

IMPLEMENTING NEW SUPPLY CHAIN MANAGEMENT PRACTICES TO IMPROVE INDUSTRIAL PRODUCTIVITY AMID THE COVID-19 PANDEMIC

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Abstract. This study aimed to develop a methodological approach to assessing the major directions for introducing new supply chain management (SCM) methods to improve the industrial enterprises' productivity during the COVID-19 pandemic and test the developed approach at enterprises in the real economy related to Russia, Kazakhstan, and Azerbaijan. To this end, a comprehensive research project needed to be implemented to assess the main prospects for implementing new SCM practices. The objective was to boost the productivity of the enterprises in the context of the pandemic and identify the main problems hindering the sustainable development of such chains. The testing identified the principal characteristics of supply chains amidst the pandemic, namely reliability (30 experts spoke in favor), resilience (22), and economy (19). At the same time, a sharp decrease was observed concerning the interest in the enterprises' supply chains optimization (7 experts), flexibility (6), efficiency (2), and environmental friendliness (4). The most promising technologies for the development of supply chains, according to the results of the study, should be considered the Internet of things ($\mu = 3.8$), additive manufacturing (3D printing) ($\mu = 3.77$), big data analytics ($\mu = 3.73$), and blockchain and virtual reality ($\mu = 3.6$ each).

Keywords: COVID-19 pandemic, environmental friendliness, optimization, supply chain management, supply chain resilience, supply chain reliability.

JEL Classification: B41, C61, L16, R11.

Introduction

The early 21st century can be called the “golden era” of supply chains. The rapid scientific and technological progress that has spurred and accelerated globalization has opened up new opportunities for manufacturers to benefit from the international division of labor. Meanwhile, technological innovations have provided a completely new and highly effective tool for supply chain management. Such chains have transformed with surprising rapidity from a previously secondary technical condition for implementing industrial and commercial activities into one of the companies' most significant competitive advantages, becoming the key essence of corporate competition (Xu, 2019). Naturally, the real economy and the academic economic community then focused on the issues of organizing supply chains and introducing new management

methods to improve the efficiency of the chains (Min et al., 2019).

The situation changed dramatically in 2020. On January 30, 2020, the World Health Organization (WHO) announced the emergence in China of a previously unknown pathogen, which has escalated into an unprecedented outbreak, and which has been met by an unprecedented response (WHO, 2020a). Despite China's truly titanic efforts, it was impossible to contain the epidemic. On March 11, 2020, WHO described the spread of coronavirus infection (COVID-19) as a pandemic and called on all countries to implement a comprehensive strategy to prevent infections, save lives and minimize impact (WHO, 2020b). Most countries' governments greenlighted extremely strict and unprecedented quarantine restrictions soon to prevent the further development of the pandemic, including those on communication with other countries, domestic transport

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links, the activities of enterprises and organizations, up to complete lockdowns. According to economists, the damage from the COVID-19 pandemic and the ensuing quarantine restrictions in the first year was comparable to the Great Recession (Giroud & Ivarsson, 2020). Faced with the first exogenous global crisis in history, humanity has discovered the extreme fragility of carefully designed supply chains, including those for essential commodities such as food, medicine, and sanitation. Before the COVID-19 pandemic, the studies focused on building agile, flexible, lean, environmentally friendly, optimized, and efficient supply chains (Kawa & Maryniak, 2019; Schniederjans et al., 2018; Stella, 2019). During the pandemic, the focus shifted sharply toward rethinking concepts of sustainability, reliability, and risk management in supply chain management in light of such research (Ozdemir et al., 2022), resulting in a dramatic increase in social demand for modern supply chain management techniques to improve industrial productivity.

This paper develops a methodological approach to evaluate the main directions of introducing new SCM methods to improve the productivity of industrial enterprises during the COVID-19 pandemic. The first section of this paper presents a review of current scientific literature on the problem under study. The second section presents the main characteristics of the methods and tools of the multi-stage research project developed to achieve the study goal. The research was tested on the example of industrial enterprises in Russia, Kazakhstan, and Azerbaijan, with the choice of countries for testing based on:

- historical similarities in the formation of national economies in the post-Soviet economic space;
- significant similarity of the regulatory and legal framework;
- high relevance of the problem for the selected countries;
- comparability of the scale of national economies and the level of industrial development in the selected countries.

The third section of the paper presents an analysis of the results obtained during testing. The fourth section offers the results of a discussion based on the comparison of the results obtained with the results previously presented in the scientific literature. The fifth section presents the main study conclusions on the problem of introducing new supply chain management methods to increase productivity in the context of the COVID-19 pandemic.

1. Literature overview

The undoubted importance and decisive importance of supply chains for competitive productivity of industrial enterprises in a turbulent economy have caused considerable attention of the scientific community to the issues of improving efficiency, reliability, and sustainability of supply chains (Kalaitzi et al., 2021; Karmaker et al., 2021). In this case, labor productivity, according to modern researchers, is one of the key tenets of economic theory

(Radło & Tomeczek, 2022), and, despite the fact that the research interest in the problems of increasing labor productivity has not diminished over the past decades, the problem has not lost its relevance (Adebowale & Agumba, 2022; Radło & Tomeczek, 2022). The importance of labor productivity for the real sector of the economy and sustained academic interest have led to a variety of approaches to the definition of labor productivity, but in this study, labor productivity is understood as an indicator of efficiency, showing the output per unit labor input (Yagi et al., 2022).

Supply chain resilience in this study refers to the ability to recover from an undesirable level of performance to the planned level through recovery or adaptation measures (Ivanov & Dolgui, 2020; Zhao et al., 2019). This study also took into account the three basic elements for achieving supply chain resilience, namely readiness, vigilance, and flexibility (Ozdemir et al., 2022). A review of the literature revealed that a significant contribution to the issue of supply chain resilience has been made by investigating the relationships of resilience, reliability, and risk in supply chain management using covariance modeling with structural equations (Ozdemir et al., 2022). Unfortunately, the study is predominantly academic in nature, while the complexity of tools applied limits its practical application.

Ye et al. (2022) demonstrated the possibilities of an integrated approach for optimizing supply chains at the interregional level by developing a hybrid multi-regional input-output model (MRIO) of China. Researchers proposed the symmetric inter-provincial MRIO model that combines the physical food and agricultural biomass system with China's monetary supply chain. The model enables systematically capturing agri-food product flows with an unprecedented level of product detail across domestic supply chains for future sustainable development design (Ye et al., 2022). Unfortunately, despite the relevance and innovativeness of the hybrid multi-regional model, the possibilities of its practical implementation at the time of the study are limited by the statistical information system imperfection that limits the model's database (Ye et al., 2022).

Researchers emphasize that evolutionary innovations in supply chains are usually not effective enough in the current economic situation. Simply improving operations or developing additional innovations to existing technologies often fails to bring the desired result (Nilsson & Göransson, 2021). This actualizes radical innovations that stem directly from a change in the business paradigm and the adoption of a new logic of its conduct, including the transition from linear one-way to circular or closed supply chains. At the same time, great attention is paid to maintaining the sustainability of supply chains, which is reflected in the sustainable innovation concept, where such innovation should be understood as the introduction of products, production processes, management practices, or business methods, new or significantly improved, that bring economic, social, and environmental outcomes (Neutzling et al., 2018). The most significant critical

factors for implementing innovation in sustainable supply chains are grouped into the following categories, ranked by their importance to resilience: (1) collaboration; (2) strategic orientation, culture, practices, and political context; (3) market influence, governance and education, and organizational capabilities; (4) capacity balance, cost and revenue sharing, supply chain metrics, and timing (Nilsson & Göransson, 2021). The most popular technologies, which researchers considered as drivers behind the supply chains development amid the pandemic, are as follows: (1) additive manufacturing (3D printing); (2) artificial intelligence; (3) autonomous vehicles; (4) big data analytics; (5) blockchain; (6) drones; (7) Internet of things; (8) robotics; (9) virtual/augmented reality (Hopkins, 2021).

Noteworthy is also the methodological approach of Gloet and Samson (2022) who analyze the possibilities of knowledge and innovation management to support innovation for ensuring the supply chain sustainable development. According to the results of the longitudinal study, the significant role of knowledge and innovation management in the sustainable development of supply chains was noted by all enterprises participating in the study, while the greatest contribution of knowledge and innovation management was noted in the following areas: (1) strategic focus, strategic planning; (2) protecting the reputation and performance of the organization; (3) commitment to sustainable supply chains management practices such as food safety and traceability; (4) supporting standards, certification, and risk management; (5) learning from partners; (6) relationships and communications; (7) innovation (Gloet & Samson, 2022; Tazhibekova et al., 2019).

It is worth noting that a significant part of the available research on new supply chain management methods is highly specialized and either cannot be adapted to other industries (Nunes et al., 2020; Salehi-Amiri et al., 2022) or requires additional research for effective adaptation (Afraz et al., 2021; Hwihanus et al., 2022). At the same time, an equally significant part of modern research considers the issue of new supply chain management methods to boost industrial enterprises' performance amidst the COVID-19 pandemic in a narrow way, analyzing only one of the possible methods, for example, blockchain (Laforet & Bilek, 2021; Wong et al., 2020; Yadav et al., 2020).

Thus, the analysis of the theoretical sources as part of this study showed that, despite the researchers' significant attention to the issues of improving supply chain management to increase the industrial enterprises' output amid the pandemic, at the time of the study, the number of evidence-based methodological approaches to a practical solution of this issue is quite limited. The key motivation for this study was the urgent need of the real economy in effective methods of supply chain management to improve the efficiency of industrial enterprises under the COVID-19 pandemic and the lack of development of this issue by modern scientific thought.

The purpose of this study was to develop a methodological approach for assessing the main directions for introducing new supply chain management methods to

improve the enterprises' performance in terms of the COVID-19 pandemic and test this approach at enterprises in the real economy. To this end, the research met the following tasks: (1) performed an analysis of theoretical sources on the topic of the study; (2) defined its methodological design; (3) determined the information base and the main research tools; (4) tested the proposed methodological approach at the enterprises of the Russian Federation, the Republic of Kazakhstan, and the Republic of Azerbaijan; (5) identified the main issues affecting the introduction of new supply chain management methods to boost industrial enterprises' output amidst the pandemic and the most promising areas for the development of such enterprises' supply chain management.

2. Methods and materials

A multi-stage research project, which involved representatives of industrial enterprises in Russia, Kazakhstan, and Azerbaijan, was developed to solve scientific problems set. The major stages of the study are shown in Figure 1.

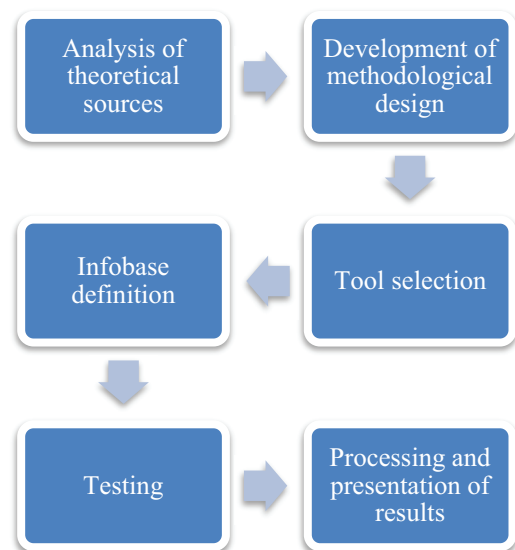


Figure 1. Main stages of the study (source: developed by the author)

The study's main limitations were considered when developing its methodological design. Limitations of the statistical information system significantly influenced the methodological design because the statistics characterizing the introduction of new supply chain management methods to improve the enterprises' performance are scattered, poorly comparable, and insufficiently relevant or reliable. Expert interviews were chosen as the most optimal research method given the lack of relevant and reliable statistical information. Taking into account the quarantine restrictions and the need to comply with the social distancing principle, the interviews of experts were conducted both in the classic version ("face to face") and using video communication (Viber, Skype, Telegram, etc.). An integrated approach was used when interviewing. It

combines the classic tools for personal and expert interviews, namely observation, collection, and recording of verbal information and audio and video recording of non-verbal information. In addition, to ensure that the study design is preserved and data on key research questions are measurable and comparable, a roadmap has been developed that expands the interview toolkit by taking advantage of statistical analysis to obtain quantifiable and comparable information on specific research questions. The study used a 5-point Likert scale to obtain quantitative indicators. This toolkit allows simultaneously providing a high level of understanding of the scale, ease of processing results, and unambiguity of the final interpretation (Vogel et al., 2020), as well as combined questions (or statements) with multiple choice and open-ended answer options. Likert scale scores in this study are interpreted as follows: (1) for questions 1 to 5: do not agree – 1 point; rather disagree than agree – 2 points; hard to answer – 3 points; rather agree than disagree – 4 points; agree – 5 points; (2) for questions 7 to 15: not interested – 1 point; rather not interested – 2 points; hard to answer – 3 points; rather interested – 4 points; use and plan to develop – 5 points. The expert interview roadmap is based on the experience of predecessors (Gloet & Samson, 2022; Hopkins, 2021) primarily in evaluating the perceptions and perspectives of new supply chain management techniques to improve industrial plant productivity. A roadmap of the expert interview is presented in the Appendix. The information obtained during the interview is not limited to the data reflected in the roadmap but includes verbal and non-verbal information provided by the experts on the research questions.

Industrial enterprises in Russia, Kazakhstan, and Azerbaijan were selected for testing. The logic of the choice of countries for testing was based on the following arguments:

- (1) historical similarity in the formation of national economies, since the national economies of all the selected countries belong to the post-Soviet economic space, and for a long time were formed under the conditions of a command economy;
- (2) significant similarity of official national rules (regulatory and legislative framework) for most countries of the post-Soviet economic space;
- (3) high relevance of the problem for the countries of the post-Soviet economic space, since the peculiarities of the formation of national economies determine both the insufficient development of problems associated with supply chain management and the difficulty of adapting methods developed for economically developed countries;
- (4) comparability of the scale of national economies and the level of industrial development in the countries selected for testing.

The study results will be relevant for most countries of the post-Soviet economic space, as well as quite relevant for many developing countries, especially for those whose economies were also formed under the

command-administrative system. The use of the results of this article for countries with developed economies may not be relevant enough, but the acute lack of research relevant to the countries of the post-Soviet economic space was a decisive argument in choosing countries for testing.

Managers of industrial enterprises were the general population in the selection of experts. Taking into account the recommendations of modern economic science determining the optimal number of expert interviews in the range from 20 to 30 (Marshall et al., 2013) and the peculiarities of the multi-country approach, the maximum number of the recommended sample, 30 expert interviews (12 for Russia, 10 for Kazakhstan, 8 for Azerbaijan), was determined for the study. Enterprises were chosen randomly. All heads of enterprises were informed about participation in the research, its goals and objectives, and confirmed their consent to participate in the research. Since the interview is completely anonymous, written confirmation of consent to process personal data is not required.

The study selected industrial enterprises for testing in Russia, Kazakhstan, and Azerbaijan. In particular, the study considered the historical similarity of the national economies' formation (countries of the post-Soviet economic space). It also took into account the scale of economies relative to this segment and the level of development of industrial production. As a general population, when choosing experts, a set of heads of industrial enterprises was used. All CEOs were informed about participation in the study, its goals and objectives, and confirmed their consent. Since the interview is completely anonymous, written confirmation of consent to the personal data processing is not required.

The average value and standard deviation and the item-total correlation were applied when providing the normality and reliability of the sample for quantitative estimates. The average value of μ was determined using Formula 1:

$$\mu = \frac{1}{n} \sum_{i=1}^n x_i, \quad (1)$$

where x – the value of the analyzed indicator; n – the number of values in the time series.

The standard (root mean square) deviation σ was defined by applying Formula 2:

$$\sigma = \sqrt{\frac{1}{n} \sum_{i=1}^n (x_i - \mu)^2}, \quad (2)$$

where x – the value of the analyzed indicator; n – the number of values in the time series; μ – an average value indicator.

Formula 3 was used when determining the coefficient of variation c_v :

$$c_v = \frac{\sigma}{\mu}, \quad (3)$$

where σ – the standard deviation; μ – an average value indicator.

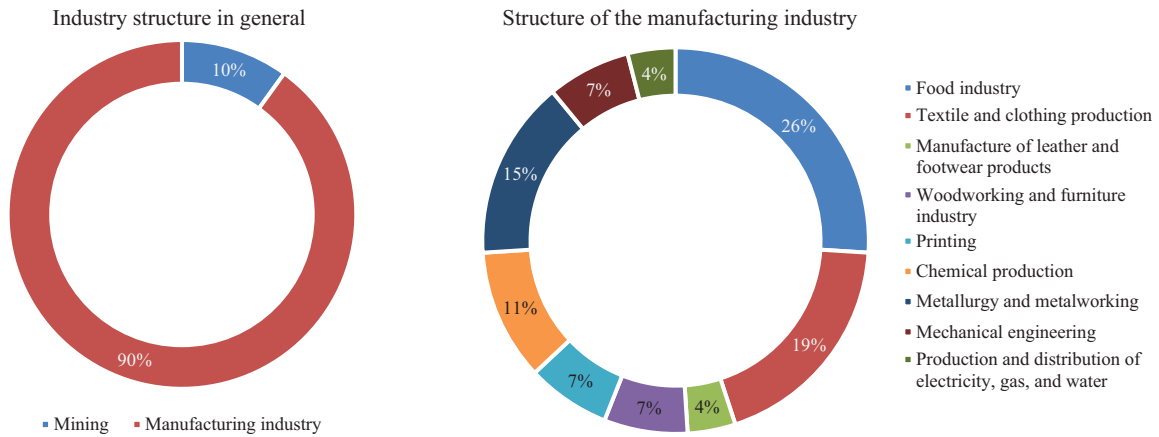


Figure 2. Sectoral structure of enterprises involved in the study (source: developed by the author)

The normality and acceptability of questions with item-total correlation were determined using the Microsoft Excel spreadsheet software tools (Formula 4).

$$r_{xy} = \frac{\sum_{i=1}^m (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^m (x_i - \bar{x})^2 \sum_{i=1}^m (y_i - \bar{y})^2}} = \frac{cov(x, y)}{\sqrt{s_x^2 s_y^2}} \quad (4)$$

The study also used the methods of encryption and graphical display of data and those for analyzing non-verbal information.

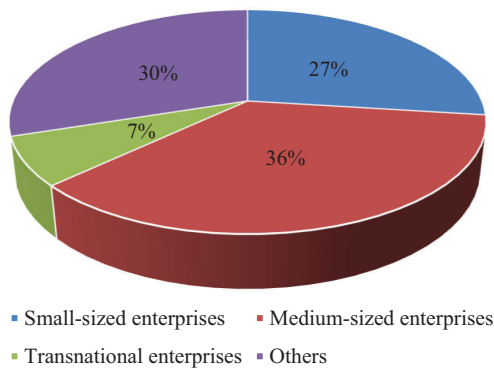


Figure 3. Structure of respondents by the size of enterprises (source: developed by the author)

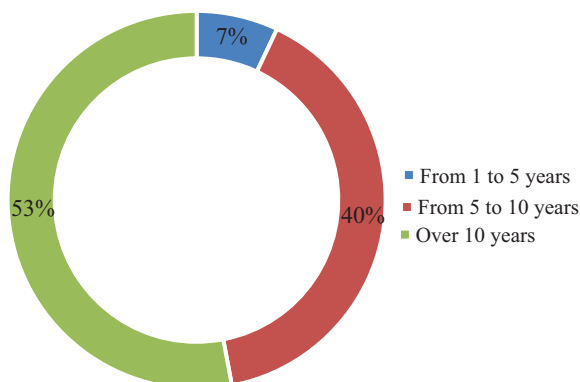


Figure 4. Structure of experts by length of service in the industry (source: developed by the author)

3. Results

The sectoral structure of the enterprises that took part in the study is shown in Figure 2.

The structure of enterprises by size is shown in Figure 3. Official national regulations were implied when defining small- and medium-sized enterprises. It should be noted that rather high proportions of small- (33%) and medium-sized (37%) enterprises are also explained by the greater openness and accessibility of these enterprises' CEOs for research.

Concerning the educational structure, all experts have higher education, while 1/5 of them have a confirmed academic degree. The structure of respondents by the length of service in the industry is shown in Figure 4.

Thus, all experts have sufficient education and knowledge of the market required for expert assessments. The major characteristics of the acceptability, normality, and reliability of the sample for questions with a Likert scale are presented in Table 1.

Table 1. Main characteristics of acceptability, normality, and reliability of the sample for Likert scale questions (source: developed by the author)

Question code	Average value	Standard deviation	Item-total correlation
RQ1	3.77	0.94	0.81
RQ2	3.87	0.82	0.81
RQ3	4.07	0.64	0.73
RQ4	3.63	0.81	0.40
RQ5	4.07	0.69	0.82
RQ7	3.77	0.97	0.83
RQ8	3.60	0.81	0.76
RQ9	2.83	0.65	0.60
RQ10	3.73	0.94	0.90
RQ11	3.60	0.86	0.89
RQ12	3.27	0.94	0.80
RQ13	3.80	0.96	0.87
RQ14	3.57	0.94	0.85
RQ15	3.60	0.97	0.82

The average value for the studied questions is in the range of 2.83 to 4.07, while the standard deviation is below 0.97, which confirms the acceptability and normality of the analyzed array of information. All calculated indicators of item-total correlation ≥ 0.4 . Therefore, the correlation can be defined as very good, the reliability of the sample is high, and the risk of information distortion is minimal. The expert interview results showed that most experts consider the efficiency of the supply chain to be an essential condition for ensuring the competitiveness of an enterprise (Figure 5).

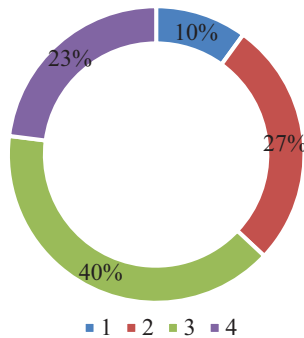


Figure 5. Perception by experts of supply chains as an essential condition for ensuring enterprises' competitiveness (source: developed by the author)

The two-dimensional distribution failed to reveal specific features of perception at the country level. However, the experts who somewhat disagreed (10%) were CEOs of small-sized enterprises. Those who neither agreed nor disagreed were from small- and medium-sized enterprises (27%). The CEOs of small- and medium-sized enterprises hesitated more when responding to the question about the inalienability of the supply chain efficiency as a condition for the competitiveness of an enterprise. The experts who neither agreed nor disagreed and those who somewhat disagreed expressed the opinion that "this is probably referred to large-scale enterprises, for Toyota or Samsung." "We have a small production..." "Of course, the COVID-19 has created challenges for the food industry. But, on the other hand, how would these chains help us? Has the lockdown been canceled?" This confirms the results of the quantitative criteria. In addition, it can be concluded that a significant part of small- and medium-sized businesses perceive supply chain management with distrust, including a lack of understanding of the opportunities and benefits for such businesses.

At the same time, respondents' reaction to the statement about the changed approaches and priorities of organizing the supply chain under the influence of the COVID-19 pandemic is more unequivocal: 27% of experts expressed agreement, 33% somewhat agreed, 40% neither agreed nor disagreed, while none expressed disagreement. Two-dimensional distribution and analysis of non-verbal information failed to reveal significant differences in responses by experts from Russia, Kazakhstan, and Azerbaijan. Meanwhile, differences that depend on

the enterprises' size remained as all experts who neither agreed nor disagreed were CEOs of small- and medium-sized enterprises. The experts' reaction to the statement about the negative impact of the COVID-19 pandemic on the supply chains of the analyzed enterprises is no less unambiguous (Figure 6).

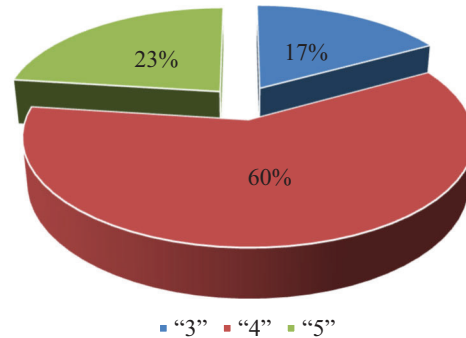


Figure 6. Experts' reaction to the statement that the COVID-19 pandemic affects supply chains (source: developed by the author)

The responses to the statement about the compliance of the organization and management of supply chains at enterprises with the expectations of their CEOs and counterparties are also almost unambiguous: more than 60% of respondents confirmed their agreement with the statement (10% agreed, 53% somewhat agreed), while 27% neither agreed nor disagreed. Only 10% noted that supply chain management is not meeting rather than meeting the expectations of managers and counterparties. At the same time, the qualitative study results and the analysis of verbal and non-verbal information during the interview indicate that most CEOs of small- and medium-sized enterprises associate compliance with the expectations not so much with a high level of supply chain management but with a low threshold of expectations of managers and counterparties. A combined question with the possibility of multiple-choice (up to three characteristics) with the further ranking of the results was applied to identify the most important features of supply chains amid the pandemic. Figure 7 below demonstrates the results of the experts' choices.

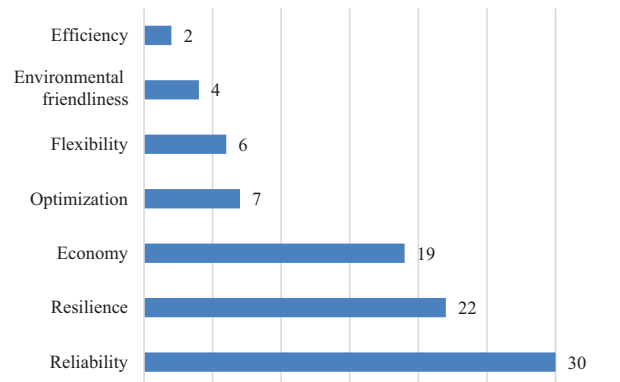


Figure 7. The most important features of supply chains amidst the COVID-19 pandemic (source: developed by the author)

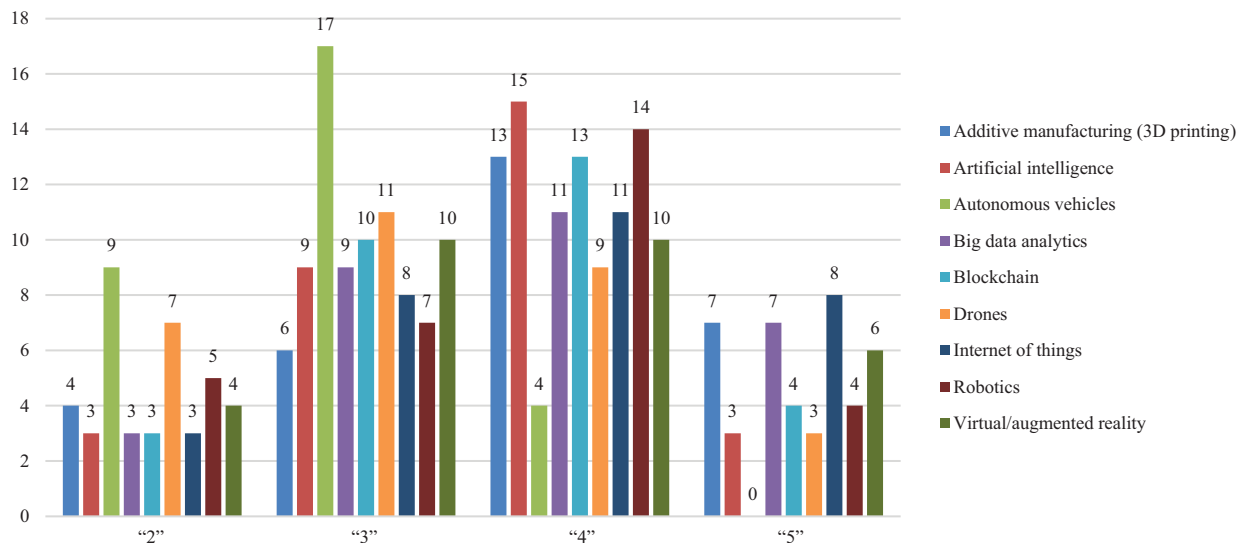


Figure 8. Assessing how experts perceive the most popular innovative technologies seen as driving supply chain development during the COVID-19 pandemic (source: developed by the author)

All 30 experts identified the reliability of supply chains as a key characteristic. The majority of experts also chose the resilience (22) and economy (19) indicators in this regard. Unfortunately, CEOs are willing to sacrifice not only the optimization (7), flexibility (6), and efficiency (2), but also environmental friendliness (4) of supply chains to ensure the reliability, resilience, and economy of supply chains, which is especially worrisome given the threats to environmental security. Figure 8 below presents an assessment of experts' perception of the most popular innovative technologies considered as a driving force for the development of supply chains during the pandemic.

As can be seen, none of the experts demonstrated disagreement. The results of the ranking by the average score showed that the most promising supply chain development technology for the studied enterprises is the Internet of things (average value 3.8), which is followed by additive manufacturing (3D printing) (3.77), big data analytics (3.73), as well as blockchain and virtual reality (3.6 each). The highest rates of the respondents' agreement were observed concerning such technologies (implemented and continuing development) as the Internet of things (8 experts), additive manufacturing (3D printing) and big data analytics (7 experts each), and virtual/augmented reality (6 experts). These categories also demonstrate comparable high rates of the technologies prospective implementation: the Internet of things (11 experts), additive manufacturing (3D printing) and big data analytics (13 experts each), and virtual/augmented reality (10 experts). Artificial intelligence technologies and robotics turned out to be the highest indicators of prospective implementation, namely 15 and 14 experts mentioned them, respectively. Meanwhile, demand for autonomous vehicles appeared to be the worst indicator (9 experts noted they were somewhat uninterested in it, while 17 were neutral). Experts explained the low popularity of autonomous vehicles by the lack of infrastructure required. The use of autonomous

vehicles requires special highways. However, experts do not believe in their rapid building. "They need separate roads! Will they drive far along our roads?" the experts said. Thus, the expert interview resulted in an assessment of CEOs' awareness and perception of new supply chain management methods, the priority characteristics of such chains, the compliance of existing supply chains with the expectations of managers and counterparties, and the prospects for introducing innovative technologies for the supply chains development.

4. Discussion

Despite the growing interest of researchers and practitioners worldwide in the new supply chain management methods implementation to improve the industrial enterprises' output in the context of the COVID-19 pandemic, this study has significant differences from the predecessors' works, which determine its relevance, novelty, and practical relevance. Thus, this research paper has a certain methodological similarity with the study of supply chain integration and flexible practices during the COVID-19 crisis (Boichenko et al., 2022a). In particular, this refers to the methodological design of the research and determining the acceptability and normality of the sample (Alzoubi et al., 2022). Recognizing the merits of the predecessors, it is worth noting that the article by Alzoubi et al. (2022) has a narrower focus, investigating only the integration of the supply chain and agile practices. At the same time, it leaves out of the study the reliability and resilience of the supply chain, which is most demanded by the real sector during the pandemic (Bui et al., 2021), which is also confirmed by this research paper. In addition, there are significant differences in the sectoral and geographical focus of the study since the article by Alzoubi et al. (2022) investigates healthcare supply chains in the UAE (Dubai Healthcare City). Meanwhile, this research focuses on

industrial supply chains in Russia, Kazakhstan, and Azerbaijan.

The results of a study by Afraz et al. (2021) of the impact of supply chain innovations on the competitive advantage of enterprises deserve close attention. The researchers pay considerable attention to the analysis of supply chains robustness and resilience and innovations that positively affect these characteristics. The research methodology is also original as the study is based on a moderated multi-mediation model with testing in the SPSS and SmartPLS software environment (Afraz et al., 2021; Boichenko et al., 2022b). Acknowledging the researchers' efforts, it is worth noting that their study failed to consider such a significant factor as the COVID-19 pandemic impact on the supply chains, unlike this research paper.

The design, building, and validating a measuring scale for industrial organizations' supply chain management practices (SCMP) by assessing their efficiency on SCM measures presented by El-Garaihy et al. (2022) also worth noting. The authors present impressive results of the analysis of theoretical sources, which made it possible to identify 20 major SCMP constructs, namely Strategic Partnership of Suppliers (SPS), Customer Relationship (CR), Information Sharing (IS), Information Quality (IQ), Postponement (PST), Agreed Vision and Goals (AVG), Sharing of Risks and Rewards (SRR), Lean Manufacturing (LM), Total Quality Management (TQM), Organizational Culture (OC), Information and Communication Technology (ICT), Benchmarking and Performance Measurement (BPM), Agile Manufacturing (AM), Outsourcing (OUT), Just In Time Manufacturing (JIT), Green SC Management (GSCM), Reverse Logistics (RL), Vendor Managed Inventory (VMI), Radio Frequency Identification (RFID), and SC Integration (SCI) (El-Garaihy et al., 2022). Moreover, the authors identified the main perspectives of the SCM performance structure: Flexibility Perspective (FLP), Efficiency Perspective (EFP), Customer's Perspective (CSP), and Product Innovation Perspective (PIP) (El-Garaihy et al., 2022). The study also developed a tool based on data from 351 industrial enterprises with the confirmatory factor analysis in the context of unidimensionality, durability, convergent validity, discriminant validity, nomological validity, and related validity criteria. The tool is designed to measure the enterprises' SCMP by evaluating their effectiveness related to SCM measures (El-Garaihy et al., 2022). Meanwhile, the study is predominantly academic in nature while recognizing and evaluating the predecessors' contributions. Its implementation at enterprises in the real economy is hampered by the complexity and specificity of the methods used.

Thus, despite the increased attention of researchers to the implementation of supply chain management methods in terms of the COVID-19 pandemic, this study has significant differences from the predecessors' scientific works both in terms of the methodologies used and the geography of the study, including the possibility of the practical application of the proposed methodological approach. The proposed methodological approach is characterized

by ease of use, high adaptability, and variability. This allows making the necessary adjustments in the presence of regional or industry specifics, applying the most unified data processing tools. Since all calculations in this study were carried out using a standard set of Microsoft Excel spreadsheet tools, the practical implementation of the methodological approach does not require specialized software and additional staff training, which greatly increases its attractiveness for the real economy.

Conclusions

This study proposes a methodological approach to assess the implementation of new supply chain management methods to improve the productivity of industrial enterprises under the COVID-19 pandemic using a qualitative approach (expert interview). Experts from Russia, Kazakhstan, and Azerbaijan participated in testing of the developed methodological approach (a total of 30 interviews). Testing of the developed methodological approach allowed identifying several areas of great importance for improving supply chain management. The distribution by country did not reveal statistically significant features of the experts' opinions, which allows stating the similarity in the perception of implementing new methods of supply chain management by heads of enterprises of different countries of the post-Soviet economic space. At the same time, there were significant differences in experts' perceptions of supply chain management depending on the size of the enterprise: CEOs of small enterprises were less informed about the benefits of new SCM methods and less interested in them compared to CEOs of medium and multinational enterprises.

In addition, the use of a qualitative approach allowed taking into account both verbal and non-verbal information, which made it possible to establish a significant level of doubt among experts about the feasibility of implementing new SCM methods for small and medium enterprises, which is also confirmed by the relatively low expectations of managers and contractors of small businesses regarding the effectiveness of supply chain management. The identified trend requires additional attention from central and regional state and municipal authorities to raise awareness and interest of small businesses in improving supply chains in the context of the COVID-19 pandemic.

From the CEOs' point of view, testing identified the most important characteristics of supply chains in the context of the pandemic. The reliability of supply chains (30 experts), their resilience (22), and economy (19) are in the lead. At the same time, not only optimization (7 experts), flexibility (6), and efficiency (2), but also environmental friendliness (4) of supply chains have faded into the background, which also requires additional attention, given the specifics of environmental safety in the tested countries.

Among the most promising technologies for supply chains development, experts noted the Internet of things (average value of 3.8), additive manufacturing (3D printing) (3.77), big data analytics (3.73), as well as blockchain

and virtual reality (3.6 each), which indicates high prospects for the improvement of supply chains applying said technologies. The quantitative characteristics in the proposed methodological approach facilitate obtaining measurable and comparable estimates of the major indicators. This shows the feasibility of using this approach for the monitoring studies implementation. The scalability and adaptability of the methodological approach, as well as high cost-effectiveness, which is important in times of crisis in the economy, enhance the prospects for this approach for its practical implementation both at the level of state and regional organizations and at the level of enterprises that initiate the supply chains improvement. The study's main limitations are considered as such: the lack of statistical information, which limits the use of statistical methods, the impact of quarantine-related restrictions over the COVID-19 pandemic, and the limited research budget, which also influenced the methodological design.

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APPENDIX

Expert interview roadmap No. _____
 “ ” _____ 2022

 City, country
 Interviewer _____

BLOCK 1

1	Sectoral structure	
	mining and quarrying	
	manufacturing industries	
	food processing	
	textile and apparel production	
	manufacture of leather goods and footwear	
	woodworking and furniture industry	
	printing activities	
	chemical production	
	metallurgy and metalworking	
	engineering	
	production and distribution of electricity, gas and water	
2	Structure by size of enterprises	
	small	

	medium	
	multinational	
	others	
3	Educational structure	
	secondary vocational	
	higher	
	academic degree	
4	Experience in the industry	
	up to 1 year	
	1 to 5 years	
	5 to 10 years	
	more than 10 years	

BLOCK 2

	Evaluation of agreement with the statement do not agree – 1 point; disagree rather than agree – 2 points; find it difficult to answer – 3 points; rather agree than disagree – 4 points; agree – 5 points.	
RQ1	In today’s environment, supply chain efficiency is essential to a company’s competitiveness	
RQ2	The COVID-19 pandemic has changed the way we think about and prioritize our supply chain	
RQ3	Our company experienced the COVID-19 pandemic’s negative impact on the supply chain	
RQ4	Our organization and management of our supply chain is in line with the expectations of our managers and partners	
RQ5	Our company is very interested in implementing innovative supply chain management methods	
RQ6	The most important for our company during a pandemic are (select no more than 3 options)	
	reliability	
	sustainability	
	cost-effectiveness	
	optimization	
	flexibility	
	eco-friendliness	
	efficiency	
	Assessment of interest in a method not interested – 1 point; rather not interested – 2 points; difficult to answer – 3 points; rather interested – 4 points; use and plan to develop – 5 points.	
RQ7	additive manufacturing (3D printing);	
RQ8	artificial intelligence;	
RQ9	autonomous vehicles;	
RQ10	big data analytics;	
RQ11	blockchain;	
RQ12	drones;	
RQ13	internet of things;	
RQ14	robotics;	
RQ15	virtual reality/augmented reality.	