitization processes, project management in supply chains should be accompanied by specialized digital technologies used to improve the quality of implementation of the enterprise strategy and ensure a continuous business process.

Research Aims

The article aims to study project management in supply chains in the context of the development of digital technologies, as well as digitalization processes that directly affect the quality and methodology of project management in the modern corporate environment. The development of modern digital infrastructure and specialized cloud services is a crucial trend today. They make it possible to accelerate the integration of participants in the logistics, transportation, and commodity markets into one system. The study aims to outline the transformation of project management changes in supply chains with the help of specialized software resulting from the development of digitization processes. The use of practical project management tools, as well as their implementation in actual practice for enterprises that utilize an extended supply chain - one that has more than two levels of hierarchical elements between the production of raw materials as well as the actual sale of the final product to the consumer. The extended supply chain

in digitalization includes online bidding platforms, intermediaries that transport raw materials, distributor networks for selling goods, etc.

MATERIALS AND METHODS

The study employed some scientific methods and analyzed modern digital technologies used for project management in supply chains. Modern digital technology tools are primarily used in the public domain, depending on the manufacturer. For example, companies such as Google, Oracle, and Microsoft allow trial versions of applications to use their platforms for free for a specific time. This makes it possible to conduct research more expediently by comparing the most popular applications offered by companies to compare natural project management in the supply chain. Moreover, modern technologies help to use matrix methods in more detail, which have become outdated with the development of digitalization, but are important when evaluating or analyzing available information. Several analytical methods were used while writing this article. The methods of deduction and induction were applied, which made it possible to identify the features of modern project management in the supply chain. It has become more gradual in the context of digital technologies. To write the article, the author used modern theoretical materials in project management research and the introduction of digital technologies in project management. The experience of domestic and foreign scholars helps outline the key common principles of organizing supply chain project management, which is used to ensure the quality of implementation of an enterprise operating in a selected market segment.

In addition, the study used materials from modern companies, as well as Microsoft Project, Jira, and the beta version of the Trello software application. They allow us to examine the internal functionality in more detail, outline the key principles of the ability to work with these platforms in the context of their extension to the supply chain, as well as the organization of structural elements of the extended chain, including work with customers, information systems and partial integration of transport services into logistics and business design. To achieve this goal, the study proposes the theoretical and methodological foundations for forming an extended supply chain as a structural

unit of enterprise functioning in the context of digitization processes.

RESULTS

In the context of the development of digital technologies, as well as the increasing role of their circulation in the internal business processes of an enterprise, it is essential to realize the quality of the supply chain, as well as to comply with all stages of its implementation, which is a top priority due to socio-economic instability and problems of the global corporate sector. Therefore, project management in supply chains is a global problem that can be solved through specialized digital services, as well as software aimed at solving logistics, transportation, or any problems that arise during project management and ensuring the further functioning of the enterprise. From this perspective, especially the use of digital planning solutions, organizing and managing the quality of project stages, a specialized digital infrastructure should be used to help improve project management aspects, minimize risks, and implement the most optimal supply chain management.

The modern development of digitalization leads to an increased involvement of digital technologies in the management of internal processes, the peculiarities of supply organization, and the improvement of the quality of the development of the accounting, control, and quality of project management systems. Project management in supply chains primarily concerns the quality of the development of the system for distributing project components, building a clear hierarchy for its activities, as well as the use of quality tools that can strengthen not only the internal policy of a company that uses a specific project setup system but also has a wide range of digitized solutions, such as automation, modeling, which can improve the quality of project management.

In today's environment of global challenges, it is becoming important not only to effectively manage the system that deals with project management and its organizations but also to identify risks in advance, effectively minimize the chance of their occurrence, and use analysis and forecasting tools. In the long run, this can not only improve the quality of project management but also strengthen

the role of digital automation and forecasting systems.

The peculiarities of project management in supply chains are primarily aimed not only at selecting suppliers, and building an efficient logistics route, but also at finding the most optimal management solutions in the enterprise, which is carried out through digital systems.

Project management is usually carried out by a project manager using some technologies that can improve not only the way they interact with the team but also improve data analytics and the actual analysis of supply management for the enterprise. Due to the spread of the coronavirus pandemic, the consequences of the war in Ukraine, and the growing trend of focusing on cheap suppliers from East Asia, there is a need to find high-quality models for the further development of enterprises that are dependent on the supply of certain raw materials or specialized materials. Project management in supply chains involves a complex process of developing systems for selecting, assessing the reliability of suppliers, and operating an enterprise or company following existing supply systems. This can not only strengthen or improve the quality of the company's operations but also create the best possible conditions for further work in the chosen market segment.

Modern digitalized processes in logistics and transportation technologies are widely integrated with digital means of Big Data development, blockchain technologies, 3D printing, and mass automation. This can not only improve the quality of project management but also make it more accessible for internal use within the company, as a transparent system of responsibility distribution, as well as project management, can improve the quality of supply chain utilization, which is used as a factor in increasing the company's competitiveness. Despite the wide range of existing technological solutions for project management in supply chains, which is described in more detail in Table 1, there are several effective solutions for supply chain optimization.

For instance, in the context of the development of digital technologies and automation processes, it is common to use the Jira system. It is used for software development and also contains

Table 1: Characteristics of the most popular project management systems in supply chains

Product name	Content	Development prospects
Microsoft Project	One of the most popular Microsoft products, introduced with standard office libraries. It allows you to implement, plan and evaluate project activities, as well as directly influence the quality of the distribution of project functions. Contains an extensive system for managing internal project functions.	The prospects of Microsoft Project are primarily related to its integration with cloud services, which can improve the specifics of approaches to organizing project activities, and enhance the quality of information analysis, collection, and processing. Therefore, a key area of further development will be broad integration with cloud services, as this product is used by a significant share of Microsoft Windows users.
Primavera	An Oracle product that provides a wide range of choices for organizing project work, which is suitable for both small, medium, and large enterprises. In addition, the company offers a wide range of functionality that can improve the quality of internal corporate project implementation, as well as enhance the use of internal or external resources, which can directly affect the quality of supply chain management.	The ability to use Primavera's digital tool locally is useful for companies that have a diversified supply chain network and need to integrate them into their network. Based on the use of such features, this product will be useful for enterprises that plan not only to strengthen their project network management but also to strengthen the function of monitoring the results of the implementation of these projects. Therefore, the product is promising for companies that focus on a broad project management model.
Open Plan	The most optimal digital product used to manage logistics processes, and may also include a corporate model for managing projects as well as small individual projects. Digital software is characterized by the specifics of the use of supply chain management, which can be most effective in the face of increasingly digital solutions.	Further versions of this product depend on the specifics of using it not only as a supply chain management system but also as a more complex system for the distribution of responsibilities and the use of key design tools. Based on the implementation of modeling, as well as the analysis of the results of the enterprise's logistics flows, the digital product contains many advantages over current analogs, which may be promising for its further modernization and improvement.
Spider Project	The key difference between this software tool and other internationally used ones is the functionality that monitors decision-making and can analyze the quality of the decisions made. This system is responsible not only for planning, organizing, and managing the project, but also makes it possible to evaluate the decisions made. This can improve the further work with the software product since based on the use of its data, it is most appropriate to implement it in a wide network of supply chains.	The prospects of this project management system in the context of mass digitization relate to the strengthening of the role of Big Data and AI technologies, which will be used to assess the effectiveness of logistics decision-making that directly affects the formation of the supply chain. Such an approach can not only ensure the quality of this product but also increase the level of its implementation in the corporate segment of the world. Improving the quality of data processing and analysis is a key principle of technology development in the direction of this supply chain project management system.
Cloud technology products	The use of cloud technologies is the most optimal solution that can be used as an element of strengthening the efficiency of supply chain management but also increasing the power of information analysis. Increasing the speed of data analysis and the quality of decision-making directly affects the efficiency of supply chain management. The use of cloud services does not require a digital infrastructure and can compensate for a weak corporate digital infrastructure. They can be integrated into fully cloud-based services that offer a wide range of supply chain management solutions.	Cloud technologies are one of the most promising and popular means of project management, not only for supply chains but also in general. The key advantages are the diversification of the range of digital solutions, which can enhance the quality of the company's performance in the market, as well as support for management decisions, which offers to carry out its activities following the challenges of today.
Matrix methods	Despite significant advances in digital technologies in project management, strategic matrix methods remain a feature of project management implementation. The most popular of them include the Gantt chart, which is used to build schedules, distribute work, and responsibilities, and determine the most and least critical work.	Prospects for the use of matrix methods in supply chain management are important for analyzing the current state. However, it is not enough as a full-fledged project management tool, which requires additional tools for analyzing project activities and implementation, as well as integrated digital solution systems that can most widely reveal its content.

Source: Compiled by the author.

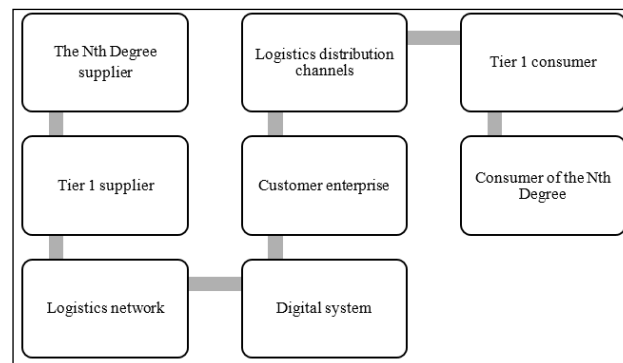
a diversified project management system that has distribution functions, helps to analyze the peculiarities of internal project development, and also distributes tasks among its participants in the most appropriate way with a fixed time. Jira is the safest and most effective tool for managing projects based on digital technologies and involves detailed software development or the implementation of a particular product. The popularity of the Jira product has come about because of its real efficiency for project implementation.

Another typical example of project management software used not only for project management in supply chains but also as a possible internal corporate application aimed at solving specific real-world problems is Trello. This app allows you to create several “dashboards” that are later used to optimize existing tasks and monitor the degree of their implementation or realization. The application has digital blocks containing a wide range of functionality in time and assigned to specific performers or project tasks. In addition, this software tool has possible corporate links, which can be localized to the needs of a particular company. Therefore, using Trello to organize a supply chain project has some competitive advantages over other digital products or solutions in organizing and developing a business.

The tools described in Table 1. that are used for effective project management in supply chains can be used not only for developing or modeling the project itself but can also be partially integrated into a digital decision-making system that may have common features with the overall development policy of an enterprise or corporation.

Modern supply chains have a complex hierarchical structure. There are several levels of interaction between the producer of raw materials and the end user and between the ordering company and the manufacturing company. Moreover, any modern supply chain includes specific digital systems that store information about the customer, transportation routes, and other project details. For its high-quality implementation, it is necessary to use a project management model based on an extended supply chain that includes information systems and a comprehensive digital infrastructure. This makes the process of establishing and further optimizing such a supply chain more accessible, and better

because by using such systems, an enterprise can achieve competitive advantages in the selected market segment. The specifics of building an extended supply chain are shown in more detail in Fig. 1.



Source: Compiled by the author.

Fig. 1: Extended supply chain

Modern supply chains may include several intermediary producers and several consumers, which leads to the formation of a certain number of levels and requires an accurate evaluation and selection mechanism. The supply process should be provided with a logistics route, consider current carrier tariffs, and contain regulatory information on the implementation of such activities. Therefore, digital systems are used to effectively manage the supply chain, which can help plan work processes efficiently and use them as an element of business planning. This will significantly improve project management in supply chains.

In the context of digital development, it is worth distinguishing between the specifics of logistics and design solutions and the formation, maintenance, and design of the supply chain since the technologies used in both are similar. However, the process of supply chain maintenance is different based on the use of technologies that must process initial information about customers and platforms where the needs of the customer enterprise are placed. Moreover, it should contain specific selection criteria, and make the supply chain a complete project, because, in the context of socio-economic instability and variability of the corporate sector, it is necessary to use not only diversified tools for creating and developing the supply chain but also to include several suppliers, which can minimize corporate risks. Therefore, in Europe and developed

countries, it is common practice to use specialized supply chain management systems, as well as to use automatic quarterly reporting systems that analyze the available information each quarter. Google and Microsoft developed such a system. Not only does it improve the company's resources in terms of their optimal use but it also ensures the functionality of any business.

The mentioned companies predict that by 2030, most companies will either use their resources to process the information on the formation of a supply chain project or use cloud technologies entirely, as they provide much more efficient use of available information and structure it under modern world requirements.

The uneven distribution of commodity production in the world, in particular the growing competition between the US and China, creates conditions for finding the most efficient suppliers and encourages Asian countries to develop supply chain automation technologies, which can help find new customers in the European market. Under such conditions, the prospects for project management in supply chains in the context of digitalization processes are focused on the development of specialized technologies for data processing, evaluation, and analysis.

DISCUSSION

The findings of the study indicate that in the context of the digitalization of business processes, the use of special software and innovative project management tools in supply chains is becoming increasingly important. The use of digital technologies allows not only for planning, organizing and use of the available data for analysis but also for minimizing the risks associated with logistics processes and the corporate strategy of the enterprise. In the context of global economic instability caused by the war in Ukraine, which has changed key suppliers and strengthened the role of China and the United States in the world, it is becoming increasingly important to use special digital platforms that enable project management.

The use of systems such as Jira or Trello is the main means of building a project in supply chains, as these software applications have a set of tools that can help to properly organize the work of the enterprise, as well as implement it following

corporate goals. It is important to conduct further research in the context of the development of software applications, as well as the development of cloud technologies, which can not only improve the quality of use and design of supply chain management but also analyze the quality and efficiency of decision-making in real time. Oracle's cloud technologies are widely used in modern logistics and project management due to their high quality, as well as the ability to implement these technologies widely in public use, as they can improve the quality of circulation of digital products that manage the supply chain process from the producer of raw materials to the consumer of the final product.

A problematic aspect of the current study is the use of an effective methodology for project work, as well as the distribution of responsibilities among supply chain participants. Large companies use complex extended supply chains that may include several levels of suppliers and consumers, but to support such a system, they need to have a strong digital infrastructure, which is a challenge in the context of political aggravation. This requires the use of diversified data centers that can quickly analyze information and make prudent decisions depending on the analytical assessment. Apart from the use of special software and digital infrastructure, the development of in-house staff performing the function of project management is the prerogative of modern enterprises. Implementing effective control can not only set up an automated project management system with high quality but also allow for effective local management decisions. Most managers performing the function of supply chain design and project management must use several matrix methods, not including the skills to use special software that allows for automating processes, etc.

Thus, the study provides prospects for the further development of digital technologies, as well as special software products that can serve both as platforms for managing the supply chain system and for its design itself. The study's results characterize that modern project management in supply chains, due to the complexity of the organization and the quality of its development, requires competent skills from project management leadership, as the distribution and customization of such products

will constantly be evolving and changing. Under these circumstances, the prospect of further research will be the use of digital technologies, modern innovative solutions, and strategies in the field of project management in supply chains.

CONCLUSION

The results of the study indicate the peculiarities of project management in supply chains. They contain a complex structure that includes not only the design of logistics and transportation solutions but also contains a hierarchy from the corporate strategy of the enterprise to the stages of its implementation at the stages of raw material supply. This approach creates the conditions for finding optimal solutions in the modern information society, namely using specialized software. Digital technologies, due to the spread of digitalization, make it possible to improve not only the quality of project management but also to minimize possible risks, introduce new technologies for the distribution of project functions, as well as the quality of its use by the current operating conditions of a particular product. According to this approach, it can be argued that modern features of project management in supply chains should have a high-quality infrastructure, as well as a built-in corporate strategy of the enterprise, which includes several levels of suppliers and consumers.

A promising area for the development of supply chain management is the use of artificial intelligence and Big Data technologies. They can operate with suppliers' operands, draw up transportation and logistics routes, and work with corporate information. With the development of digitization processes, the role of application software is increasing. However, special matrix methods, such as SWOT, PEST analysis, and the Gantt chart, are among the key tools for determining the specifics of project management.

The study shows that today's leading multinationals, as well as the most popular IT companies, are working on developing a special digital infrastructure. This can help to fulfill local internal company projects as well as integrate them with more global supply chains. The supply chain inherently consists of a structure built on the primary source of raw material production, as well

as the end user. Any enterprise operates under these conditions. Therefore, to improve customer service quality and minimize supply disruptions risks, most leading companies use information management technologies, which are often integrated into cloud services.

REFERENCES

- Antenucci, I. 2021. Smart Cities, Smart Borders. Sensing Networks and Security in the Urban Space. In *Sensing In/Security. Sensors as Transnational Security Infrastructures*, edited by N. Klimburg-Witjes, N. Poehacker, and G. C. Bowker, 76–100. Mattering Press
- Arvis, J.F., Ojala, L., Wiederer, C., Shepherd, B., Raj, A., Dairabayeva, K. and Kiiski, T. 2018. Connecting to compete for 2018: trade logistics in the global economy. World Bank. DOI:10.1596/29971.
- Bauböck, R. and L. Orgad, eds. 2020. Cities Vs States: Should Urban Citizenship Be Emancipated from Nationality? EU Working Paper RSCAS 2020/16: Florence.
- Bondarenko, S., Liganenko, I., Kalamani, O. and Niekrasova, L. 2018. Comparison of methods for determining the competitiveness of enterprises to determine market strategy. *Int. J. Civil Eng. Tech.*, 9(13): 890-898.
- Brito, M.F., Ramos, A.L., Carneiro, P. and Gonçalves, M.A. 2019. Ergonomic analysis in lean manufacturing and industry 4.0—a systematic review. In *Lean Engineering for Global Development*. Springer, pp. 95–127.
- Evtodiev, T. E., Chernova, D.V., Ivanova, N.V. and Kisteneva, N.S. 2019. Logistics 4.0. In S. Ashmarina, M. Vochozka (Eds.), *Sustainable Growth and Development of Economic Systems. Contributions to Economics* (pp. 207-219). Cham: Springer. DOI: 10.1007/978-3-030-11754-2_16.
- Fourcade, M. and J. Fleur. 2020. Loops, Ladders and Links: The Recursivity of Social and Machine Learning. *Theory and Society*, 49(5–6): 803–832.
- Govindana, K., Cheng, T.C.E., Mishrac, N. and Shuklad, N. 2018. Research of the delivery logistics management information system based on big data. *Transportation Research Part E: Logistics and Transportation Review*, 114, 343-349. DOI: 10.1016/j.tre.2018.03.011
- Hallikas, J., Immonen, M. and Brax, S. 2021. Digitalizing procurement: the impact of data analytics on supply chain performance. *Supply Chain Manage.*, 26: 629–646.
- Ivanov, D. 2021. Lean resilience: AURA (Active Usage of Resilience Assets) framework for post-COVID-19 supply chain management. *Int. J. Logist. Manage.* doi: 10.1108/IJLM-11-2020-0448
- Klumpp, M. and Zijm, H. 2019. Logistics innovation and social sustainability: how to prevent an artificial divide in Human-Computer Interaction. *J. Bus. Logist.*, 40: 265–278.
- Korepin, V., Dorozhkin, E., Mikhaylova, A. and Davydova, N. 2020. Digital economy and digital logistics as new area

- of study in higher education. *Int. J. Emerg. Technol. Learn. (ijET)* **15**: 137–154.
- Mahindroo, A., Samalia, H.V. and Verma, P. 2018. Information systems road map to enhance economic and operational reverse logistics performance. *Int. J. Logis. Syst. Manag.*, **29**(2): 215-240.
- Möller, F., Guggenberger, T.M. and Otto, B. 2020. Design principles for route optimization business models: a grounded theory study of user feedback, in Paper presented at the Wirtschaftsinformatik (Zentrale Tracks) (Potsdam). doi: 10.30844/wi_2020_j10-moeller
- Nitsenko, V., Kotenko, S., Hanzhurenko, I., Mardani, A., Stashkevych, I. and Karakai, M. 2020. Mathematical modeling of multimodal transportation risks doi: 10.1007/978-3-030-36056-6_41
- Noussan, M. and Tagliapietra, S. 2020. The effect of digitalization in the energy consumption of passenger transport: An analysis of future scenarios for Europe. *J. Clean Prod.*, **258**: 120926.
- Oleśków-Szłapka, J. and Stachowiak, A. 2018. The framework of logistics 4.0 maturity model. In: International Conference on Intelligent Systems in Production Engineering and Maintenance, 771-781. Springer, Cham. DOI:10.1007/978-3-319-97490-3_73.
- Philipp, R., Gerlitz, L. and Moldabekova, A. 2020b. Small and Medium-Sized Seaports on the Digital Track: Tracing Digitalisation across the South Baltic Region by Innovative Auditing Procedures. In: International Conference on Reliability and Statistics in Transportation and Communication, 351-362. Springer, Cham. DOI:10.1007/978-3-030-44610-9_35.
- Rosin, F., Forget, P., Lamouri, S. and Pellerin, R. 2019. Impacts of industry 4.0 technologies on Lean principles. *Int. J. Prod. Res.*
- Rossini, M., Costa, F., Tortorella, G.L. and Portioli-Staudacher, A. 2019. The interrelation between Industry 4.0 and lean production: an empirical study on European manufacturers. *Int. J. Adv. Manufactur Technol.*, **102**(9): 3963–3976.
- Rudychева, N. 2019. Digitalization of transport is hampered by a lack of standards and economic feasibility. CNews.
- Shvets, V.Y., Rozdobudko, E.V. and Solomina, G.V. 2013. Aggregated methodology of multicriterion economic and ecological examination of the ecologically oriented investment projects. *Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu*, **3**: 139-144.
- Stojanović, Đ. and Ivetić, J. 2020. Possibilities of using Incoterms clauses in a country logistics performance assessment and benchmarking. *Transport Policy*. DOI:10.1016/j.tranpol.2020.03.012.
- Varela, L., Araújo, A., Ávila, P., Castro, H. and Putnik, G. 2019. Evaluation of the relation between lean manufacturing, industry 4.0, and sustainability. *Sustain*, **11**(5): 1439.
- Witkowski, K. 2017. Internet of things, big data, industry 4.0–innovative solutions in logistics and supply chains management. *Proc. Eng.*, **182**: 763-769.

