

# STRATEGIC DEVELOPMENT OF MOTOR TRANSPORT ENTERPRISES' INNOVATIVE PROCESSES IN UKRAINE

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## ABSTRACT

This study is aimed at developing a methodological approach to identify and justify the strategy for the development of enterprises' innovative processes, which enables considering alternatives and determining the priorities of adaptation as well as increasing the level of flexibility to changes in the business operating conditions. The study is based on the materials of 21 motor transport companies in Ukraine. The methodological toolkit is based on the proposed polyfactorial 3D model with the implementation of correlation, regression and cluster analysis. The use of the strategy for the innovation process development of the motor transport enterprise with the introduction of focus on the asymmetry of its directions increases efficiency, which becomes equal to the benchmark or close to the maximum efficient value.

**Keywords:** strategy; integrated development; innovative processes' Polyfactorial 3D Model; cluster analysis

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## INTRODUCTION

The war in Ukraine has left a profound impact on the country's economy, necessitating a

focused effort to rebuild and stabilize affected sectors. Among these sectors, transport enterprises play a vital role in facilitating trade,

transportation, and overall economic development. To effectively address the challenges stemming from the war, it is imperative for these enterprises to strategically develop their innovative processes to drive growth, efficiency, and competitiveness.

Despite the importance of innovative processes in the post-war recovery, there is a notable literature gap regarding the specific strategies and approaches that motor transport enterprises should adopt in this context. This article seeks to fill this gap by providing a comprehensive examination of the strategic development of enterprises' innovative processes amid the ongoing consequences of the war in Ukraine. The primary aim of this research is to analyze and propose effective strategies for motor transport enterprises to enhance their innovative processes. By identifying the most suitable strategy based on the proposed polyfactorial 3D model, enterprises can optimize their resource allocation, adapt to the changing operating environment, and ensure competitive advantages and value for their consumers. To achieve this aim, the research employs a theoretical and conceptual framework that integrates technology integration strategies and knowledge attraction for innovation. By combining these elements, motor transport enterprises can leverage existing technological advancements and attract external knowledge to drive their innovative processes forward.

The relevance and significance of this study lie in its ability to provide practical guidance to motor transport enterprises, policymakers, and industry stakeholders involved in the reconstruction efforts in Ukraine. By understanding the strategies that yield the highest effectiveness in innovative process development, enterprises can make informed decisions and allocate resources efficiently. The research methodology employed in this study utilizes scenario modeling methods and the proposed polyfactorial 3D model. This approach allows for a systematic analysis of different clusters of motor transport companies, considering their specific characteristics and deviations from the reference scenario. Measurable indicators and the asymmetry of innovative process development are used to evaluate the effectiveness of different strategies.

The contributions of this study extend beyond filling the existing literature gap. The insights

and recommendations provided offer valuable guidance for motor transport enterprises, policymakers, and industry stakeholders involved in the post-war reconstruction efforts in Ukraine. The ability to select and implement effective strategies based on the proposed framework enables enterprises to position themselves for long-term success, competitiveness, and enhanced value for their customers. This research addresses the crucial subject of the strategic development of enterprises' innovative processes in the aftermath of the war in Ukraine. By bridging the literature gap, proposing a theoretical framework, employing a robust methodology, and presenting significant findings, this study offers practical insights and guidance to stakeholders navigating the challenges of post-war recovery in the motor transport sector.

## LITERATURE REVIEW

Strategic development in an enterprise is closely related to the processes of envisaging global economic changes and searching for and implementing large-scale solutions that ensure its viability and stability through determining future so-called success factors. It is worth noting that when analyzing the concept of strategic development, scholars interpret its essence and main features in various ways. The main content of their work, however, indicates that the choice of the optimal strategy, which should be focused on obtaining 'future' results, also should consider the current state of the enterprise, its financial and economic indicators, available resources, and the peculiarities of the influence of external and internal factors on development (Zachosova et al., 2022).

The key features of strategic enterprise development are as follows:

- ensuring the enterprise's rapid response to changes in the external environment, which creates a targeted impact on its condition and forms the required terms for the implementation of the strategy to achieve the goals that have been set (in this case, the external environment refers to a set of strategic changes that may occur in the process of fulfilling the enterprise's management strategy) (Benito et al., 2022);

- supporting the strategic plan with the required research and actual and anticipated data (AlQershi et al., 2022);
- forecasting the consequences of the management decisions based on scenario prediction with due regard to the corresponding changes in resource distribution, effective networking with other business entities, and the formation of strategic staff behavior (Dhar et al., 2022);
- developing and applying the analytical toolkit (methods and models), which require top managers to use an entrepreneurial behavior style in order to envisage future threats, while also finding new economic and creative opportunities for new management solutions (Zaoui et al., 2021);
- using the advanced strategic development systems as a combination of intuition, management experience and knowledge of the company's top management in focusing efforts on achieving strategic goals (Andersen et al., 2022);
- engendering strategic creative thinking in employees in order for them to understand the enterprise development strategy alongside establishing the motivation to achieve a high competence level by each team member, which primarily will provide for the company's better interaction with the external environment (Brintseva and Glybovets V. 2020; Wan and Liu, 2021).

The war in Ukraine has significantly impacted the country's economy, necessitating the rebuilding and stabilization of affected sectors. Motor transport enterprises play a crucial role in facilitating trade and transportation, requiring the strategic development of innovative processes to overcome the challenges posed by the war (Yu et al., 2022). International experience in developed countries offers valuable insights for Ukraine's motor transport sector. Germany, known for its automotive industry, has successfully integrated advanced technologies such as electric vehicles, autonomous driving systems and connected mobility solutions. Collaborations between industry, academia, and government agencies have fostered a culture of innovation and sustainable transportation solutions (Trencher and Edianto, 2021). Japan's automotive sector

focuses on technological innovation and efficiency, leading advancements in hybrid vehicles, fuel efficiency, and in-car safety technologies. In Japan, China and the EU, strategic partnerships between industry leaders and research institutions have accelerated innovation and technology adoption (Drelich-Skulska and Bobowski, 2021; Dzienis and McCaleb, 2022). The United States has witnessed disruptive innovation in the automotive industry through companies like Tesla and Waymo. These enterprises have transformed the sector by leveraging software, artificial intelligence, and renewable energy (León and Aoyama, 2022). These international experiences emphasize the importance of strategic development and innovation in the motor transport industry and also provide valuable insights for Ukraine's motor transport enterprises. Adapting and applying these experiences to the specific challenges faced in Ukraine will contribute to the successful development of innovative processes and facilitate the country's rebuilding and stabilization efforts. By studying and adapting successful practices from developed countries, Ukrainian motor transport enterprises can enhance their understanding of innovative processes and identify relevant strategies for post-war recovery and future growth.

The choice of an innovative development strategy by motor transport enterprises under the current war conditions will depend on particular aspects, primarily on the conditions and factors of both the internal and external environments, the enterprise's potential for the possible introduction of radical innovative changes in the provision of transport services, delivery of new services in the market in coordination with demand for them from potential customers, as well as on the company's ability to monitor scientific and technical data concerning the introduction of innovative products in the market, and also to implement a set of tasks to ensure the strategic monitoring of innovative processes. All the above-mentioned aspects have determined the purpose of this research, which is to form a methodological approach for identifying and justifying the strategy for the development of enterprises' innovative processes which enables considering alternatives and determining priorities for adaptation, as well as increasing the level of flexibility to changes in business operating conditions.

## METHODOLOGY

This study proposes using a polyfactorial 3D model, according to which the efficiency level of the company's innovation process development strategy can be diagnosed based on the identification of integral indicators in three dimensions: technological, organizational, and science and technology. This 3D model enables interpretation of the development efficiency of innovative processes using a complex indicator, which is a vector of three-dimensional space. Figure 1 suggests the approach to determining the efficiency vector of the strategic development of the enterprise's innovative processes, taking into consideration the identified integral indicators, the values of which form the axes of the three-dimensional space.

Integral values of Technological Dimension of Development (TDI), Organizational Level of Development (ODI), and Science and Technology Dimensions of Development (STDI) indicators, according to the proposed polyfactorial 3D model, can be calculated based on the definition of the arithmetic mean of the input indicators incorporated in the structure of these indicators. For example, the TDI value can be measured as the sum of the normalized data of such indicators as the new technology mastering ratio ( $c_1$ ), the technology suitability ratio ( $c_2$ ) and the ratio of innovation implementation ( $c_3$ ). The level of ODI can be measured as the sum of the normalized data of such indicators as the share of the employees involved in R&D ( $c_4$ ), the share of costs for training personnel for innovative activities ( $c_5$ ), as well as the share of innovation costs in the company's income ( $c_6$ ). STDI comprises such indicators as the intellectual property provision ratio ( $c_7$ ), the intellectual property suitability ratio ( $c_8$ ) and the share of R&D expenditures and other involved knowledge ( $c_9$ ).

The research methodology is presented in Figure 1.

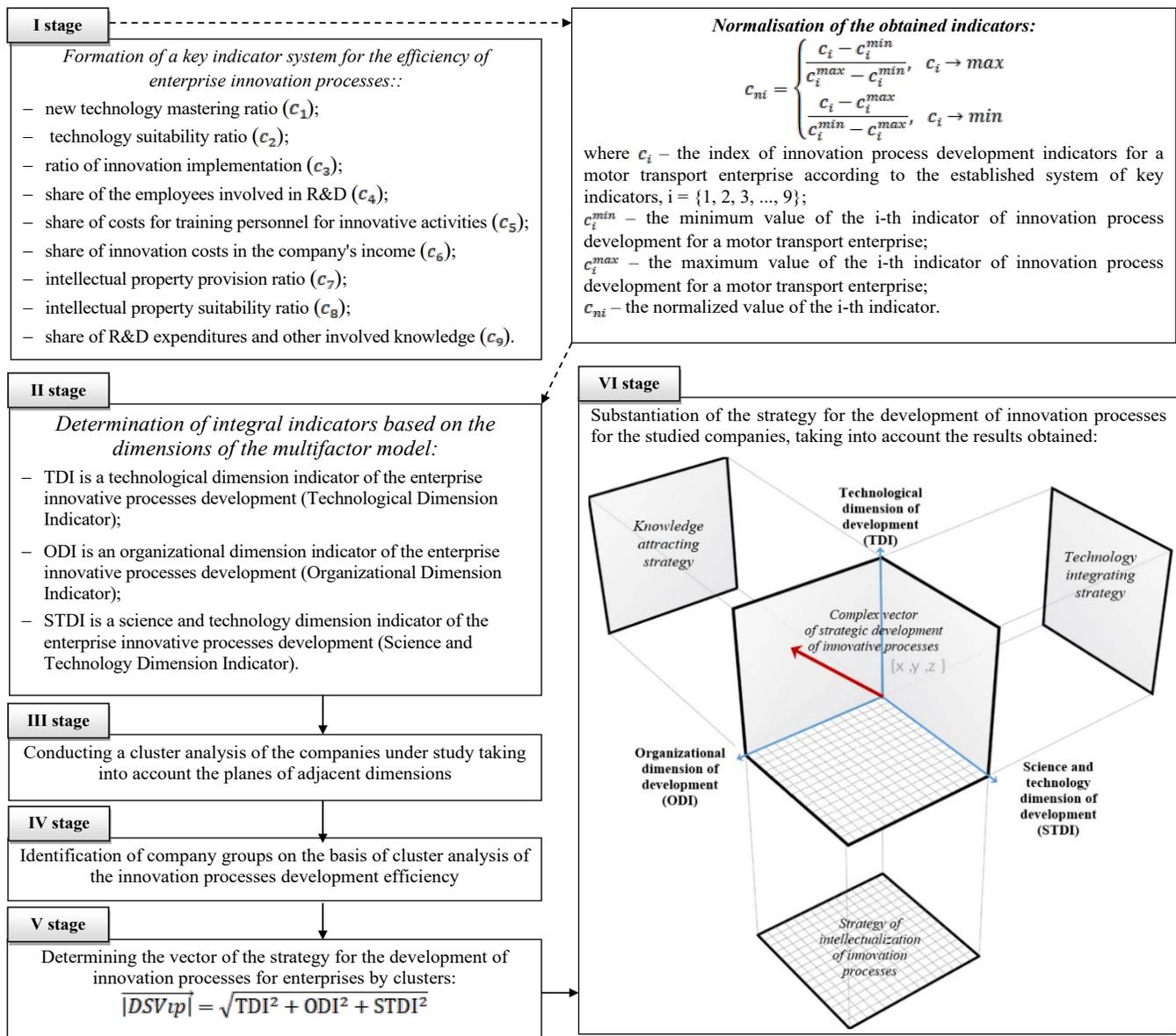
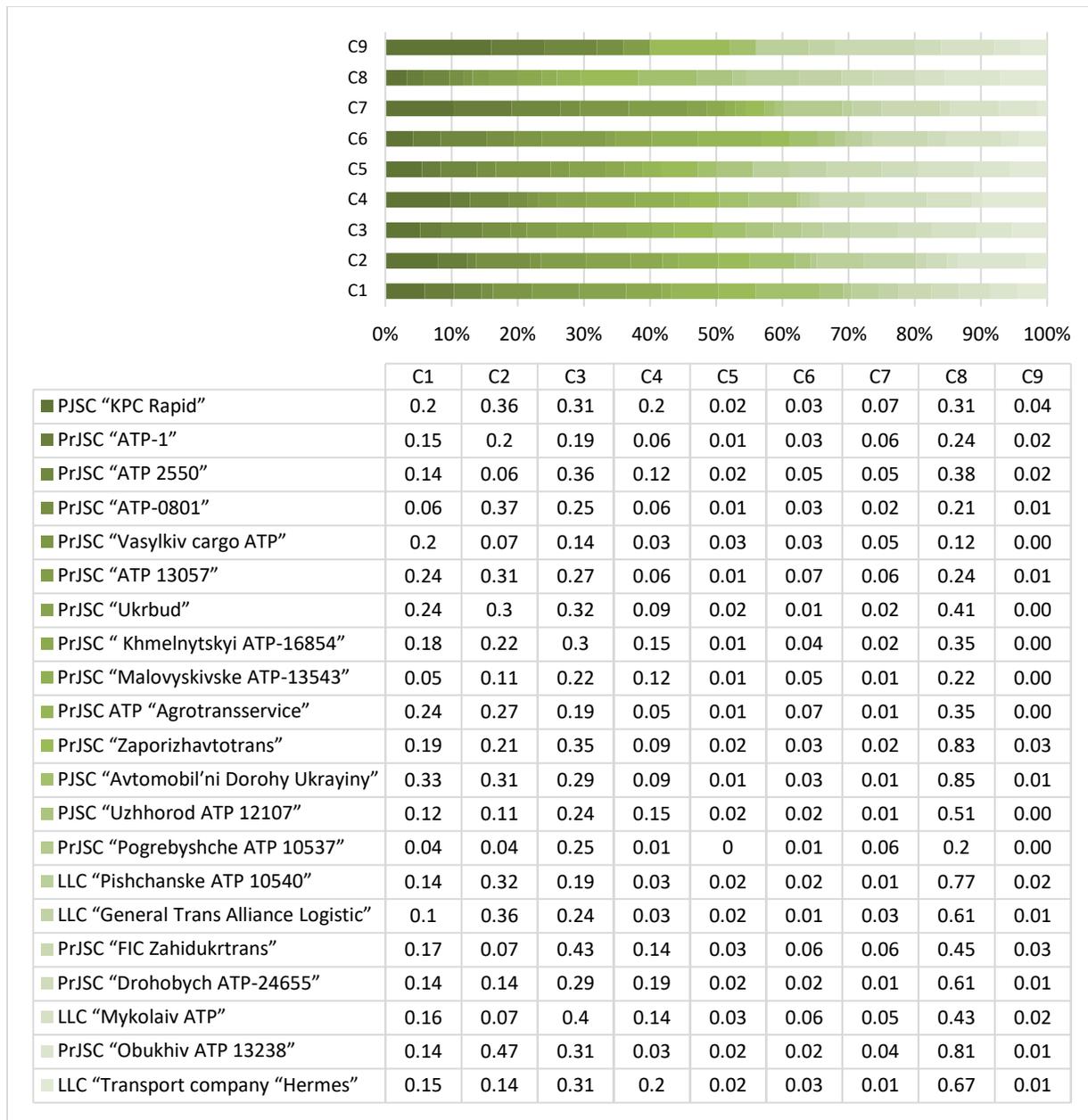


Figure 1: Stages of conducting the study

Source: formed by the authors

The research was carried out according to materials, such as data and financial reports, provided by 23 motor transport enterprises. The formation of the company sample was based on the selection of enterprises engaged in cargo transportation, as well as geographical criteria to ensure representation from different regions in Ukraine. The main criterion for selecting companies was the willingness of their management to provide the necessary data for calculating key performance indicators, which are presented in the system for developing a multifactor model, as some of the required

information is not publicly available. Inquiries were sent to 50 companies during the period January 12 to February 2, 2022, out of which 23 participated. To update the data for 2022, follow-up inquiries were sent to the 23 companies under investigation from April 26 to May 17, 2023, of which 2 companies refused to provide the necessary information citing legal norms in the conditions of wartime. A fragment of the initial data (2022) is presented in Figure 2.



**Figure 2:** Initial data for the study, which shows a fragment of key performance indicators of innovation processes in 2022

Source: formed by the authors by the materials of studied companies

The "k-NN", or "nearest neighbor", clustering method was used in this study. The nearest neighbor method is based on a particular way of measuring the degree of similarity (convergence or closeness) of a precedent and the current problem situation (Ghazzawi and Alharbi, 2019).

Qualitative methods such as interviews or focus groups could be employed to gather in-depth insights from managers, employees, and other stakeholders regarding the effectiveness of

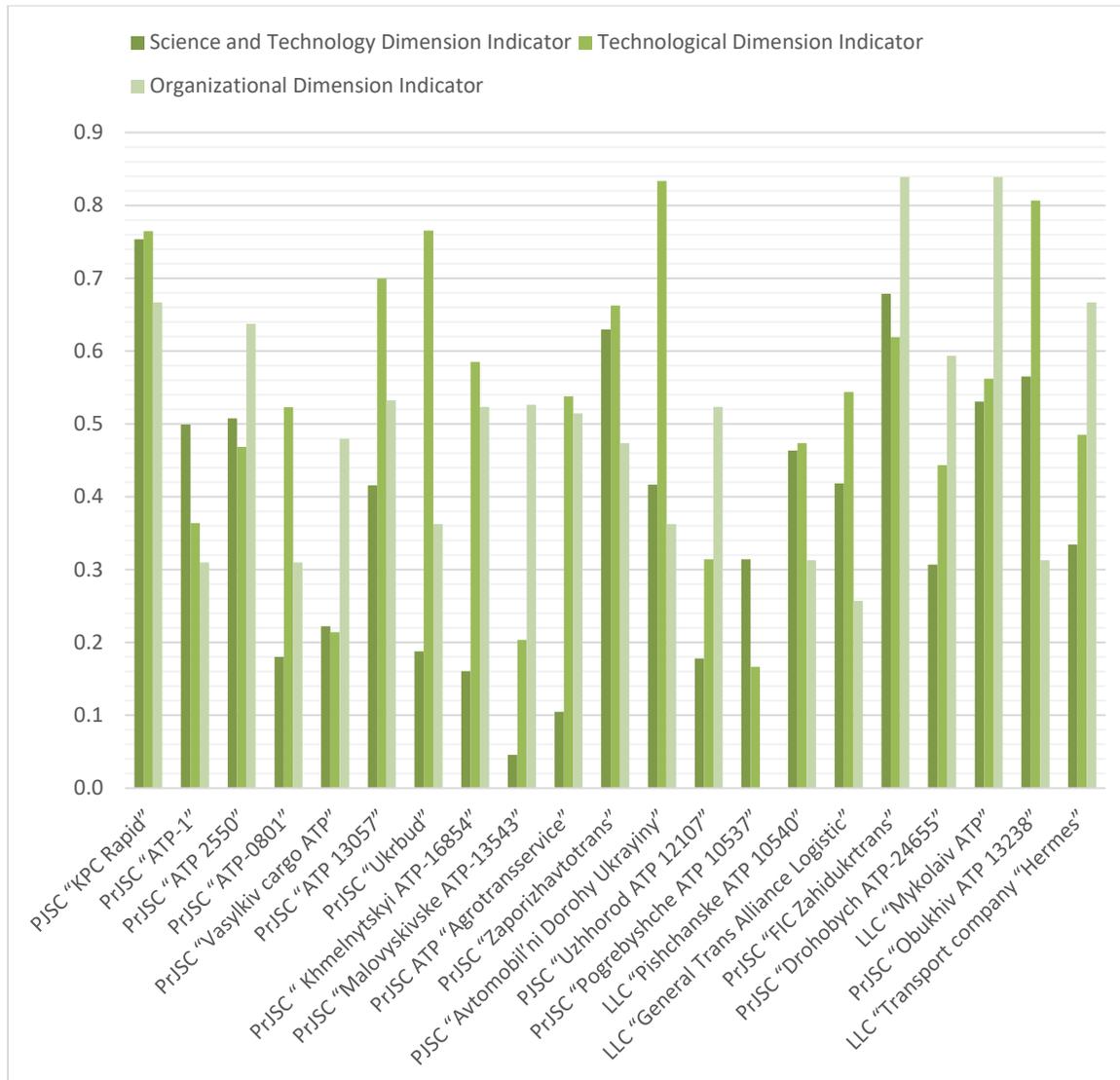
the innovation process development strategy. This qualitative data can complement the quantitative findings and provide a richer understanding of the factors influencing efficiency. Conducting in-depth case studies of selected motor transport enterprises can provide detailed insights into their innovation process development strategies, including contextual factors, challenges, and best practices, which can

offer a nuanced understanding of the complexities involved.

## RESULTS

It is possible to determine the indicators in three directions of the development strategy -

the technological, organizational, and science and technology dimensions of the polyfactorial 3D model - on the basis of the obtained normalized efficiency indicators of the innovative processes development. The results of the conducted assessment are shown in Fig. 3.



**Figure 3:** Key indicators of the polyfactorial 3D model dimensions of the innovative processes development strategy for the surveyed motor transport enterprises

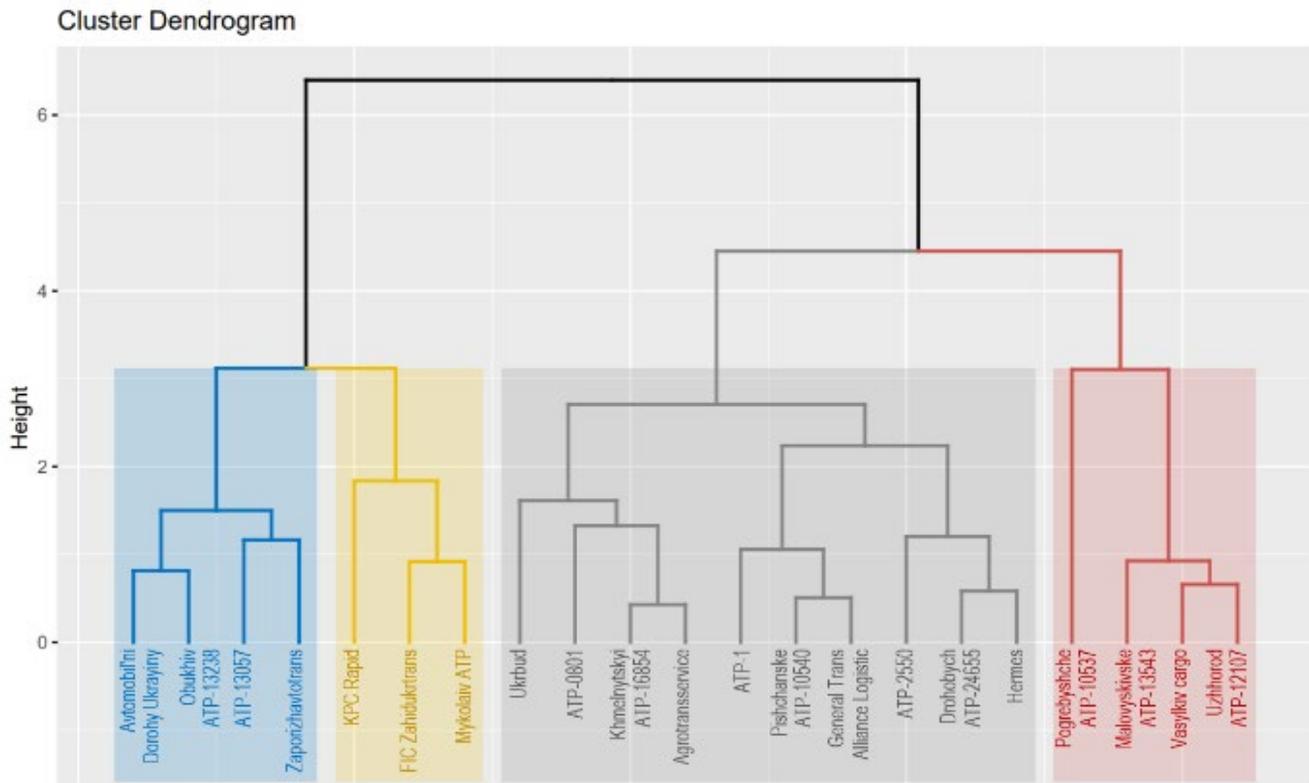
Source: formed by the authors

Overall, based on the results of the cluster analysis on three defined planes according to the dimensions of the proposed polyfactorial 3D model, it can be argued that the vast majority of companies tend to have approximately the same level of indicators of innovative process development. Among the surveyed companies,

PrJSC "Obukhiv ATP 13238", PrJSC "Pogrebyshche ATP 10537", PrJSC "FIC Zahidukrtrans" and LLC "Mykolaiv ATP" stand out. These enterprises characteristically have asymmetry in innovative processes development as compared to the other investigated motor transport companies.

Since the individual planes of the proposed polyfactorial 3D model mainly form one large cluster, a more in-depth study of the features of the development of innovative processes at motor transport enterprises is needed using complex hierarchical clustering which considers indicators on all planes simultaneously.

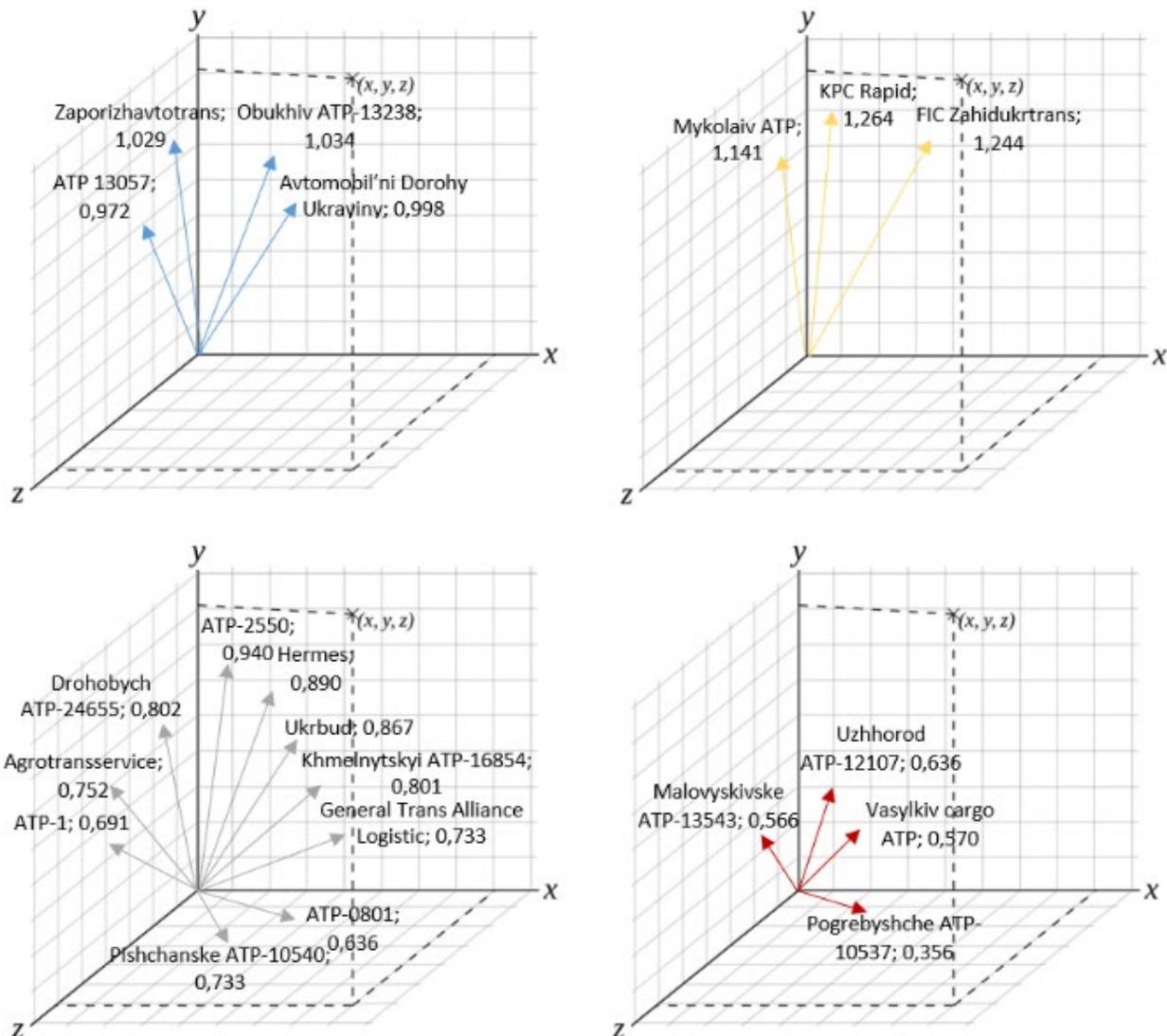
The obtained results of the hierarchical clustering of the studied companies are displayed in the form of a dendrogram in Fig. 4.



**Figure 4:** The dendrogram of hierarchical clustering of the studied motor transport enterprises  
Source: formed by the authors

It thus is possible to distinguish four main clusters determining the similarity of the efficiency of innovative processes development at the studied enterprises. Compared to previous studies on clustering by separate planes of vector indicators, a more even distribution of companies by clusters can be determined. This statement affirms the need for a comprehensive approach to the assessment of the effective strategy for innovative process development, as this context ensures clearer distinguishing of the specifics of individual groups of enterprises. Therefore, it is possible to confirm the advisability of using the polyfactorial 3D model proposed herein, providing for the integration of various directions of the innovative processes development strategy.

The diagnosis of the development effectiveness of the innovative processes at motor transport enterprises was carried out by determining the value of the vector (Fig. 5).



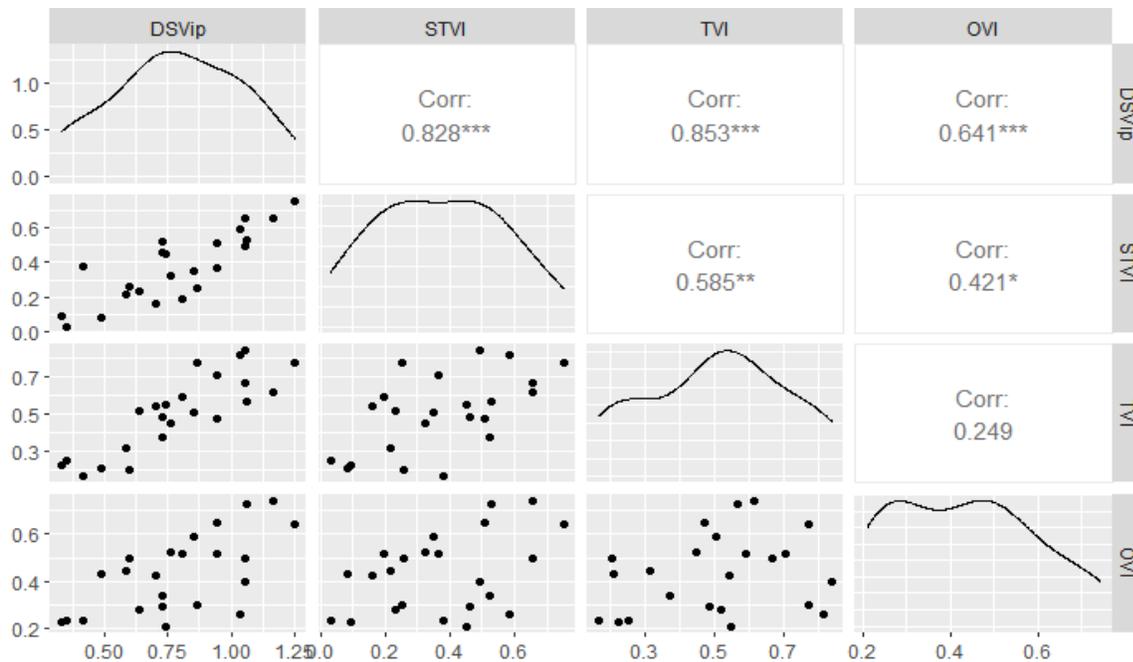
**Figure 5:** Integral vectors of innovative processes strategic development of motor transport enterprises by defined clusters

Source: formed by the authors

To build an effective model for the strategic development of innovative processes, particularly for the investigated automotive transport enterprises, it is necessary to conduct a correlation analysis of the relationships between key indicators (indicators) of the scientific-technical (STVI), technological (TVI), and organizational (OVI) vectors, as well as the integral vector (DSVip). The correlation analysis results are presented in Figure 6.

Based on the results of the conducted correlation analysis, it can be stated that there is a significant correlation between the integral

vector of strategic development and the technological vector (0.853) and the scientific-technical vector (0.828) of the investigated automotive transport companies' innovative processes. There is also a sufficient level of correlation between the integral vector of strategic development of the investigated automotive transport enterprises and their organizational vector.



**Figure 6:** Correlation matrix of innovation process development strategy vectors of the studied automotive transport enterprises

Source: formed by the authors

Taking into account the formed groups of automotive transport enterprises for each cluster, regression modeling was conducted to assess the effectiveness of the strategic

development of innovative processes. The results of modeling the effectiveness of the strategic development of innovative processes for the first cluster are presented in Table 1.

**Table 1:** Results of regression analysis for the vector of strategic development of innovative processes of automotive transport enterprises in the first cluster

Group of companies	Indicators	Coefficients	Standard error	$t_{stat}$	P-value	Lower 95%	Higher 95%
Cluster 1	Y-intercept	-0,0018	0,0056	-0,5162	0,6413	-0,0208	0,0150
	STVI	0,1938	0,0240	9,4744	0,0025	0,1509	0,3035
	TVI	0,6214	0,0164	36,9606	0,0000	0,5549	0,6594
	OVI	0,8214	0,0221	35,8410	0,0000	0,7232	0,8641
Cluster 2	Y-intercept	-0,0053	0,0608	-0,1112	0,9216	-0,2683	0,2547
	STVI	0,1228	0,0997	4,6579	0,0431	0,0354	0,8937
	TVI	0,5243	0,0660	9,4634	0,0110	0,3406	0,9084
	OVI	0,5839	0,1185	5,9069	0,0275	0,1901	1,2098
Cluster 3	Y-intercept	0,1105	0,074	1,2478	0,3384	-0,2261	0,4108
	STVI	0,4156	0,1101	3,9107	0,0396	-0,0432	0,9043
	TVI	0,7502	0,0824	10,5207	0,0089	0,5123	1,2213
	OVI	0,1127	0,074	1,2478	0,3384	-0,2261	0,4108
Cluster 4	Y-intercept	0,0685	0,0247	1,8351	0,3176	-0,269	0,3599
	STVI	0,4690	0,0336	13,2046	0,0481	0,0167	0,8701
	TVI	0,8321	0,0297	26,6849	0,0238	0,4158	1,1718
	OVI	0,4206	0,069	4,5445	0,1379	-0,5635	1,1911

Source: formed by the authors

The developed multiple regression models are adequate to the operation conditions of the defined clusters of motor transport enterprises since the coefficients of the determination indicate a high level of correlation between the considered factors and the resulting integral vector of innovative processes strategic development at the level of 97-99%. The adequacy of the developed models is also verified

by Fisher's test, since  $F_{crit} < F$ , as well as by Student's test:  $t_{tabl} < t_{stat}$ .

A scenario simulation containing a set of seven possible options in the context of the proposed vector model was carried out in order to identify the effectiveness of possible alternatives for the innovative process development of motor transport enterprises (Table 2).

**Table 2:** Scenario modelling of the vector of innovative processes strategic development of motor transport enterprises

Company	Scenarios for innovative process development according to the dimensions of the polyfactorial 3D model:						
	STDI	TDI	ODI	STDI-TDI	STDI-ODI	TDI-ODI	STDI-TDI-ODI
Khmelnyskyi ATP-16854	0,670	0,712	0,665	0,699	0,721	0,693	0,742
Uzhhorod ATP-12107	0,501	0,501	0,477	0,517	0,525	0,517	0,553
Drohobych ATP-24655	0,627	0,659	0,623	0,649	0,677	0,644	0,692
Hermes	0,724	0,726	0,685	0,750	0,754	0,745	0,798
Malovyskivske ATP-13543	0,412	0,411	0,397	0,423	0,435	0,428	0,456
Pogrebyshe ATP-10537	0,386	0,371	0,348	0,395	0,395	0,375	0,413
ATP-1	0,600	0,614	0,571	0,619	0,635	0,589	0,647
ATP-0801	0,534	0,540	0,490	0,561	0,544	0,542	0,585
Vasylkiv cargo ATP	0,498	0,511	0,491	0,508	0,539	0,502	0,544
ATP-13057	0,827	0,829	0,762	0,863	0,847	0,838	0,904
Agrotransservice	0,585	0,622	0,574	0,613	0,624	0,600	0,645
Pishchanske ATP-10540	0,537	0,542	0,470	0,572	0,530	0,529	0,579
General Trans Alliance Logistic	0,566	0,603	0,523	0,605	0,580	0,560	0,613
Obukhiv ATP-13238	0,829	0,846	0,730	0,889	0,819	0,826	0,899
Ukrbud	0,648	0,711	0,608	0,704	0,664	0,661	0,712
Avtomobil'ni Dorohy Ukrainy	0,808	0,831	0,715	0,869	0,798	0,811	0,880
KPC Rapid	1,032	1,064	0,980	1,071	1,088	1,017	1,114
Zaporizhavltrans	0,887	0,872	0,799	0,921	0,901	0,874	0,956
FIC Zahidukrtrans	0,954	0,981	0,915	0,986	1,014	0,945	1,033
ATP-2550	0,790	0,773	0,723	0,814	0,811	0,784	0,855
Mykolaiv ATP	0,887	0,893	0,813	0,894	0,911	0,862	0,962

Source: formed by the authors

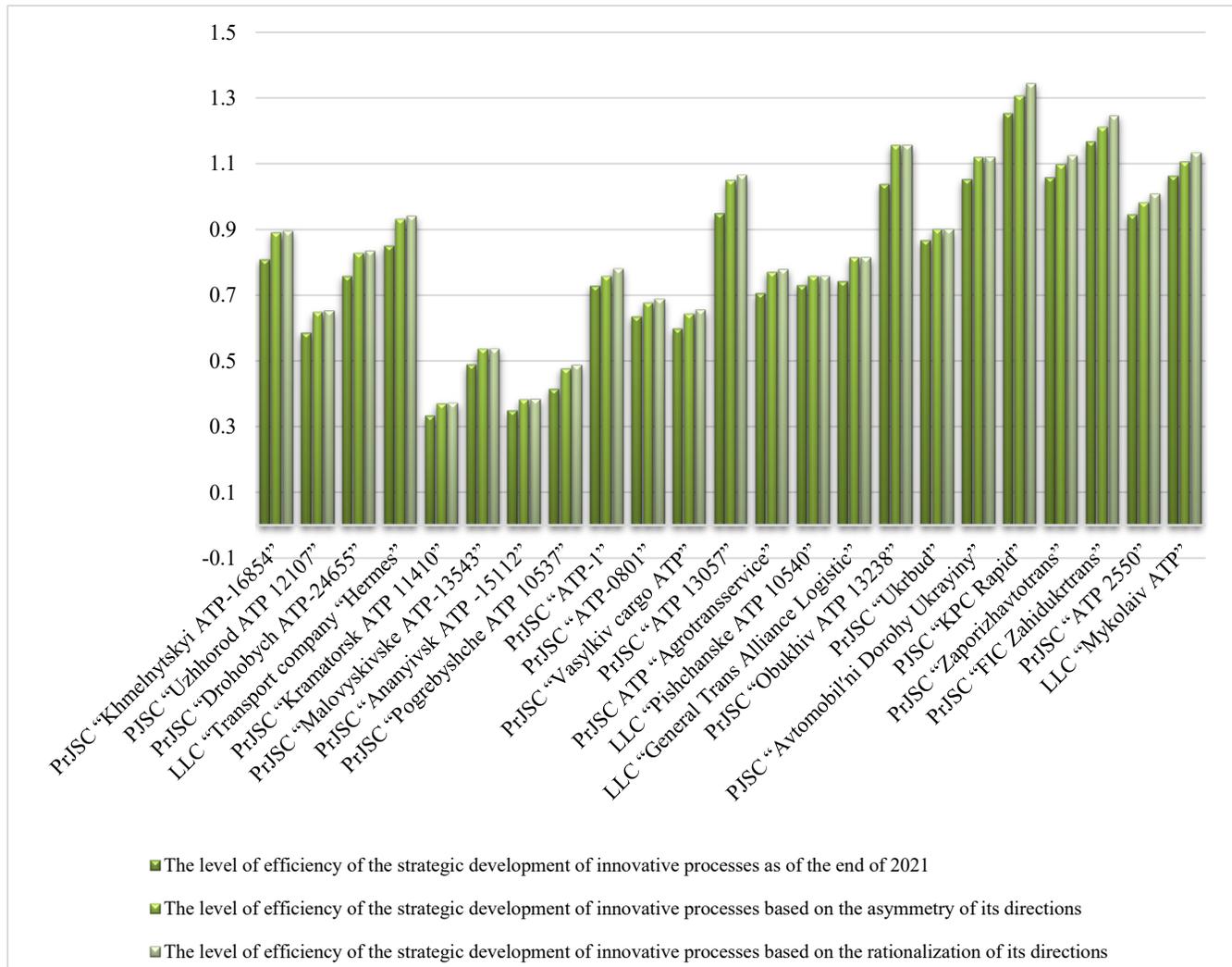
Based on the conducted scenario modelling of the effectiveness of innovative process strategic development according to the formed alternatives, it is possible to determine that the vast majority of the studied motor transport enterprises can achieve the maximum (or close to it) level of efficiency in the context of the

integral vector without using the reference scenario. Particularly, the achievement of the maximum efficiency level under the "STDI-TDI" scenario was recorded for the third cluster of motor transport enterprises, as the value of the anticipated integral vector of the strategic development of innovative processes shares the

same level with the “STDI-TDI-ODI” reference scenario.

The proposed polyfactor model provides an opportunity not only for diagnosing the level of development of innovative processes in enterprises but also for identifying ways to enhance it based on the identified strategy. A significant addition to this is the implementation

of scenario modeling, which allows for assessing the impact of applying the strategy in the future. Considering the identified strategies for motor transport enterprises, we evaluated the anticipated value of the vector of strategic development of their innovative processes and also compared the obtained indicators with the results of 2021 and the maximum possible effect concerning the reference scenario (Fig. 7)



**Figure 7:** Forecast indicators of the vector of innovative process strategic development of motor transport enterprises (*DSVip*) according to the results of scenario modelling

Source: formed by the authors

The research conducted for this study confirms that all investigated motor transport enterprises are characterized by an increase in the efficiency level of innovative process development based on its asymmetry. For example, motor transport companies of the first cluster have a deviation from the reference scenario that varies between

0.2 and 0.9%, and enterprises of the second and fourth clusters tend to have a deviation of 1-3%. Motor transport enterprises of the third cluster that use a technology integration strategy tend to have a result equal to the reference forecast option. Thus, the obtained results prove that the use of the strategy for innovative process

development by the motor transport enterprise with the introduction of focus on the asymmetry of its directions increases the effectiveness, which is equal to the reference option or close to the maximum effective value. Meanwhile, it is worth emphasizing that the use of the proposed vector model by motor transport enterprises with a lower level of innovative process development enables its improvement.

Therefore, motor transport companies can use the most effective type of strategy based on the implementation of the scenario modelling method according to the specified dimensions in order to select the best one according to the proposed polyfactorial 3D model, with due regard to the limited resource provision for the comprehensive development of innovative processes.

## DISCUSSION

The conducted scenario modelling made it possible to determine an efficient strategy for innovative process development, which is based on the most effective vector plane (Russo et al., 2022). Particularly, by using the proposed polyfactorial 3D model, a motor transport company can develop innovative processes with the help of the knowledge attraction strategy (Valiyev et al., 2021), the strategy of technology integration (Tang and Veelenturf, 2019), and the strategy of innovative processes intellectualization (Malik et al., 2021). Based on the proposed directions for innovative processes development, a motor transport enterprise requires a strategy connected with the improvement of transportation processes, the expansion of the scope of business activity, and an increase in the efficiency of transportation enterprise activities (Dykan et al., 2021). At the same time, the choice of a strategy for innovative process development depends on many factors that can be used to supplement the proposed vector model. Using the proposed polyfactorial 3D model in selecting a strategy for innovative processes development of a motor transport enterprise creates an opportunity to:

- Identify trends in the development of a motor transport enterprise and reserves for improving innovative activities efficiency (Liu et al., 2022);
- Identify weaknesses in innovative activity and business activity conditions that impede

the development of innovative processes in the motor transport enterprise (Bulturbayevich, 2021);

- Highlight priority opportunities and conditions contributing to the development of innovative processes of the enterprise based on principles of integration (Boichenko et al., 2022);
- Determine the market position of the motor transport enterprise and analyze the innovations suitable for implementation in its operation (Lagorio et al., 2022);
- Conduct a competitive diagnosis in terms of the innovative development of motor transport companies (Ekici et al., 2019).

Forming mathematical models of the strategic development of innovative processes provides not only a new toolkit for innovative activity research but also ensures the improvement of economic and mathematical modelling methods, the formation (according to the most crucial role of innovations in the company's economic development) of a new complex methodical approach directly focused on strategic development, and analysis of innovative processes efficiency of motor transport enterprises (Dey et al., 2019). Considering the selected vectors of the innovative processes efficiency of the motor transport enterprise will result in the increased effectiveness of their strategic development, as well as in the expanded range and quality of the services provided. Moreover, the obtained results can be used while justifying and developing priority directions of the strategy for innovative process development of motor vehicle enterprises as a component of the toolkit for the formation of leadership positions in the market (Colovic, 2022).

## CONCLUSION AND RECOMMENDATION

The study proposed a polyfactorial 3D model that incorporates correlation, regression, and cluster analysis to analyze and evaluate the efficiency of the strategic development of innovative processes. The theoretical input of this study lies in the development of the polyfactorial 3D model, which provides a comprehensive framework for assessing and diagnosing the efficiency level of innovative process development strategies. By considering three dimensions—technological, organizational,

and science and technology—the model allows for a more holistic understanding of the factors influencing innovation processes within enterprises. Practically, this research contributes by providing motor transport enterprises with a methodological toolkit for identifying and prioritizing adaptation strategies in the face of changing business operating conditions, particularly in post-war scenarios. The findings suggest that focusing on the asymmetry of directions within the innovation process development strategy can lead to increased efficiency and improved competitiveness. The study also highlights the importance of selecting appropriate strategies based on the characteristics and needs of individual enterprises, as indicated by the different clusters identified.

The research demonstrates that the adoption of the proposed methodological approach, along with the polyfactorial 3D model, enables motor transport enterprises to make informed decisions regarding their innovation process development strategies. By considering the asymmetry of directions, companies can enhance their flexibility and adaptability to changes in the operating environment, ultimately leading to improved competitive advantages and increased value for consumers. This study offers valuable insights for practitioners and researchers seeking to optimize the strategic development of enterprises' innovative processes in complex and challenging contexts. Considering the limited resource provision for the complex development of innovative processes, motor transport enterprises can select the most effective type of strategy, since its adequacy is confirmed based on the implementation of the scenario modelling method following the proposed polyfactorial 3D model, and then can increase the level of flexibility and adaptability to changes in the operating environment, ensuring competitive advantages and company values for consumers.

The limitations of the research should be acknowledged. The study is conducted on a sample of 23 motor transport enterprises in Ukraine, and the findings may not be directly applicable to other industries or countries. Future research could replicate the study in different contexts to assess the generalizability of the proposed model. The research focuses on the strategic development of innovative processes within the context of the ongoing

consequences of the war in Ukraine. However, external factors such as economic, political, and social conditions may influence the effectiveness of the proposed strategies. Future research could explore the interaction between these external factors and innovation process development strategy. The study primarily focuses on the immediate effects of the innovation process development strategy. Future research could examine the long-term effects and sustainability of the proposed strategies, considering factors such as organizational learning, knowledge transfer, and continuous improvement.

Significance of this study for future research lies in its methodological approach, the application of the polyfactorial 3D model, and the focus on asymmetry in the development of enterprises' innovative processes. While acknowledging the limitations of the research, further studies can build upon these findings to explore the generalizability, data availability, external factors, and long-term effects to enhance the understanding and effectiveness of innovation process development strategies in diverse contexts.

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