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Vitalii Sharko
D.Sc. in Economics, Professor of the Department of Commodity Science, Expertise and Commercial Business, Vinnytsia Institute of Trade and Economics of State University of Trade and Economics, Vinnytsia, Ukraine;
e-mail: vorfahr@ukr.net
ORCID: 0000-0001-5830-8911
(Corresponding author)

Nataliya Zamkova
D.Sc. in Philosophy, Professor of the Department of Finance, Vinnytsia Institute of Trade and Economics of State University of Trade and Economics, Vinnytsia, Ukraine;
ORCID: 0000-0001-9557-2607

Viktoriya Kryveshchenko
Candidate of Economic Sciences, Associate Professor of the Department of Commercial Activities and Logistics, Kyiv National University of Economics named after Vadym Hetman, Kyiv, Ukraine;
ORCID: 0000-0002-2375-9664

Nadiya Andrusenko
Candidate of Economic Sciences, Associate Professor of the Department of Commodity Science, Expertise and Commercial Business, Vinnytsia Institute of Trade and Economics of State University of Trade and Economics, Vinnytsia, Ukraine;
ORCID: 0000-0003-3746-6202

Eduard Kovtun
Candidate of Economic Sciences, Associate Professor of the Department of Management and Public Administration, Vinnytsia Institute of Trade and Economics of State University of Trade and Economics, Vinnytsia, Ukraine;
ORCID: 0000-0002-8505-8361

Andrii Savitskyi
D.Sc. in Economics, Associate Professor of the Department of Management, Khmelnytskyi Polytechnic Professional College by Lviv Polytechnic National University, Khmelnytskyi, Ukraine;
ORCID: 0000-0002-2265-4270

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STRATEGICAL PLANNING OF INNOVATIVE DEVELOPMENT OF THE ENTERPRISE

ABSTRACT

One of the leading areas of economic research is the analysis of the main patterns of innovative development of the enterprise. Numerous scholars have provided substantial grounds for the need to apply a strategic approach to planning the innovative development of the enterprise.

The rapidly changing transformational economic conditions, under which Ukrainian machine-building enterprises are operating, bring to the forefront the search for and justification of the priority areas of development that would be able to ensure the implementation and adaptation of the goals of enterprise development to the external and internal environment, as well as the sectoral characteristics of their functioning.

The article analyses and generalises the criteria of selection of a competitive strategy of innovative development and analyses methods of solution of multi-criteria tasks in the strategic innovation development, with advantages and shortcomings. It is proposed that hierarchical structures for decision-making on the choice of the competitive strategy of innovation development by results and costs.

The article develops a factor-based system of assessments of the level of the innovative development of enterprises, which is based on the identification of indicators of the use of resources for innovative activity of the enterprise, indicators of innovation of products, and indicators of innovation efficiency. The article offers a model of calculation of the integral indicator and a scale of assessment of innovation development of a machine-building enterprise, which is determined on the basis of a certain number of components of innovation development and their weight.

The subject of the study covers theoretical and practical aspects of innovative development of Ukrainian mechanical engineering enterprises.

Keywords: enterprise, industry, innovative development, expert assessment, competitive strategy, mechanical engineering, strategic planning

JEL Classification: O14, O21, P41

INTRODUCTION

Currently, machine-building enterprises are far from being at the forefront of both the internal and external markets. The main reasons for this situation (Bogachov, 2022) are the obsolescence of fixed assets, lack of financial resources for development, and insufficient human resources (need for retraining). In the course of their development, enterprises are constantly interacting with other business entities, building commercial relationships with their environment: competitors, consumers, suppliers, etc. Each form of relationship between the elements of the industrial enterprise and the elements of its environment is a strategic problem that requires constant search, setting indicators, and solving problems in planning strategic innovative development.

LITERATURE REVIEW

The study of the problems of forming an effective competitive strategy for innovative development of enterprises (Tazetdinova A. & Bayaskalanova T., 2020), management

of innovative assets in the system of improving the competitiveness of industrial enterprises is thoroughly covered in the works of domestic and foreign scholars (Bogoviz, Ragulina, 2020).

Rapid changes in the development of industrial enterprises associated with the emergence of new technologies, globalisation of activities, increased competition in the markets of finished products and resources, make it necessary to adapt to changes in the environment (Zakharkin, 2014). In these economic conditions, the theory and practice of forming, selecting, and implementing the strategy of innovative development of enterprises (Sharko, 2021) is becoming increasingly relevant, within which the enterprise determines the ways of its implementation, taking into account external and internal factors of influence on its activities (Yushkevych, et al., 2024). The exogenous factors of influence on the strategic guidelines for the development of domestic enterprises have been studied in the following works (Korotkyi, 2015; Shevchuk, 2015).

In the context of the knowledge economy and deepening competition, a vital task for industrial enterprises is to find new ways to gain competitive advantages and plan the innovative development of the enterprise, including on the basis of a detailed analysis of modern trends and concepts of forming strategies for innovative development of the enterprise (Bogoviz, Ragulina, 2020), research and description of the processes of innovation implementation and methods of their generation within enterprises (Shulhina, Yukhymenko, 2015).

The core idea of the study on the specifics of strategic planning of the innovative development of machine-building enterprises under current conditions lies in the comprehensive analysis (Mantulenko V., 2024) of processes related to the long-term determination of objectives, directions, and instruments of the innovative renewal of enterprises to ensure their competitiveness, adaptability to environmental changes, and sustainable development.

In particular, the research done by Omelianenko T. and Yakovenko M. (2017) examined the role of strategic planning in the innovative development of enterprises and proposed the principle of synchronizing operational and innovation strategies. The research done by Nevmerzhytska S. and Levchuk Ya. (2018) focused on the analysis of strategic innovation planning and the formation of development strategies under conditions of uncertainty.

Thus, it becomes evident that identifying the most effective strategic planning tools for evaluating the innovative potential of machine-building enterprises is of particular importance. Smirnova D. (2023) systematized strategic planning instruments for assessing the innovation potential of railcar manufacturing enterprises. The author conducted a study employing PEST and SWOT analyses to evaluate the readiness of Ukrainian industrial enterprises for innovation.

While examining the current challenges and opportunities in the strategic development of innovations in Ukrainian enterprises, it was revealed that the authors Pavliuk T., Polusmiak Yu., and Honcharov A. (2024) outlined approaches to innovation implementation with an emphasis on Industry 4.0, digital flows, strategic drivers, and the structure of innovation strategy for Ukrainian industrial enterprises.

Research on innovation policy and the regulation of technological innovations in the European Union was carried out by Ahern D. (2025), Ruohonen J., Timmers P. (2025), and Meyer O., Boell M., Legat C. (2025).

In his work, Ahern D. (2025) emphasizes that the need for regulatory choice to counteract the inhibitory effect of regulatory lag is more critical for emerging markets and growth promotion than achieving one-time regulatory excellence. The author proposed key components for the innovative development of industrial enterprises, including anticipatory strategic foresight and sandbox experiments. He introduced the concept of anticipatory governance, which may assist Ukrainian enterprises in integrating strategic foresight, experimentation, and learning into the innovation regulatory process.

Meyer O., Boell M., and Legat C. (2025) proposed standardization as a strategic element for technological innovation. Their analysis highlights that standardization is a driving force in implementing Industry 4.0, especially in Europe, where the harmonization of regulatory frameworks goes hand-in-hand with technological advancements. In our view, the future of Ukrainian industrial enterprises lies in the creation of a flexible system of standards that enables effective adaptation to emerging digital challenges.

Meanwhile, Ruohonen J. and Timmers P. (2025) underscore the significance of digital innovation development strategies in industry. Their work contributes to the ongoing discourse on innovation, technological development, and industrial policy in Europe by providing empirical insights into the effectiveness and orientation of the Digital Europe Programme. These findings may serve as a practical basis for addressing the challenges of innovative development in Ukrainian industrial enterprises.

AIMS AND OBJECTIVES

We aim to present and duly substantiate our own approach to strategic planning of innovative development for machine-building enterprises, based on clearly defined calculations. To this end, we have systematized performance indicators of existing machine-building enterprises. The study introduces an original methodology developed by the authors to determine the potential capabilities of machine-building enterprises to implement innovations in their operations.

To achieve the stated aim, the following objectives were (Conference, 2005) set within the framework of this study:

1. To select performance indicators of existing enterprises, namely: operating profitability, indices of production volume changes, revenue from sales, operating expenses, and operating profit.
2. To analyze the selected indicators and provide relevant commentary.
3. To develop an algorithm outlining the stages for assessing the strategic innovative development of machine-building enterprises.
4. To group potential indicators of enterprises' innovation potential, perform relevant calculations, and synthesize the obtained indicators.
5. To conduct an expert evaluation of the components constituting the innovation potential of machine-building enterprises.
6. To propose priority factors that would contribute to the strategic planning of innovative development in enterprises.

METHODS

The methodological basis of the article is a set of techniques, principles, general theoretical, special, interdisciplinary methods of scientific research (Bogachov, 2022). To achieve the set goal and solve the defined tasks, there were used the following methods: economic and statistical, financial, comparative and factor analysis - to estimate the state of marketing, logistics and innovation development of machine-building enterprises in Vinnytsia and Khmelnytskyi regions, in the analysis of the impact of external and internal factors on the choice of strategies for innovative development of enterprises, to determine the tools for marketing and logistics at machine-building enterprises, and to monitor the processes of increasing the level of innovative strategic development of the enterprise (Sharko, 2021); methods of analysis (Padilla Sarosa, 2005), synthesis, deduction to ground the expediency of elements and their interrelation in the formation of a competitive strategy for innovative development of enterprise (Iastremska, 2023) to determine marketing management technologies in the strategy of innovative development of enterprise; graphic - for visual representation, schematic and graphical construction of theoretical and practical positions of the study; abstract and logical - for logical generalisation of theoretical foundations and formulation of the conclusions of the Study.

RESULTS

With the aim of substantiating the feasibility and relevance of strategic planning (Tulchynska, & Khval, 2011) of innovative development of the industrial enterprise, the main indicators indicating the pace of production development of the above ten enterprises are considered, namely: Private Joint-Stock Company "Barskiy Engineering Plant"; Private Joint-Stock Company "Bershad Electrotechnical Plant"; (Nusynov, V., Burkova, L., & Shura, N., 2020) Private Joint-Stock Company "Kalynivka Machine-Building Plant"; Public Joint-Stock Company "Mohyliv-Podilkyi Machine-Building Plant"; Limited Liability Company "Vinnytsia Aggregate Plant"; Public Joint-Stock Company "Ukrelektroaparat"; State Enterprise "Krasyliv Aggregate Plant"; State Enterprise "Novator"; Public Joint-Stock Company "Plant "Temp"; Public Joint-Stock Company "Krasyliv Machine-Building Plant."

Important indicators used in the study to estimate the state and pace of the development of industrial enterprises (Mantulenko, 2024) are profitability of operating activities, index of changes in production volumes, sales revenue, operating expenses, and profit from operating activities (Table 1-10).

The analysis of the data summarised in Table 1 indicates that the main attention is drawn to the profitability indicators of LLC "Vinnytsia Aggregate Plant", where the operating profitability indicator has fallen by 5.1% over the past 4 years (in 2021 +10.5%, in 2024 +5.2%).

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Table 1. Profitability of operating activities of machine-building enterprises of Vinnytsia and Khmelnytskyi regions in 2020-2024, (%).

Legal name of the enterprise	Years				
	2020	2021	2022	2023	2024
PJSC "Barskiy Engineering Plant"	5.6	-4.2	1.7	1.9	2.3
PJSC "Bershad Electrotechnical Plant"	2.9	-1.4	1.6	2.3	4.3
PJSC "Kalynivka Machine-Building Plant"	7.2	12.5	5.4	5.3	5.5
PJSC "Plant "Temp"	2.6	2.0	- 1.3	1.5	1.8
PJSC "Mohyliv-Podilskyi Machine-Building Plant"	9.4	22.4	7.3	2.8	3.2
LLC "Vinnytsia Aggregate Plant"	9.8	10.3	6.3	6.1	5.2
PJSC "Ukrelektroaparat"	8.7	7.3	-1.6	2.8	3.3
SE "Novator"	2.4	2.0	1.8	1.5	2.3
SE "Krasyliv Aggregate Plant"	7.3	6.4	-1.3	2.5	3.6
PJSC "Krasyliv Machine-Building Plant"	4.5	-3.1	2.3	1.8	2.1
Ukraine (average value)	6.08	6.36	2.65	3.03	3.49

According to the data summarised in Table 2, the annual indicators of changes in the production volumes of these enterprises indicate unstable trends in the functioning of national machine-building enterprises.

The indicators of profitability of operating activities of LLC "Vinnytsia Aggregate Plant" indicate its low level and instability (in 2020 +9.4%, in 2024 +3.2%). Almost the same situation is observed at PJSC "Ukrelektroaparat" (+8.7% in 2020, +3.3% in 2024) and PJSC "Barskiy Engineering Plant" (+5.6% in 2020, +2.3% in 2024). As a result, profitability has declined significantly in Ukraine over the past 5 years.

Table 2. Index of changes in production volumes of machine-building enterprises in Vinnytsia and Khmelnytskyi regions in 2020-2024.

Legal name of the enterprise	Years				
	2020	2021	2022	2023	2024
PJSC "Barskiy Engineering Plant"	3.12	2.32	2.5	1.84	1.14
PJSC "Bershad Electrotechnical Plant"	0.58	0.59	0.75	2.5	3.01
PJSC "Kalynivka Machine-Building Plant"	0.99	0.98	0.50	1.99	1.26
PJSC "Plant "Temp"	0.67	0.89	0.99	0.89	0.93
PJSC "Mohyliv-Podilskyi Machine-Building Plant"	0.22	1.79	2.33	1.94	2.07
LLC "Vinnytsia Aggregate Plant"	0.96	0.98	0.99	0.54	0.63
PJSC "Ukrelektroaparat"	3.25	3.16	2.48	2.17	1.99
SE "Novator"	2.12	1.75	1.63	1.14	1.08
SE "Krasyliv Aggregate Plant"	1.93	1.54	1.23	2.8	3.74
PJSC "Krasyliv Machine-Building Plant"	0.69	0.62	0.80	3.00	3.22
Ukraine (average value)	1.49	1.56	1.52	1.63	1.51

According to the data presented in Table 2, the annual changes in the production volumes of these enterprises indicate unstable trends in the functioning of domestic machine-building enterprises.

Table 3. Sales revenue of machine-building enterprises of Ukraine in 2020-2024 (in actual prices), UAH million.

Legal name of the enterprise	Years				
	2020	2021	2022	2023	2024
PJSC "Barskiy Engineering Plant"	20147	17546	18220	18452	17247
PJSC "Bershad Electrotechnical Plant"	17489	19223	22547	25473	27179
PJSC "Kalynivka Machine-Building Plant"	82659	80547	78633	80475	81233
PJSC "Plant "Temp"	33700	30053	29892	26744	27252
PJSC "Mohyliv-Podilskyi Machine-Building Plant"	90658	88475	88129	89723	90147
LLC "Vinnytsia Aggregate Plant"	26439	40847	32847	22506	24563
PJSC "Ukrelektroaparat"	24157	21348	20144	19863	20145
SE "Novator"	18552	16390	16855	17254	17556
SE "Krasyliv Aggregate Plant"	227158	220174	219116	218173	217347
PJSC "Krasyliv Machine-Building Plant"	23212	28407	35857	50102	55473
Ukraine (average value)	39225.13	39303.63	38408.38	37561.25	38165.25

Thus, the most attention is drawn to the indices of changes in production volumes of such enterprises as PJSC "Barskiy Engineering Plant" (3.12% in 2020, 1.14% in 2024), PJSC "Mohyliv-Podilskyi Machine-Building Plant", where the situation has changed significantly (3.25% in 2020, 1.99% in 2024), and PJSC "Ukrelektroaparat", where the situation has also deteriorated (2.12% in 2020, and 1.08% in 2024).

Table 4. Profit from the operating activities of machine-building enterprises in Ukraine.

Legal name of the enterprise	Years				
	2020	2021	2022	2023	2024
PJSC "Barskiy Engineering Plant"	1748	1623	1544	1324	1287
PJSC "Bershad Electrotechnical Plant"	1522	1047	983	738	794
PJSC "Kalynivka Machine-Building Plant"	20744	16257	13543	11478	12496
PJSC "Plant "Temp"	3168	3771	1874	1556	1632
PJSC "Mohyliv-Podilskyi Machine-Building Plant"	1478	985	753	812	819
LLC "Vinnytsia Aggregate Plant"	2239	7154	2210	795	842
PJSC "Ukrelektroaparat"	3158	2862	2472	2749	3047
SE "Novator"	1233	944	1054	1134	1013
SE "Krasyliv Aggregate Plant"	8627	8047	6952	7045	7235
PJSC "Krasyliv Machine-Building Plant"	3168	3771	1874	1556	1632

According to the data summarised in Table 4, it can be concluded that the indicators of changes in the production volumes of machine-building enterprises show an increase (from 1.49% in 2020 to 1.51% in 2024), but at a rather slow pace; however, stable indicators of the pre-crisis years have not been achieved yet. And the reasons for this are not only the general political crisis in the country, the military operations that Ukraine is conducting in its eastern territories, the occupation of Crimea and the almost complete severance of trade relations with Russia, to which the Ukrainian machine-building enterprises were mainly oriented, but also the fact that during the period of stability (stagnation) these enterprises did not take care of expanding their sales market, diversifying suppliers and integrating into the international European and Asian space. This will be described in more detail in the following sections of the paper.

The analysis of the data in Tables 2 and 3 shows the imbalance in the financial performance of machine-building enterprises. For example, PJSC "Barskiy Engineering Plant" ended 2023 with a significantly reduced profit from operating activities, which amounted to UAH 1324 billion, although sales revenue amounted to UAH 18452 billion. The main reason for the significant change in profit is typical for all domestic industrial enterprises in this period - the level of costs for procurement and raw materials for production has changed significantly due to the sharp deterioration of the economic situation (Bogoviz, Ragulina, 2020) in the country and the devaluation of the hryvnia. The year 2022 was even less

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successful, as sales revenue decreased to UAH 1,747 billion, while the company's profit from operating activities fell to UAH 1,287 billion.

The data on the activities of PJSC "Mohyliv-Podilskyi Machine-Building Plant" also indicate a significant decrease in profit from operating activities (by UAH 409 billion between 2020 and 2023). The same significant decline in profit from operating activities occurred at PJSC "Ukrelektroaparat" (decrease in profit by UAH 220 billion in 2020-2024) and PJSC "Plant "Temp" (decrease in profit by UAH 659 billion in 2020-2024).

Based on the analysis of the data summarised (Rokotyanskaya, et al., 2018) in the tables, it is clear that operating expenses increased at PJSC "Ukrelektroaparat" (by +UAH 113 billion in 2020-2024), PJSC "Barskiy Engineering Plant" (from UAH 11248 billion in 2020 to UAH 13752 billion in 2024) and PJSC "Mohyliv-Podilkyi Machine-Building Plant" (from UAH 10335 billion in 2020 to UAH 11423 billion in 2024), which can be explained by the development of new types of products necessary for the military defence of the country.

Some companies have managed to reduce their operating expenses over the years: SE "Novator" (decrease by UAH 8327 billion in 2020-2024), PJSC "Kalynivka Machine-Building Plant" (decrease by UAH 5499 billion in 2020-2024), and LLC "Vinnytsia Aggregate Plant" (decrease by UAH 6830 billion in 2020-2024).

Thus, having statistical data on the performance of Ukrainian machine-building enterprises over the past 5 years, it is clear that modern domestic machine-building enterprises in Ukraine are operating in difficult crisis conditions. Enterprises are faced with constant choices and risky decisions that affect the future of the enterprise.

Therefore, innovative development planning of machine-building enterprises should be a set of measures that cause various transformations and changes in the organisational system, labour relations, and relationships with suppliers and consumers of products.

A common approach to estimating the innovative development of an enterprise (Bogoviz, Ragulina, 2020) is the diagnostic approach. It is used when there is a limited amount of information about the object of study, and involves diagnosing the state of innovation potential by a limited number of parameters based on a systematic understanding of its components, cause-and-effect relationships of diagnostic parameters with other important parameters of the economic system (Korotkyi, 2015).

In modern conditions, most machine-building enterprises do not pay enough attention to establishing indicators for strategic innovative development planning. Therefore, the methodology proposed by the authors will be useful in determining the potential capabilities of the engineering enterprise to introduce innovations into its activities. We propose to estimate strategic innovative development planning of a machine-building enterprise in five stages (Figure 1).

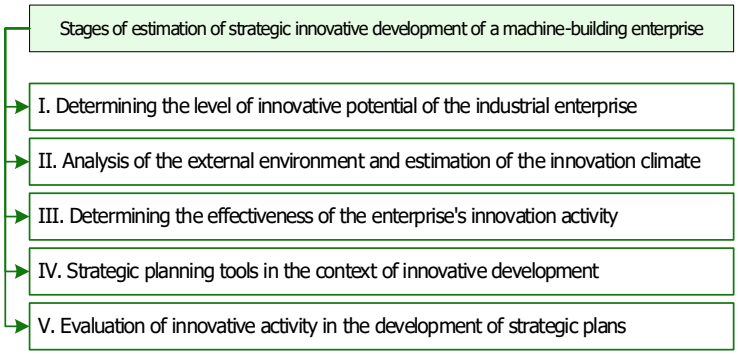

Figure 1. Stages of Evaluation of Strategic Innovative Development Planning of the Machine-Building Enterprise. *(Source: Sharko, 2021)*

To provide a comprehensive assessment of the level of innovation potential, indicators (Ki) are calculated that characterise the level of each component of innovation potential. The innovative capabilities of the machine-building enterprise were determined by the calculated indicators, which were combined into independent groups: profitability indicators (Ip), financial performance indicators (Ifi), liquidity indicators (Ili), and production indicators (Ipr). Each group is represented by five indicators (Vlasenko, 2013).

All indicators were calculated for the last reporting year to fully assess all available resources. The structure of indicators characterising the level of components of the innovative potential and the scores of all indicators on the example of a machine-building enterprise in the Vinnytsia region are presented in Table 5.

Table 5. Structure of indicators of innovative potential of the engineering enterprise. *(Source: Sharko, 2021)*

Symbols	Groups of indicators	Name of indicators	Values of the indicators
I_P	Profitability indicators	profitability of the enterprise	0.0329
		profitability of equity capital	0.0421
		product profitability	0.0301
		sales profitability	0.0247
		profitability of investments	0.0292
I_{fi}	Indicators of financial activity	current assets turnover ratio	1.97
		equity turnover ratio	4.92
		self-financing ratio	0.05
		financial stability ratio	0.49
		leverage ratio	3.87
I_{li}	Liquidity indicators	absolute liquidity ratio	0.0247
		quick ratio	0.063
		current liquidity ratio	0.7044
		share of current production assets in assets	0.89
		equity coverage ratio	1.426
I_{pr}	Production indicators	fund return	5.06
		capital equipment	0.9
		costs per UAH 1 of marketable products	0.97
		ratio of production costs to the value of average annual inventories	4.93
		Material assets turnover ratio	4.79

The next step is to select the individual components of the enterprise's innovation potential (formula 1) (Sharko, 2021):

$$I_p = \sqrt[n]{P_n^1 K_i} \quad (1)$$

where K_i is the quantitative value of the i-th indicator; n is the number of indicators in a particular group of indicators ($n = 5$).

The level of the components of innovation (Bogoviz, Ragulina, 2020) demonstrates the provision of the enterprise with assets of a certain group. The level of the profitability indicator reflects the level of income that can be directed to the implementation and development of innovative activities (Vlasenko, 2013). The value (Tiulin, 2019) of the components of innovative potential should be within the range: [0; max]. For the machine-building enterprise, this indicator will have the following values:

$$I_p = \sqrt[5]{0.0329 \times 0.0421 \times 0.0301 \times 0.0247} \times 0.0292 = 0.0313$$

$$I_p = \sqrt[5]{1.97 \times 4.92 \times 0.05 \times 0.49} \times 3.87 = 0.6204$$

$$I_{li} = \sqrt[5]{0.0247 \times 0.063 \times 0.7044 \times 0.89} \times 1.426 = 0.268$$

$$I_{pr} = \sqrt[5]{5.06 \times 0.9 \times 0.97 \times 4.93} \times 4.79 = 2.533$$

The generalised level of the enterprise's innovative potential is presented in the following form (formula 2):

$$I_{Ip} = \sum_{I_{Ip}} \cdot W_i \quad (2)$$

where W_i the weight of each component of the enterprise's innovative potential.

The normative range of values of the generalised level of innovative potential is as follows:

- 0 - the enterprise has no opportunities to implement innovative activities;

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- 0.01-1 - the level of innovative potential is low, showing a lack of own funds for the implementation of innovative projects;
- 1.01-10 - medium level of innovative potential, indicates limited opportunities for implementation of innovative developments;
- 10.01-max - high level of innovative potential, indicates sufficient capabilities of the machine-building enterprise for the implementation of innovations.

The generalised level of the enterprise's innovation potential is determined by the method of an expert survey. Each expert (involving leading specialists of the enterprise) was presented with a list of components of innovation potential, and it was necessary to assess the importance of their impact on the priority of innovation activities. As a result, the weight of each component was determined as the arithmetic mean of the values selected by the experts. The results of the experts' assessment of the components of innovative potential are presented in Table 6.

Table 6. Results of the expert assessment of components of the innovative potential of a machine-building enterprise.

Components of the innovative potential of the enterprise	Experts							Value
	1	2	3	4	5	6	7	
Profitability indicators	0.7	0.5	0.5	0.1	0.3	0.4	0.3	0.4
Indicators of financial activity	0.1	0.3	0.2	0.1	0.3	0.4	0.4	0.26
Liquidity indicators	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.14
Production indicators	0.1	0.0	0.1	0.6	0.3	0.1	0.2	0.2

According to the indicators in Table 6, the studied machine-building enterprise belongs to the group of industrial enterprises with a low level of innovative potential. Therefore, the enterprise has insufficient opportunities for innovation and a lack of its own funds to finance innovative projects.

Using the proposed methodology, it is possible to obtain quantitative estimates of the level of innovative potential for all parameters, which can be used to respond to minor changes in any of them (Oliinyk, 2017).

It should be noted that only a systematic approach will allow us to reflect the processes of innovative development, to identify the real connection and relationships of individual parties to the process. Therefore, the most important feature of this system is the multicomponent unity of indicators. It should be noted that during the analysis the indicators, it is necessary to further simplify and structure the real phenomena, since the system of indicators reflects the objective reality only with a certain degree of approximation. As with any relative indicator, the level of innovative potential characterises the degree to which the maximum possible, prospective, or planned assessment has been achieved. The periodic performance of such an assessment is associated with deepening and expanding knowledge about the state of the object of analysis and with the development of production, which reduces the level of relativity of the indicator (Zakharkin, 2014).

Strategic analysis of the external environment for the engineering enterprise involves the selection of key factors of this environment and the corresponding multifactorial system analysis. In this case, the key factors should be: factors and trends in the external environment that have a direct impact on the business processes of the industrial enterprise; factors that contain potential threats to the business processes of an engineering enterprise; factors which development contain new opportunities for the enterprise's business.

External factors of the studied machine-building enterprise are: labour market (human resource), capital market (financial resource), technology market (technological resource), supplier market (logistics resource), and market of all other factors influencing the enterprise (marketing resource).

Each of the above resources has a significant impact on the efficiency of the machine-building enterprise - this is the priority (Mantulenko, 2024) goal of strategic analysis and the entire strategic management of the enterprise, including the innovative aspect of its activities. Therefore, the factors that determine the process of strategic planning of the enterprise's innovative development should be ranked according to the priority of their impact on both the innovative activity of the enterprise and the process of strategic planning of its development in general.

For this purpose, the method of prioritisation based on expert assessment and matrix recording was used. This method allows to identify the dominant factors that have the highest priority (Vlasenko, 2017). The results of the expert survey are shown in Table 7.

Table 7. The results of the expert survey on the priority of factors influencing the strategic planning of innovative development of the enterprise. *(Source: Sharko, 2021)*

Factors	Experts							Comparative system used
	1	2	3	4	5	6	7	
X_1–X_2	=	>	>	>	=	>	=	>
X_1–X_3	>	>	>	>	=	>	=	>
X_1–X_4	>	=	>	=	=	=	=	=
X_1–X_5	>	>	=	=	=	=	=	=
X_1–X_6	<	<	=	<	<	=	<	<
X_1–X_7	>	>	=	=	=	=	=	=
X_1–X_8	<	<	=	<	=	<	=	<
X_1–X_9	=	<	<	=	<	<	<	<
X_1–X_{10}	>	>	=	=	>	>	>	>
X_1–X_{11}	=	>	>	>	=	>	=	>
X_1–X_{12}	>	>	>	>	=	>	=	>
X_1–X_{13}	>	=	>	=	=	=	=	=
X_1–X_{14}	<	<	=	<	<	=	<	<
								$R_i \rhd R_j, C_{ij} = 1.5$ $R_i \lhd R_j, C_{ij} = 0.5$ $R_i = R_j, C_{ij} = 1$

The calculation of the relative indicator of influence factors is as follows (formula 3):

$$S_{i1} = \sum_1^n C_{ig} \quad (3)$$

where n – number of factors,

$$S_i = \sum_1^n S_{it} \quad (4)$$

Relative indicator (P_{ij}) is calculated by formula 5:

$$P_{i1} = \frac{S_{i1}}{S_1} \quad (5)$$

For the next ineration:

$$S_{i\mathrm{m}} = \sum_1^n C_{ig} \cdot S_{i(m-1)}$$

$$S_{\mathrm{m}} = \sum_1^n S_{im}$$

Relative indicator (P_{im}) is calculated by formula 6:

$$P_{im} = \frac{S_{im}}{S_m} \quad (6)$$

where m – number of inerations.

The calculation of the relative indicator of the factors is given below in Table 8.

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Table 8. Evaluation of the results of the expert survey to determine the relative value of the influence factors.

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}	S_{i1}	P_1	S_{i2}	P_{i2}
X_1	1.0	1.5	1.5	1.0	1.0	0.5	1.0	0.5	0.5	1.5	1.5	1.5	1.0	0.5	1.0	15.5	0.084	100.00	0.047
X_2	1.5	1.0	1.5	1.5	1.0	1.5	1.0	1.0	1.5	0.5	0.5	0.5	1.0	1.0	0.5	15.5	0.084	240.25	0.112
X_3	1.5	1.5	1.0	0.5	0.5	0.5	0.5	1.0	1.0	1.5	0.5	0.5	1.0	1.0	0.5	12.5	0.068	156.25	0.073
X_4	1.0	0.5	0.5	1.0	0.5	1.0	0.5	1.0	1.5	0.5	1.0	0.5	1.0	1.0	0.5	12	0.065	144	0.067
X_5	1.0	1.0	0.5	1.5	1.0	1.5	0.5	1.0	0.5	0.5	1.5	0.5	1.0	1.0	0.5	13.5	0.074	182.25	0.085
X_6	0.5	1.5	1.0	1.0	0.5	1.0	1.5	0.5	0.5	1.0	0.5	1.0	0.5	0.5	1.0	12.5	0.068	156.25	0.073
X_7	1.0	1.0	0.5	0.5	0.5	0.5	1.0	0.5	0.5	1.0	0.5	1.0	0.5	0.5	1.0	10.5	0.057	110.25	0.052
X_8	0.5	1.0	1.0	1.0	1.0	0.5	0.5	1.0	0.5	0.5	0.5	0.5	1.0	0.5	0.5	10.5	0.057	110.25	0.052
X_9	0.5	0.5	1.0	0.5	1.0	0.5	0.5	1.0	1.0	0.5	0.5	1.0	0.5	0.5	1.0	10.5	0.057	110.25	0.052
X_{10}	0.5	0.5	0.5	0.5	0.5	1.0	1.0	0.5	1.0	1.0	0.5	1.0	0.5	0.5	1.0	10.5	0.057	110.25	0.052
X_{11}	1.5	0.5	0.5	1.0	1.5	0.5	0.5	0.5	0.5	0.5	1.0	1.5	0.5	1.0	0.5	12	0.065	144	0.067
X_{12}	1.5	0.5	0.5	0.5	0.5	1.0	1.0	0.5	1.0	1.0	1.5	1.0	0.5	1.0	0.5	12.5	0.068	156.25	0.073
X_{13}	1.0	1.0	1.0	1.0	1.0	0.5	0.5	1.0	0.5	0.5	0.5	0.5	1.0	0.5	1.0	11.5	0.063	132.25	0.062
X_{14}	0.5	1.0	1.0	1.0	1.0	0.5	0.5	0.5	0.5	0.5	1.0	1.0	0.5	1.0	1.5	12	0.065	144	0.067
X_{15}	1.0	0.5	0.5	0.5	0.5	1.0	1.0	0.5	1.0	1.0	0.5	0.5	1.0	1.5	1.0	12	0.065	144	0.067
S_m																183.5		2140.5	

As a result, each expert is offered a list of factors to evaluate the importance of their impact on the process of strategic planning of the enterprise's innovative development according to the rating system (Bogoviz, Ragulina, 2020):

1. 0 - this factor is most likely not involved in the strategic planning of innovative development.
2. 25 - nothing can be said about the influence of the factor on the strategic planning of innovative development of the enterprise.
3. 50 - the influence of this factor can sometimes lead to minor changes in the process of strategic planning of innovative development of the enterprise.
4. 75 - the influence of this factor always entails insignificant changes in the process of strategic planning of innovative development.
5. 100 - the influence of this factor always entails significant changes in the process of strategic planning of the enterprise's innovative development.

The results of the experts' evaluation are subject to analysis, but it is worth considering the regularity (formula 7):

$$max = |A_i - B_i| \lhd 50;\ \overline{1,n} \tag{7}$$

$$\frac{\sum|A_i - B_i|}{n} \leq 25$$

where A_i and B_i - assessment of each i -th pair of factors in relation to the i -th risk (if there are twenty evaluations, it should be - (i = 21), accordingly, for the opinions of 1-2, 1-3, 1-4, 1-5, 1-6, 1-7, 2-3, 2-4, 2-5, 2-6, 2-7, 3-4, 3-5, 3-6, 3-7, 4-6, 4-7, 5-6, 5-7, 6-7 experts compared in pairs).

The acceptable difference between the evaluations of two experts (for any factor) should be less than 50. After that, the experts' evaluations are reconciled into the average value. The experts' evaluations can be considered as not contradicting each other if the resulting value does not exceed 25. The final results of the analysis are presented in Table 9.

Table 9. Analysis of positive expert opinions on the factors of influence on the strategic planning of innovative development of the enterprises.

Value, *Ri*	Experts							*max /Ai–Bi/*
	I	II	III	IV	V	VI	VII	
X_1	75	75	80	60	60	88	75	28
X_2	75	90	100	90	85	95	90	25
X_3	75	100	95	85	80	90	100	25
X_4	55	60	50	60	50	50	60	10
X_5	55	60	60	60	55	50	60	10
X_6	60	50	50	60	60	50	50	10
X_7	42	30	28	25	35	30	30	17
X_8	30	25	25	25	25	25	25	5
X_9	30	50	50	25	10	25	50	40
X_{10}	5	0	5	10	10	0	0	10
X_{11}	55	60	50	60	50	50	60	10
X_{12}	55	60	60	60	55	50	60	10
X_{13}	30	25	25	25	25	25	25	5
X_{14}	75	90	100	90	85	95	90	25
X_{15}	60	50	50	60	60	50	50	10
$\frac{\sum_{i=1}^{n}\lvert A_i - B_i\rvert}{n}$	240/15=16							

The data in Table 9 indicates the acceptable consistency of experts; the sum of maximum deviations is 16.

Thus, the results of the quantitative analysis performed by this methodology allow us to identify the most important factors for the strategic planning of innovations. As a result, five priority factors were selected that have the greatest impact on the planning of innovative development (Bogoviz, Ragulina, 2020) of the enterprise (Table 10).

Table 10. Priority factors that determine the process of strategic planning of innovations at the micro level.

Name of factors	Normative indicator
1. Level of organisation of management of new product development and production preparation	0.112
2. Financial condition of the enterprise	0.085
3. Possibility of penetrating new markets or strengthening positions in traditional markets	0.073
4. Availability of own scientific and technical base and highly skilled labour force	0.073
5. Volume of investments and payback periods	0.073

Similarly, the priority factors with the highest score at the macro and meso levels can be selected.

Determining the effectiveness of the innovation activity of the engineering enterprise should be based on interrelated methodological tasks, namely: assessing the profitability of each of the possible options for implementing the innovative project; comparing options and choosing the best one [Vlasenko N.A., 2013].

The main performance indicators of the innovative project include:

- commercial (financial) efficiency, which takes into account the financial consequences of the project for its direct participants;
- budgetary efficiency, which reflects the financial impact of the project on the state, regional, and local budgets;
- economic efficiency, which takes into account the costs and results associated with the implementation of the national project that go beyond the direct financial interests of the participants in the innovative project (enterprise level) and allow for cost measurement.

A common method for evaluating the effectiveness of the enterprise's innovative activity is the method of determining the payback period (P_p) [Stadnyk V.V., 2015]. In case of even distribution of cash inflows by years, it is determined by the

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formula 8:

$$P_p = \frac{I}{A_{an}+N_p} \quad (8)$$

where I – level of investments, A_{an} – annual amortization, N_p – net profit.

If the cash flows are uneven over the years, the payback period is equal to the period of time (number of years) over which the total net income (cumulative income) exceeds the amount of investment. In general, the payback period *n* is equal to (Sharko, 2021) (formula 9):

$$\sum_{k=1}^{n} P_k \rhd 1 \quad (9)$$

where P_k – net cash income per year k, investment-driven, is calculated as the sum of annual amortisation in the k-th year and annual net income for the k-th year.

Another method of evaluating innovative projects is the method of calculating the investment efficiency ratio (accounting return on investment) (formula 10):

$$I_{er} = \frac{N_p}{1-F_a} \quad (10)$$

where F_a – residual value of fixed assets.

The net present value (NPV) is the discounted return, defined as the sum of the discounted values of the revenues less the costs received in each year over the life of the project (formula 11):

$$NVP = PV - I = \sum_{t=1}^{n} \frac{CF_t}{(1+r)^t} - I \rhd 0 \quad (11)$$

where I – amount of initial investment, PV – The present value of the cash flow over the economic life of the project, CF_t – net payment flow in the period, r – discount (rate), n – planned period of implementation of the investment project.

The profitability index (PI) characterises the return on investment of a project (formula 12):

$$PI = \frac{PV}{1} \quad (12)$$

For effective projects, $PI > 1$. The coefficient of financial autonomy of the project (K_{fa}) is determined by the formula 13:

$$K_{fa} = \frac{O_f}{Z} \quad (13)$$

where O_f – own funds, Z – borrowed funds.

Considering that for the machine-building enterprise the amount of estimated investments is UAH 12650 thousand, own funds - UAH 5687.5 thousand, annual depreciation - UAH 8290.9 thousand, net profit - UAH 58451.1 thousand, residual value of fixed assets - UAH 55 thousand, the planned period of implementation of the investment project is 3 years, the net flow of payments for the first year is UAH 14132 thousand, for the second - UAH 19638.6 thousand, for the third - UAH 24680.5 thousand, the discount rate is 0.14, the value of the above indicators for the innovation project proposed for implementation in the machine-building enterprise reflects its effectiveness (Table 11).

Table 11. Results of performance evaluation of machine-building enterprises. Note: average value.

Indicator under study	Evaluation results
T_{prof}	1 year; 14132 > 12650
K_{ei}	4.81
NPV	31516.9 (UAH)
P_I	3.5
K_{fa}	0.45

The payback period of one year means that the company will be able to recover all invested funds within one year. The investment efficiency ratio and the profitability index are significantly higher than one, which underlines the earlier conclusion that the project is efficient, as well as the high value of net discounted income. However, the value of the financial autonomy ratio is not large enough and indicates a high dependence of the project on external sources of funding.

A business plan is a strategic planning tool. A business plan in a domestic market economy is a compulsory and standard document of the industrial enterprise's business activities.

A strategic plan is a set of substantiated goals of enterprise development (or solving specific problems), set with given priorities, and mechanisms for their achievement. The criteria to evaluate the strategic plan are the degree of increase in the enterprise's potential from its implementation.

The process of developing the strategic innovative plan is characterised by such stages as (Sakharova O.): analysis (diagnostics of the organisation's state, study of external and internal factors that determine development, SWOT analysis); goal setting (definition and approval of the main goal, main strategic directions); planning (formation of private strategies for achieving goals in each direction and selection of measures, distribution of responsibility for the plan implementation) (Shevchuk O.A., 2015). Based on the results of each of the above stages, the examination and approval procedure are carried out.

DISCUSSION

Given the situation caused by the Russian invasion of Ukraine, machine-building enterprises are facing a range of challenges that significantly affect their economic activities and prospects for stable and innovation-driven development. Therefore, strategic planning of innovation development becomes a key factor for ensuring the long-term competitiveness of machine-building enterprises. Ukrainian scholars such as Vereshchahina H. and Plekhanova T. (2020) examined the specific features of innovation strategies and proposed advantages while refining the definitions of strategic enterprise development planning. However, in contrast to their scholarly assertions, our approach comprehensively takes into account the necessity of adhering to the key components of enterprise development to ensure the desired transformations, as well as the elements of the innovation process. Vlasenko N. A., Harafonova O. I., and Hlynska A. E. (2013) emphasized the role of state regulation in innovation development, particularly in the machine-building sector, through clusters, R&D activities, and preferential taxation. In their work, strategic planning is often equated with government program support, while the internal potential of enterprises is largely overlooked. In contrast, Western scholars such as Michael Porter (USA), Henry Chesbrough (USA), and Stefan Bruns (Germany) argued that enterprises should independently shape their innovation profiles based on competitive advantages, utilizing open innovation, Industry 4.0 technologies, and data-driven planning. However, this approach is oriented toward high-tech environments, which may not always be accessible to Ukrainian industrial enterprises. Peter Drucker and Klaus North (Germany) viewed innovation as a product of organizational culture. According to them, strategic planning is primarily a matter of knowledge management, learning, and change management. Nevertheless, this methodology is designed for stable economies with developed organizational cultures and is difficult to scale under the conditions of a transformational economy.

As such, there remains a lack of consensus within the academic community regarding the mechanisms of implementation, the role of the institutional environment, technological renewal, and the interconnection between digitalization and sustainable development. This has necessitated academic debate and the formulation of the authors' position.

In the context of implementing an innovation strategy, our research revealed that domestic scholars predominantly emphasize state support, whereas European researchers tend to focus on internal enterprise resources and the ecosystem-based approach. In this study, we further developed the scholarly perspective of Yefremov (2009), who substantiated the necessity of applying parallel-network planning methods for innovation-driven development to ensure the continuity of a

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company's strategic growth. We also highlight the key stages of integrating strategy evaluation methods and innovation selection into the overall process of planning a company's innovative development.

Ukrainian scholars tend to argue that strategic innovation planning should be grounded in a detailed analysis of economic indicators such as profitability and return on investment (ROI). In contrast, European approaches emphasize innovation capacity, organizational flexibility, and environmental sustainability. In our view, a high-quality strategic analysis should be based on a set of relevant indicators, including profitability indicators, financial performance metrics, liquidity ratios, and production indicators. These were further supplemented with expert assessments of the components of innovation potential to identify the specific features of strategic innovation planning in the machine-building sector.

Additionally, we have identified a set of priority factors (with normative benchmarks) that will shape the process of strategic innovation planning at the microeconomic level.

In our opinion, the practical implementation of a strategic plan for the innovative development of an enterprise as a process requires adherence to the following principles: flexibility (involves constant adaptation to changes in the environment in which the enterprise operates); communicativeness (involves coordination and integration of efforts); interactivity (involves the creative nature of planning and repeated elaboration of already drawn up plans); multiplicity (involves choosing the best of alternative opportunities to achieve the goals); participation (involves the importance of the enterprise itself).

CONCLUSIONS

The authors argue that the peculiarities of planning the strategic innovative development of machine-building enterprises should be based on clearly defined calculations. To this end, real performance indicators of operating machine-building enterprises were selected and analyzed. The study identifies the potential of machine-building enterprises to implement innovations in their operations, which is a key factor in ensuring their long-term competitiveness, adaptability to changes in the external environment, and sustainable growth. In the current context of war, globalization, and digitalization, industrial enterprises face the necessity not only to respond quickly to challenges but also to proactively shape an innovation policy that anticipates trends and introduces advanced technologies ahead of time.

Based on the conducted research, this paper presents the selection and analysis of key performance indicators (operating profitability, indices of production volume changes, sales revenue, operating expenses, and operating profit), proposes an algorithm for the stages of strategic innovative development assessment for machine-building enterprises, groups potential indicators of the enterprises' innovation capacity, and provides their calculation and generalization. An expert assessment of the components of the innovation potential of machine-building enterprises was also carried out, which contributed to identifying the priority factors that will facilitate strategic planning of innovative development.

Thus, the topic researched in the article will further contribute to identifying the potential marketing and logistics capabilities of machine-building enterprises for strategic innovative development. Therefore, the methodological approaches proposed in the study will allow for a comprehensive and holistic approach to the process of strategic planning of innovative development in machine-building enterprises. Moreover, the authors believe that in the context of a transforming economy and digitalization, it is important to foster scientific discourse on the hybrid approach to strategic planning of innovative development in the machine-building industry. Further scientific research should be devoted to these issues.

ADDITIONAL INFORMATION

AUTHOR CONTRIBUTIONS

All authors have contributed equally.

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CONFLICT OF INTEREST

The Authors declare that there is no conflict of interest.

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Шарко В., Замкова Н., Кривещенко В., Андрусенко Н., Ковтун Е., Савіцький А.

СТРАТЕГІЧНЕ ПЛАНУВАННЯ ІННОВАЦІЙНОГО РОЗВИТКУ ПІДПРИЄМСТВА

Одним із провідних напрямів економічних досліджень є аналіз основних закономірностей інноваційного розвитку підприємства. Велика кількість учених займалася змістовим обґрунтуванням необхідності застосування стратегічного підходу до планування інноваційного розвитку підприємства.

Мінливі трансформаційні умови господарювання, у яких функціонують машинобудівні підприємства України, висувають на перший план пошук та обґрунтування пріоритетних напрямів розвитку, які спроможні були б забезпечити реалізацію й адаптацію цілей розвитку підприємств до зовнішнього та внутрішнього середовища, а також галузевих особливостей їхнього функціонування.

У роботі виконано аналіз реальних показників діяльності промислових підприємств і доведена необхідність використання в стратегії інноваційного розвитку підприємств показників та їхніх індикативних характеристик.

Здійснено аналіз та узагальнення критеріїв вибору конкурентної стратегії інноваційного розвитку й аналіз методів виконання багатокритеріальних завдань у стратегічному інноваційному розвитку за перевагами та недоліками. Запропоновано ієрархічні структури для ухвалення рішень стосовно вибору конкурентної стратегії інноваційного розвитку за результатами й витратами.

Розроблено систему факторних оцінок рівня інноваційного розвитку підприємств, яка ґрунтується на визначенні показників використання ресурсів для інноваційної діяльності підприємства, показників інноваційності продукції та показників інноваційної ефективності. Запропоновано модель розрахунку інтегрального показника й шкалу оцінювання інноваційного розвитку машинобудівного підприємства, яка визначається на основі певної кількості складових інноваційного розвитку та їхньої ваги.

Предмет дослідження охоплює теоретичні та практичні аспекти інноваційного розвитку українських підприємств машинобудування.

Ключові слова: підприємство, галузь, інноваційний розвиток, експертна оцінка, конкурентна стратегія, машинобудування, стратегічне планування

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