

*Чем более точна наука, тем больше можно
из нее извлечь точных предсказаний.
А. Франс*

ЕКОНОМІКА ПІДПРИЄМСТВА ТА УПРАВЛІННЯ ВИРОБНИЦТВОМ

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TYPES OF ORGANIZATIONAL SUPPORT FOR CORPORATE INNOVATION ACTIVITY IN ENGINEERING COMPANIES

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The value of engineering as a leading industry in innovation in the country has been grounded. According to the authors, engineering brings together a large number of diverse businesses, making it impossible to use the same tools of organization of innovation at engineering enterprises of different types. A classification of engineering companies in terms of market characteristics, characteristics of the technological process and requirements to end-users has been provided. The features of innovation of each enterprise group have been determined. A principle approach to determining the type of organizational support for innovation activities of each group of enterprises has been described. Four basic types of organizational support for innovation have been defined. The features of the components of organizational support for each group of engineering enterprises have been studied.

Keywords: innovation, innovation activity, corporate management, organization, organizational support, engineering.

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ТИПИ ОРГАНІЗАЦІЙНОГО ЗАБЕЗПЕЧЕННЯ КОРПОРАТИВНОЇ ІННОВАЦІЙНОЇ ДІЯЛЬНОСТІ МАШИНОБУДІВНИХ ПІДПРИЄМСТВ

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Обґрунтовано значення машинобудування як провідної галузі інноваційної діяльності у країні. На думку авторів, машинобудування об'єднує велику кількість різномірних підприємств, що робить неможливим використання однакових інструментів організації інноваційної діяльності на машинобудівних підприємствах різних типів. Наведено класифікацію машинобудівних підприємств із точки зору особливостей їх ринків, особливостей технологічного процесу та вимог до кінцевих споживачів. Визначено особливості інноваційної діяльності

кожної із груп підприємств. Наведено принциповий підхід до визначення типу організаційного забезпечення інноваційної діяльності кожної із груп підприємств. Визначено чотири базових типи організаційного забезпечення інноваційної діяльності. Розглянуто особливості складових частин організаційного забезпечення для кожної із груп підприємств машинобудування.

Ключові слова: інновації, інноваційна діяльність, корпоративне управління, організація, організаційне забезпечення, машинобудування.

ТИПЫ ОРГАНИЗАЦИОННОГО ОБЕСПЕЧЕНИЯ
КОРПОРАТИВНОЙ ИННОВАЦИОННОЙ ДЕЯТЕЛЬНОСТИ
МАШИНОСТРОИТЕЛЬНЫХ ПРЕДПРИЯТИЙ

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Обосновано значение машиностроения как ведущей отрасли инновационной деятельности в стране. По мнению авторов, машиностроение объединяет большое количество разнородных предприятий, что делает невозможным использование одинаковых инструментов организации инновационной деятельности на машиностроительных предприятиях разных типов. Приведена классификация машиностроительных предприятий с точки зрения особенностей их рынков, особенностей технологического процесса и требований к конечным потребителям. Определены особенности инновационной деятельности каждой из групп предприятий. Приведен принципиальный подход к определению типа организационного обеспечения инновационной деятельности каждой из групп предприятий. Определены четыре базовых типа организационного обеспечения инновационной деятельности. Рассмотрены особенности составляющих организационного обеспечения для каждой из групп предприятий машиностроения.

Ключевые слова: инновации, инновационная деятельность, корпоративное управление, организация, организационное обеспечение, машиностроение.

In the modern economic system based on competition, innovation and knowledge is the basis of economic development. An industrial company acts as a primary link of both supply and demand for innovation. Engineering plays a special role in the economy through innovative development to influence the technical and technological base of other companies. Particular attention has been paid to the machine-building complex in a number of works, but its development has not been sufficiently studied.

The organization of innovation in the company has been the subject of research by many scientists such as V. Hrynova, V. Vlasenko, S. Illiashenko, R. Fatkhutdinov [1 – 3] etc., but in many cases the study of this complex function was limited to innovation management recommendations for forming or reforming organizational structures or advice on the best options for innovation at the enterprise. K. Pavitt, W. Abernathy, J. Quinn [4 – 6] developed a classification of enterprises according to the different characteristics of their innovation activity. These studies, on the one hand, do not make it possible to conclusively choose the most effective way for innovative development of machine-building enterprises, on the other hand, they prove a complex and heterogeneous structure of the industry.

These approaches don't take into account the company, its market environment and innovation potential, and narrow the concept of organization innovation, which reduces the effectiveness of the implementation of these recommendations into practice.

The research aims to develop a rational use of different types of organizational support for innovation in different groups of machine-building enterprises.

Organizational support of innovation (OSI) is a set of rules and structures that create conditions for a normal progress of innovative processes, implementation of plans; support the system at the required level by providing the necessary resources, organization of relationships between the individual elements and eliminate deviations that may occur in the system. OSI has a complex structure, where each of the parameters can act in different ways [7].

Improving OSI is an important tool for raising the effectiveness of innovation enterprises, but in the case of the engineering complex, formation of effective recommendations and borrowing practices is complicated by the heterogeneity of the industry. To study the patterns of innovation, machine building is divided into four groups depending on the characteristics of the applicable technologies, products, market type, features of consumer products (Table 1).

Table 1

Characteristics of machine-building enterprises, and peculiarities of their innovation activity

Group	Characteristics of the group	Features of innovation activity of the group	Branches of industry
1	Highly technological automated manufacturing, high requirements for qualification of manufacturing and operating personnel	The main source of innovative ideas is research and development, the introduction of a more or less significant innovation requires stopping the manufacturing process due to the high degree of automation; a close "science-production" relationship	Manufacture of electronic components and circuit boards; production of radiological, electromedical and electrotherapeutic equipment; production of tools and equipment for measuring, testing and navigation; production of clocks; manufacture of optical instruments and photographic equipment; production of computers and peripheral equipment; manufacturing of air and spacecraft, related equipment
2	Steady production technology components for industrial use; maximal universality of products	The most important are innovations for improving production and management processes, elimination of costs (materials, energy, money, time); monitoring trends in consuming industries	Manufacture of batteries and accumulators; manufacture of wires, cables and wiring devices; manufacture of magnetic and optical storage media; manufacture of electromechanical and pneumatic hand tools; manufacture of bearings, gears, mechanical transmission elements and drives; production of ovens, furnaces and furnace burners; manufacture of pumps and compressors; manufacture of taps and valves
3	Production of goods for end consumers, a large number of models, much attention is paid to the design and marketing, ease of operation, no need for special skills of users	The emphasis in innovation shifted to the consumer; a large number of design and marketing innovation	Manufacture of household appliances; production of electric lighting equipment; production of office machines and equipment, except computers and peripheral equipment; manufacture of bicycles, wheelchairs and baby carriages; production of motorcycles; manufacture of motor vehicles, trailers and semi-trailers; production of household electronic equipment for receiving, recording and reproduction of sound and pictures
4	Production of capital goods for industrial use with long term of exploitation; the need to consider customer requirements; the need for special training of the user	The need to cover all elements of the innovation cycle, from research to provision of after-sales service	Manufacture of engines and turbines, except aircraft, vehicles and motorcycle engines; production of communications equipment; manufacture of industrial cooling and ventilation equipment; manufacture of hydraulic and pneumatic equipment; production of lifting and handling equipment; manufacture of electric motors, generators, transformers, electricity distribution and control equipment; manufacture of machinery and equipment for agriculture and forestry; manufacture of railway locomotives and rolling stock; building of ships and boats; production of military vehicles; metal production machinery and machine tools

Features of each type of machine-building enterprises make it possible to justify specific forms of organizational support for innovation processes, which are the most effective in this segment (Table 2).

Table 2

Types of innovation strategy of machine-building enterprises

Group No. / Innovation potential level	Group 1	Group 2	Group 3	Group 4
High innovation potential	Aggression	Improvement	Aggression	Aggression
Middle innovation potential	Regression	Expectation	Survival	Prosperity
Low innovation potential	Agony	Stabilization	Crisis	Agony

Development of common recommendations for organizational support at various engineering companies is complicated by the specifics of the industry: companies have to deal with different types of markets, and market demands as

to the product and degree of innovation have certain features. So, several types of innovative strategies have been offered to make organizational mechanisms consistent with the overall business strategy and innovation. Depending on the type of machine-building enterprise, as defined in Table 1, and innovation capacity of enterprises, it would be appropriate to recommend a particular system of organizational support, a set of polar patterns that allow a particular company to adapt a system to its specificity. For enterprises with low innovation potential, the minimum necessary and, if possible, free and low-cost tools that, nevertheless, can activate innovation at the enterprise and simultaneously increase its innovation potential have been given. For businesses with high innovation potential the most effective tools have been recommended, which at the same time require the mobilization of a significant amount of material and human resources.

The combination of the three variants of development of the innovative potential of an enterprise and innovative expression of the three options needs can distinguish nine typical situations which may take place at an industrial enterprise. Each of the above situations corresponds to a certain innovation strategy that aims to change the situation of enterprises towards improving their own position (an increase of the innovation potential and meeting current needs). In turn, the innovation strategy defines the parameters of OSI (Table 3).

Table 3

The content of the innovation strategy and OSI of an enterprise

Type of innovation strategy	Contents of innovation strategy	Contents of components of OSI			
		Structure	Communication	Motivation	Culture
1	2	3	4	5	6
Prosperity	The purpose of the innovation strategy is to further develop the company, form an innovative potential. Developing innovative ideas may not end with the introduction as well as realization of the results on the external market of intellectual property	Appropriate selection of search as a separate unit, perhaps creating a separate structure to implement, if permanent innovation is inherent in the company. In general, temporary working groups deal with introduction. A separate unit can be created for market placement of innovation in the case of high performance of search	Defining clearly the formal structure of cooperation in the innovation sphere, creating conditions for building informal communications within the core activities	Active motivation of employees to generate and implement innovative projects that not only enhances the efficiency of the enterprise, but is also an important tool for accumulation of experience and innovation of organizational culture	It is advisable to make efforts to create innovative organizational culture and provide full management support to it
Improvement	Innovation strategy is aimed at improving innovation. The main areas of work are careful observation of market trends and rapid response to new trends	Scientific (search) work and marketing of innovations are coordinated within separate structural elements	The focus is on the formation and development of effective external informal communication, so that the effectiveness of the innovation of the company depends on its ability to receive and process the signals of the environment	Innovation motivation system covering the entire staff is set as a priority	Organizational culture (OC) with a high level of innovation is a prerequisite for the implementation of such a strategy. An important tool for boosting innovation of OC is involvement of all the staff in the generation of innovations that improve the implementation of different scale innovative projects
Aggression	The aggressive innovation strategy, usually with a claim to obtain leadership in its segment. A necessary condition is the existence of scientific and technological backlog and a strong marketing team	Scientific (search) work and marketing of innovations are coordinated within separate structural elements	Requires an efficient system of formal and informal communications. The latter requires purposeful development in the case of total or partial change of personnel (see column "Culture")	Innovation motivation system covering the entire staff is of priority	Organizational culture with a high level of innovation is a prerequisite for the implementation of this strategy. You may need rapid reform, including changes in personnel, particularly at key posts
Stabilization	Consolidation of market position by improving innovation, imitation of the best examples of market behavior, finding their own niche	Optimization of the organizational structure, regulation of innovation processes within available structures. The scope of innovation and limited financial resources make it inappropriate to create separate units. The possible formation of separate temporary working groups, including the sphere of innovations. Involving external providers in the absence of adequate specialist training and/or experience in a particular field of work	It is important to have the existing system of external and internal communications for effective improvement of a critical number of innovations	Using tangible and intangible tools to attract the maximum number of the staff to generate innovative ideas for improving products and processes at the enterprise	It is advisable to make efforts to create innovative organizational culture which displays its full support of the top-management
Survival	Ensuring the existence of the enterprise through the use of reserves (including human resources)	Optimization of the organizational structure, regulation of innovation processes within available structures. The scope of innovation and limited financial resources make it inappropriate to create separate units. Formation of separate temporary working groups, including the sphere of innovations is possible	Used primarily to inform staff about the situation in the company and the prospects of the situation, collection of innovative ideas of the staff; particularly important is the quality of vertical communications	The focus is on the immaterial tools and the use of reserves of loyalty	It is advisable to make efforts to create innovative organizational culture which is fully supported by the top-management; of particular importance is the loyalty of staff and the willingness to fight for the future

Table 3 (the end)

1	2	3	4	5	6
Regression	Innovation strategy aims to create an innovative reserve (a bank of ideas that can be used if necessary) or implement the results on the external market. Innovative activity is weakly associated with the primary one	Selection of the search activity to a special structural unit is a prerequisite for saving efficiency of the primary activity and the innovative one. You can create a separate entity for the realization of the innovative potential	Determining whether the core of the staff will stay to better times and using its potential to improve the situation of the company	The focus is on the immaterial tools and the use of the reserve of loyalty	Studying the available OC, the organization work on the basis of the results, gradual reforming, using low-cost tools
Expectation	A strategy in which the company has neither the need nor the capacity to engage in innovation activities	The strategy does not require serious structural reforms, possible changes in the regulations if the management aims to shift to another market or increase the innovation potential	It usually has no innovative content	Motivation to innovative activity is not a target one; it is possible to stimulate creativity and train personnel for further development of the company	Studying the available OC, the organization of work on the basis of the results, gradual reforming, using low-cost tools
Crisis	The main objective of general and innovative strategies is to ensure the existence of the company either by increasing the innovation capacity, or by leaving for a less innovative market sector	Reduction of units and positions with the preservation of the key personnel; the focuses is on ordering the functional of structural elements	Regulation of formal communication, development of informal internal and external communications, providing a better use of the personal potential of employees and external opportunities	A shift to non-financial incentives; additional costs for financial incentives are usually almost impossible. An option may be restructuring the pay system to increase the share of its variable part	Studying the available OC, the organization of work on the basis of the results, gradual reforming, using low-cost tools
Agony	The liquidation strategy i. e. realization of the residues of products, equipment, facilities, reducing the staff. The creation and implementation of innovative strategies is not supposed	Organizational support changes made within the main strategy, if necessary. Typically, these changes aim to reduce costs and are not associated with innovation			

On the basis of OSI types that are appropriate to different innovative strategies of engineering enterprises one can identify two ways in which approaches to the formation of organizational structures differ, which is a key component of the organizational support. Firstly, it is works on the main innovation cycle at the enterprise or involvement of external structures in the implementation of work. Secondly, it is selection of individual business units for work of the main innovation cycle and providing support to it or rejection of the formation of such structural elements.

So there are four basic types of OSI (Figure).

	With the creation of separate structural units	Without the creation of separate structural units
With the involvement of external institutions	Separate and external OSI	Separate and integral OSI
Without the involvement of external institutions	Autonomous and internal OSI	Autonomous and integral OSI

Figure. The classification of OSI types at engineering companies

Thus, a variety of engineering enterprises do not make it possible to create a single most effective system of innovation. The proposed approach takes into account the peculiarities of

the internal and external environment of the company and its innovative potential in the selection of organizational support for innovation. The study identified four basic types of organizational support for innovation of engineering enterprises. Formalizing selection criteria and analysis of the shortcomings of each type of organizational support is the subject of further research.

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RISK MANAGEMENT DESIGN OF INVESTMENT PROJECTS AT POWER GENERATION ENTERPRISES

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Electric power industry as a leading energy sector of Ukraine needs constant renewal and development. Therefore, realization of investment projects aimed at the modernization and reconstruction and at the construction of new power generation enterprises is appropriate. Since the process of project implementation is accompanied by a number of risks, in this case, a question arises as to the necessity