

Plakhotnik, O. O., & Kuzmenko, N. V. (2024). The system of managing the competitiveness of machine-building enterprises as a strategic tool regarding the creation and maintenance of their competitive advantages. *Actual Issues of Modern Science. European Scientific e-Journal*, 28, 17-26. Ostrava: Tuculart Edition, European Institute for Innovation Development.

DOI: 10.47451/man2024-01-01

The paper is published in Crossref, ICI Copernicus, BASE, Zenodo, OpenAIRE, LORY, Academic Resource Index ResearchBib, J-Gate, ISI International Scientific Indexing, ADL, JournalsPedia, Scilit, EBSCO, Mendeley, and WebArchive databases.



UDC 621:005.3:005.332.4

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The system of managing the competitiveness of machine-building enterprises as a strategic tool regarding the creation and maintenance of their competitive advantages

Abstract: In the conditions of fierce competition, one of the most important criteria for a country's readiness for the challenges of the Fourth Industrial Revolution is an assessment of its industrial competitiveness and the level of innovative development. A competitive machine-building complex is the foundation of ensuring the appropriate level of the country's competitiveness. It is the core of the national economy, which Ukraine's place in the global environment depends on. The machine-building complex is one of the most important economic activity. It occupies a key position in the global economy, determining the pace of technological progress and ensuring the needs of high-tech products in the markets, has a significant impact on ensuring the economic growth of the country, the development of scientific and technological progress and social development. This study aims to improve the competitiveness of machine-building enterprises' management systems, enabling them to maintain and develop their competitive advantages and effectively integrate into the global economic space. The study object is the management system of the competitiveness of machine-building enterprises. The study subject is a set of theoretical, methodical, and applied provisions regarding the formation of an effective management system for the competitiveness of machine-building enterprises as a strategic tool for creating and maintaining their competitive advantages. The main scientific and unique research methods used were theoretical generalization, specification, systematization, analysis and synthesis, systematic approach, and statistical and graphic analysis. A considerable contribution to the development of theoretical and practical aspects of increasing the competitiveness of machine-building enterprises and ensuring the effectiveness of the management system for this process, determining the role of machine-building in ensuring the competitiveness of the domestic economy, developing tools for the activation of the development of domestic machine-building, development of its advantages was made by such domestic and foreign scientists as: D. Malashchuk, M. Provozin, V. Panchenko, R. Fathutdinova, I. Ansoff, M. Porter, I. Farynovych, O. Kurchuk, L. Koval, L. Sozansky, N. Karachina, L. Balabanova, B. Danylyshyn, O. Gamova, N. Taran, E. Ryuli, Y. Abram, A. Pavlychek, V. Zyanko, S. Shuppisser, N. Tarnavska, A. Cherep, O. Honchar, M. Bondarchuk, A. Karami, G. Ortina, M. Filippov, I. Piddubny, L. Piddubna, M. Mazak, V. Korneev, E. Didenko, K. Freeman and others. Despite the significant achievements of scientists, the theoretical and methodological foundations of the formation of a system for managing the competitiveness of machine-building enterprises, the implementation of which will

provide an opportunity to form stable competitive advantages at the enterprise, instantly respond to the challenges of the external environment and effectively integrate into the global economic space, remain insufficiently substantiated. It was emphasized that today, the issue of ensuring and increasing the level of competitiveness of mechanical engineering is a pressing one. An analysis of the current functioning state of Ukraine's processing industry was performed. Problematic aspects regarding ensuring, maintaining, and developing the level of competitiveness of machine-building enterprises are highlighted. The machine-building enterprises competitiveness managing concept was developed using system analysis, based on inductive and systemic approaches. Applying the developed concept in the work practice of enterprises will provide an opportunity to form sustainable competitive advantages, instantly respond to the challenges of the external environment, and integrate into the global economic space.

Keywords: machine-building enterprises, management system, competitiveness, development, competitive advantages, activation, external environment.



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Наталія В. Кузьменко, здобувач вищої освіти другого (магістерського) рівня спеціальності «Менеджмент» за освітньо-професійною програмою «Менеджмент», Дніпровський державний технічний університет. Кам'янське, Україна.

Система управління конкурентоспроможністю машинобудівних підприємств як стратегічний інструмент щодо створення й утримання їх конкурентних переваг

Анотація: В умовах жорсткої конкуренції одним із найголовніших критеріїв готовності країни до викликів Четвертої промислової революції, де провідним сектором економіки є сектор знань, а саме вміння генерувати нові креативні ідеї, ефективно використовувати нові знання, є оцінка її промислової конкурентоспроможності та рівня інноваційного розвитку. Фундаментом забезпечення належного рівня конкурентоздатності країни є конкурентоспроможний машинобудівний комплекс. Він є ядром національної економіки, від якого залежить місце України у глобальному середовищі. Машинобудівний комплекс є одним з найважливіших видів економічної діяльності, займає ключове положення в глобальній економіці, визначаючи темпи технологічного прогресу та забезпечуючи потреби високотехнологічних виробів на ринках, має значний вплив щодо забезпечення економічного зростання країни, розвитку науково – технічного прогресу й соціального розвитку. Метою даного дослідження є удосконалення системи управління конкурентоспроможністю підприємств машинобудування, що надасть їм можливість утримувати й розвивати свої конкурентні переваги та ефективно інтегрувати у світовий економічний простір. Об'єктом дослідження є система управління конкурентоспроможністю підприємств машинобудування. Предметом дослідження є сукупність теоретичних, методичних і прикладних положень щодо формування ефективної системи управління конкурентоспроможністю машинобудівних підприємств як стратегічного інструменту щодо створення й утримання їх конкурентних переваг. В роботі використовувались основні загальнонаукові та спеціальні методи дослідження, а саме: теоретичного узагальнення, конкретизації, систематизації, аналізу і синтезу, системний підхід, статистичний аналіз та графічний. Величезний внесок у розробку теоретичних й практичних аспектів щодо підвищення конкурентоспроможності підприємств машинобудування й забезпечення ефективності системи управління цим процесом, визначенні ролі машинобудування у забезпеченні конкурентоспроможності вітчизняної економіки, розробку інструментарію щодо активізації розвитку вітчизняного машинобудування, розвиток їх конкурентних переваг внесли такі вітчизняні й закордонні вчені як: Д. Малащук, М. Провозін, В.

Панченко, Р. Фатхутдінова, І. Ансофф, М. Портер, Ж. Ламбен, І. Фарінович, О. Курчук, Л. Коваль, Л. Созанський, Н. Карачина, Л. Балабанова, Б. Данилишин, О. Гамова, Н. Таран, Е. Рюлі, Й. Абрам, А. Павличек, В. Зянько, С. Шупіссер, Н. Тарнавська, А. Череп, О. Гончар, М. Бондарчук, А. Карамі, Г. Ортіна, М. Філіппов, І. Піддубний, Л. Піддубна, М. Мазак, В. Корнєєв, Є. Діденко, К. Фрімен та інші. Незважаючи на суттєві напрацювання вчених залишаються недостатньо обґрунтованими теоретико-методичні основи формування системи управління конкурентоспроможністю машинобудівних підприємств, реалізація якої надасть можливість сформувати на підприємстві стійкі конкурентні переваги, миттєво реагувати на виклики зовнішнього середовища та ефективно інтегрувати у світовий економічний простір. Наголошено, що на сьогодні, злободенним постає питання щодо забезпечення й підвищення рівня конкурентоспроможності машинобудування. Проведено аналіз поточного стану функціонування переробної промисловості України. Виділено проблемні аспекти щодо забезпечення, підтримки й розвитку рівня конкурентоспроможності підприємств машинобудування. Розроблено концепцію управління конкурентоспроможністю підприємств машинобудування на застосуванні ідей системного аналізу, в основу якого покладено індуктивний та системний підходи. Застосування розробленої концепції в практиці роботи підприємств надасть можливість сформувати стійкі конкурентні переваги, миттєво реагувати на виклики зовнішнього середовища та інтегрувати у світовий економічний простір.

Ключові слова: машинобудівні підприємства, система управління, конкурентоспроможність, розвиток, конкурентні переваги, активізація, зовнішнє середовище.



Introduction

Formulation of the problem. Machine building is one of the most important types of economic activity, which occupies a key position in the global economy, determining the pace of technological progress and ensuring the needs of high-tech products in the markets, has a significant impact on ensuring the economic growth of the country, the development of scientific and technical progress, and social development. More than 2,800 industrial enterprises and more than 230 organizations performing various scientific, technical and research works are involved in the structures and divisions of the machine-building industry of Ukraine. The approximate number of people working in this field is more than 1 million. The domestic mechanical engineering plays a key role in ensuring the competitiveness of products on the domestic and foreign markets of Ukraine. Therefore, the study of the current state of operation of machine-building enterprises and the improvement of the management system of their competitiveness is relevant, since they ensure the proper level of the country's competitiveness.

The study subject is a set of theoretical, methodical, and applied provisions regarding the formation of an effective management system for the competitiveness of machine-building enterprises as a strategic tool for creating and maintaining their competitive advantages.

The study object is the management system of the competitiveness of machine-building enterprises.

This study aims to improve the competitiveness of the management systems of machine-building enterprises, enabling them to maintain and develop their competitive advantages and effectively integrate into the global economic space.

The main scientific study methods include theoretical generalization, specification, systematization, analysis and synthesis, systematic approach, and statistical and graphic analysis.

The scientists I. Piddubny, L. Piddubna, L. Balabanova (*Balabanova et al., 2009*), I. Vinichenko, M. Porter, O. Shvydanenko, Yu. Prodius, I. Ansoff, M. Galeliuk, R. Fathutdinova, M. Sharko were engaged in the development of theoretical and practical aspects of increasing the competitiveness of machine-building enterprises and ensuring the effectiveness of the management system for this process. The determination of the role of mechanical engineering in ensuring the competitiveness of the domestic economy, the development of tools for the activation of the development of domestic mechanical engineering, the development of their competitive advantages are devoted to the researches of such scientists as D. Malashchuk (*Malashchuk, 2018*), M. Provozin, V. Panchenko, I. Ansoff, M. Porter, J. Lamben, I. Farynovych, N. Volosnikova (*Volosnikova et al., 2022*), O. Kurchuk, L. Koval and L. Sozansky (*Sozansky & Koval, 2021*), N. Karachina, T. Halimon, B. Danylyshyn, O. Gamova (*Gamova, 2020; Gamova, 2021*), N. Taran, E. Ryuli, Y. Abram, A. Pavlychek, V. Zyanko, S. Shuppisser, N. Tarnavskaya (*Tarnavskaya, 2008*), A. Cherep, O. Honchar, M. Bondarchuk, A. Karami, G. Ortina, M. Filippov, M. Mazak, V. Korneev, E. Didenko (*Didenko & Zhurakovsky, 2017*), K. Freeman and others. However, the theoretical and methodological foundations of the formation of the system of managing the competitiveness of machine-building enterprises, its components, which would ensure the growth of the competitive advantages of machine-building enterprises, remain insufficiently researched. All these facts determined the relevance of this study.

Main part

Challenges of industry in current conditions

The experience of highly developed countries shows that the main factor of economic growth is a high technical level of production potential, and effective development of the industry is possible only based on the rapid development of scientific and technical progress and effective implementation of innovative activities. All these factors require the implementation of an effective state policy in this direction, a significant amount of capital investment, the presence of personnel capable of accepting innovations and skillfully generating new competitive ideas, etc.

Russia's full-scale invasion of Ukraine dealt a heavy blow to the Ukrainian economy. This especially applies to the domestic industry, which had a tendency to decrease production volumes. Today, the situation regarding the activities of machine-building enterprises is extremely critical. The enterprises of the defense-industrial complex, the repair plants, the industrial production sites are destroyed and damaged. A large part of the industrial giants does not work at all, some are in the process of relocation (*Schwartz, 2022*). However, despite the war, in incredibly difficult economic conditions, in 2023 Ukraine rose two places in the Global Innovation Index and occupies the 55th place, which published by the World Intellectual Property Organization in the report under the slogan "Innovation in Conditions of Uncertainty". The report on the Global Innovation Index 2023 presents the latest global innovation trends and the annual innovation ranking of 132 countries and economies of the world. We will list some components of the rating, namely: regulatory environment – 77th position (in 2021 – 78th position), human capital and research – 47th position (in 2021 – 44th position), education – 31st

position (in 2021 – 23rd position), research and development (R&D) – 68th position (in 2021 – 58th position), information and communication technologies – 59th position (in 2021 – 69th position), knowledge and technology outputs – 45th position (in 2021 – 33rd position) (*Global...*, 2023a; *Global...*, 2023b).

We will present trends in Ukraine's positioning in the global space using such indicators as the global competitiveness index, the global innovation index, the innovation index, and the industrial competitiveness index (*Table 1*) (*Pisarenko et al., 2023; Global...*, 2023b).

The positions of Ukraine in international rankings reflecting the state of development of innovative activity provide an opportunity to determine the level of state support for innovative projects and their financing; availability of a mechanism for the introduction of innovations in economic activity and further commercialization; the level of cooperation of innovative enterprises and research institutions, etc. According to the data in the *Table 1*, the position of Ukraine occupies an unchanged trend in the global economic space in relation to the value of the Global Innovation Index from 2018 to 2021. Its decrease by 8 positions in 2022 is understandable, but still holding the fourth position among 36 countries of the lower-middle income economic group.

According to the innovation index of the Bloomberg Agency, Ukraine occupies a consistently low position in the ranking of innovative economies. In 2021, Ukraine occupies the 58th position out of 60 countries. Among the strengths in 2021, the existing innovation environment and the impact on employment are identified. Ukraine has quite high indicators as employment in science-intensive activities, the spread of broadband Internet (communication), spending on innovations that do not relate to research and development works, and the export of science-intensive services. At the same time, the weakest innovation dimensions concern the amount of funding and innovation support, the attractiveness of research systems, and intellectual property.

Ukraine also has weak positions according to the global index of competitiveness. The World Economic Forum classified Ukraine as one of the countries in transition from a factor-oriented economy to an efficiency-oriented economy. According to the theory of development stages according to the Global Competitiveness Index, three stages are distinguished, namely: factor-oriented economy; efficiency-oriented economy and innovation economy. According to the World Economic Forum, over the past few years, Ukraine has been classified as a transitional stage from the first stage to the second. According to the World Economic Forum, ensuring competitiveness in this situation depends on effectively functioning public and private institutions, well-developed infrastructure, a stable macroeconomic environment, and a healthy workforce. Our country has a low position in the activity of state institutions and the macroeconomic environment, which are objects of state regulation of the economy (*Volosnikova et al., 2022*).

The index of industrial competitiveness of Ukraine is an effective tool for analyzing national competitiveness. Industrial competitiveness is defined as the ability of countries to strengthen their presence on foreign and domestic markets with the simultaneous development of activities with high added value and technological level. The index of industrial competitiveness evaluates three main performance criteria of the processing industry, namely: the ability to produce and export the products of the processing industry; technological complexity of products and

exports, export quality; the impact of processing industry on world production and trade. Each indicator is weighted on a scale from 0 to 1. The position of Ukraine according to the index of industrial competitiveness for the period 2019-2021 is presented (*Table 2*) (*Industrial..., 2023; Competitive..., 2018; UNIDO's..., 2020*).

Ukraine has quite low international positions in the Industrial Production Competitiveness Index, Industrialization Intensity Index, Global Competitiveness Index, etc.

Low activity in the process of updating production facilities is also observed, the wear rate for industry in 2021 was 60.5%, for processing – 60.2%. Figure 1 shows trends in the degree of wear of fixed assets in the processing industry indicating the growing problem of the loss of technical potential of industrial complexes and the need to increase the competitiveness of technical base of the enterprises (*Statistical Yearbook..., 2023; Ukraine..., 2023*).

Recovery of fixed assets depends on investment in fixed capital. In order to master the internal and later foreign markets of machinery, machine-building enterprises need large-scale reconstruction, complete modernization of equipment and defining elements of the technical base, expansion of capacities, and mastery of new technologies for the production of competitive products. From 2019 to 2022, there is a negative trend of changes in the implementation of fixed assets (*Figure 2*), precisely the gradual further lag of Ukraine in technological increase from the developed countries of the world (*Statistical Yearbook..., 2023; Ukraine..., 2023*).

Regarding the volume of production of industrial products, in Ukraine in 2022 they decreased by 36.9%, while in 2021 an increase of 1.9% was recorded. The deterioration of the situation is observed after the start of missile attacks in 2022 on the energy infrastructure and interruptions in the supply of electricity. In those conditions, industrial enterprises temporarily stopped working or reduced production. Due to the fall in the volume of production in mechanical engineering, the amount of steel consumption in the country also decreased by 43.1%. We will consider the theoretical and methodological aspects of improving the competitiveness of machine-building, considering the extremely complex present of the country, the current state of machine-building enterprises, performance indicators, Ukraine's position on the international and domestic markets.

Concept of managing competitiveness of machine-building enterprises

Given the dynamism of the enterprise competitiveness management system, which requires constant improvement and development of its structural elements, we will present a management concept based on applying system analysis ideas based on inductive and systemic approaches (*Figure 1*).

The management concept consists of the processes of ensuring transformational reformations in the spheres of enterprise activity and a complex of mechanisms that implement management actions to ensure the appropriate level of competitiveness of machine-building enterprises, namely:

- the processes of ensuring transformational reformations in the technical and technological spheres of activity, organizational and managerial spheres, operational management, and financial and social spheres of the enterprise. The constant monitoring of the processes of ensuring transformational reformations, based on the results of the development and implementation of scientific and practical recommendations regarding the priorities of the

enterprise's development from the point of view of ensuring the appropriate level of its competitiveness in the future will ensure an increase in the efficiency of the enterprise's functioning and the achievement of high-ranking competitive advantages;

- the scientific and technical potential management, production, market, intellectual, innovative, and financial mechanisms. The application of mechanisms for managing the company's potential is determined by the need for a practical assessment of its current state and capabilities and the determination of prospective benchmarks that will ensure the company's competitive advantages in the modern operating conditions;
- the information and communication mechanism for managing the competitiveness of enterprises, which ensures the construction of a single information space regarding the production of competitive products and the level of competitive advantages of the enterprise with the property of managed transparency. The effective functioning of the information and communication mechanism provides an opportunity to have timely operational information about the current situation at the enterprise concerning the operation of the entire system, to identify critical situations and unfavorable trends on time, to influence the assessment of the situation and instantly make suggestions to the workers of various structural units in its discussion and adjustment, considering influence of internal and external environmental factors. As a result, the accuracy of management decision-making increases, communications are improved, new creative ideas appear, and the coordination of the activities of process participants improves.

Discussion

The presented conceptual principles of managing the competitiveness of machine-building enterprises will ensure the coordinated functioning of the enterprise as a single integrated system. A characteristic feature of the developed conceptual principles is their use within the information space – an information and communication mechanism.

Regarding the components of the management concept. The tasks of further research are the improvement of the theoretical and methodological foundations for the development of machine-building enterprises, considering the impact of transformations in the economic, technical-technological, organizational-management, financial, social and operational management spheres, and the development of scientific and practical recommendations regarding the priorities of their development, which will ensure the improvement of the efficiency of the enterprises and the achievement of competitive advantages. The factors influencing the transformational processes of the enterprise in today's conditions and the system for evaluating the effectiveness of transformations require a more in-depth study. This will provide an opportunity to build models of industrial enterprises on the basis of ensuring transformations by spheres of activity.

The implementation of mechanisms for managing the company's potential will contribute to the optimization of labor resources, ensuring cost management, operational control over the costs of technological materials, semi-finished products, displaying all production operations in real time in the accounting system, timely detection and analysis of negative trends, prevention of crisis situations, namely ensuring management with relevant, timely, complete information for the purpose of developing sound management decisions, etc.

Conclusions

The competitiveness management is crucial for ensuring the stability and development of machine-building enterprises. It allows enterprises to become more flexible, adapt to changes in the modern economic conditions, compete effectively on the world market, and ensure the production of high-quality, innovative products.

The applying of proposed management concept in the work of enterprises practices will allow them to form sustainable competitive advantages, instantly respond to the challenges of the external environment, and integrate into the global economic space.



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Appendix

Table 1. Positions of Ukraine in international rankings in 2018-2022

Characteristic	Period under analysis				
	2018	2019	2020	2021	2022
	Place of Ukraine in Rating				
Global Innovation Index	43 (126)	47 (129)	45 (131)	49 (132)	57 (132)
	Switzerland Netherlands Sweden	Switzerland Sweden USA	Switzerland Sweden USA	Switzerland USA United Kingdom South Korea	Switzerland USA Sweden
Bloomberg Innovation Index	46 (60)	53 (60)	56 (60)	58 (60)	-
	South Korea Sweden Singapore	South Korea Germany Finland	Germany South Korea Singapore	South Korea Singapore Sweden	-
Global Competitiveness Index	83 (140)	85 (141)	55 (63)	54 (58)	49 (180)
	USA Singapore Germany	Singapore USA Hong Kong	Singapore Denmark Switzerland	Switzerland Sweden Denmark	Sweden

Table 2. Positions of Ukraine according to index of industrial competitiveness and its components in 2019-2021

Characteristic	Period under analysis		
	2019	2020	2021
Industrial Performance Index (CIP)	ranked 68	ranked 69	ranked 69
	CIP score 0,032	CIP score 0,032	CIP score 0,033
Manufacturing value added per capita	270,9061	257,0445	265,313
Manufactured exports per capita	753,4163	767,7337	1075,4411
Impact of a country on world manufactures trade	0,0021	0,0023	0,0025
Impact of a country on world MVA	0,0009	0,0008	0,0008
Medium- and high-tech manufactured exports share in total manufactured exports	0,3511	0,3423	0,3224
Medium- and high-tech MVA share in total MVA	0,318	0,2756	0,2835
Manufactured exports share in total exports	0,6655	0,6848	0,7107
Manufacturing value added share in total GDP	0,1175	0,115	0,1139

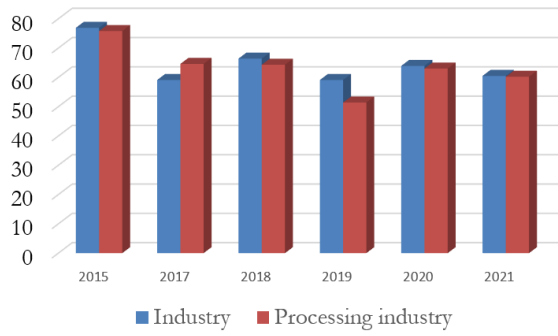


Figure 1. Fixed asset depreciation

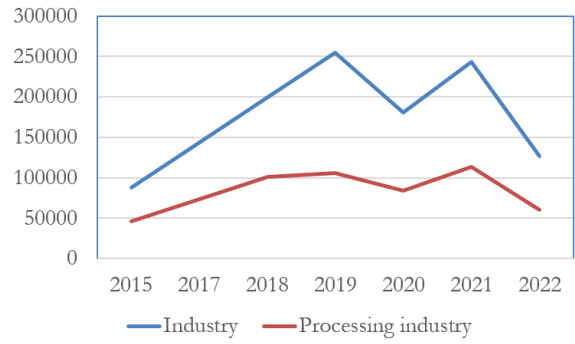


Figure 2. Trends in changes in commissioning of fixed assets

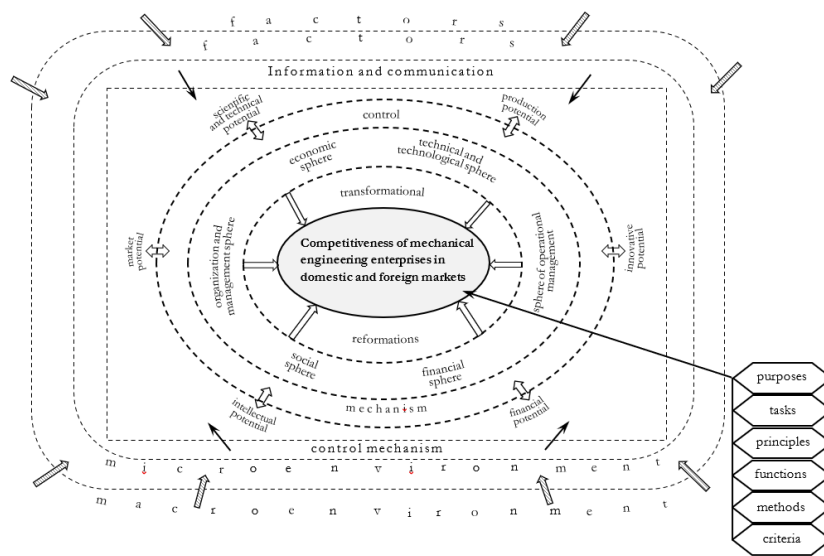


Figure 3. Concept of managing competitiveness of machine-building enterprises (Source: developed by the author)