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INNOVATIVE ACTIVITIES OF MACHINE-BUILDING ENTERPRISES

The stages of innovation activity of the machine-building enterprise are defined: marketing, R&D, development and production, commercialization and sales. These stages are specified through separate stages of the innovation process, which contain a number of business processes. Business processes are presented in the form of protocols of innovation activity.

Keywords: enterprise, innovative activity, business processes, stages, protocol of innovation activity, machine-building.

Лохман Н. Инновационная деятельность предприятий машиностроения. Определены этапы инновационной деятельности предприятия машиностроения: маркетинг, НИОКР, освоение и производство, коммерциализация и сбыт. Эти этапы конкретизированы через отдельные стадии инновационного процесса, которые содержат ряд бизнес-процессов. Бизнес-процессы представлены в виде протоколов инновационной деятельности.

Ключевые слова: предприятие, инновационная деятельность, бизнес-процессы, этапы, протокол инновационной деятельности, машиностроение.

Background. One of the main factors in ensuring the stable economic development of our country is the innovation activity (IA) of enterprises [1, p. 33].

Machine-building as a strategically important branch of Ukraine is characterized by differentiation, polystructure, adaptability, synergy and antientropy of its structure as well as a wide range of products and active participation in the territorial and sectoral division of labor. The current state of the industry does not correspond to the goals and objectives of increasing the long-term competitiveness of the economy and the occupation of stable market niches in the world markets for science-intensive products [1].

In the difficult economic and political conditions, which Ukraine has hit, the machine-building industry, as a base for many sub-sectors of industry, including military engineering, needs innovative transformations. Implementation of the IA provides for its phased implementation: from decision-making to obtaining final results, taking into account market requirements and opportunities of the enterprise [2, p. 364].

Innovative activity is a complex process, which should be elaborated in detail and explained from the standpoint of a separate enterprise of the industry for its successful implementation. Therefore, there is a need to

clearly define the structure and clarify the content of the machine engineer's IA by means of a protocol system as a document containing mandatory actions at each of the specified stages.

Analysis of recent researches and publications. A. Kostyuk, M. Rymar, O. Zakharkin, R. Yakovenko, O. Goncharova and others were studying the enterprise's IA.

So, according to O. Zakharkin, innovation activity is a complex of measures (scientific, technological, industrial, organizational, financial and commercial), which together lead to innovations in the form of new or improved product (service) or technology of doing business [3, p. 274].

R. Yakovenko, A. Chernega believe that the IA in its entirety has complex, systematic character and covers such types of work as the search for ideas, licenses, patents, personnel, the organization of research work, engineering activities, which combines inventions, rationalization, designing, creation of engineering and technical objects, information and marketing activities [4, p. 438].

Such scientists as M. Rymar, N. Lykun define the IA of the enterprise as an activity that involves planning, organization, management, motivation and control of the object of management by developing and applying a system of strategies (selected depending on the innovation potential of the enterprise and the factors of the external environment), aimed at achieving the goal by the enterprise set before [2, p. 363].

As it can be seen from the proposed definitions, the authors treat innovation activity as a set of actions, but the very actions, their consistency and content have different interpretations.

The issue of the IA on machine-building enterprises is considered by many domestic scientists, but the directions of their research are differently vectored.

Thus, K. Zaichenko disclosed the role and place of innovation activity in the national economy; the basic statutory framework regulating innovation activity is analyzed and possible ways of improving the present situation of the IA [5] are proposed. Y. Konoval pays attention to the current state of innovation development of machine-building enterprises, including the structure of innovative activity financing, determines the share of enterprises that introduced innovations, the volume of industrial production sold, etc. [6]. M. Boyarska considered the implementation of innovative processes in the machine-building industry in Ukraine, identified the main directions of the IA and problems that hinder the innovation processes in the engineering industry of Ukraine [7]. T. Tsarova analyzed some aspects of the IA of enterprises, determined the specifics of demand for innovative technologies within the industry [8].

The results of the analysis of publications on innovation activities at the machine-building enterprises indicate the lack of research results on the issues of specification of the structure and content of the IA of an enterprise.

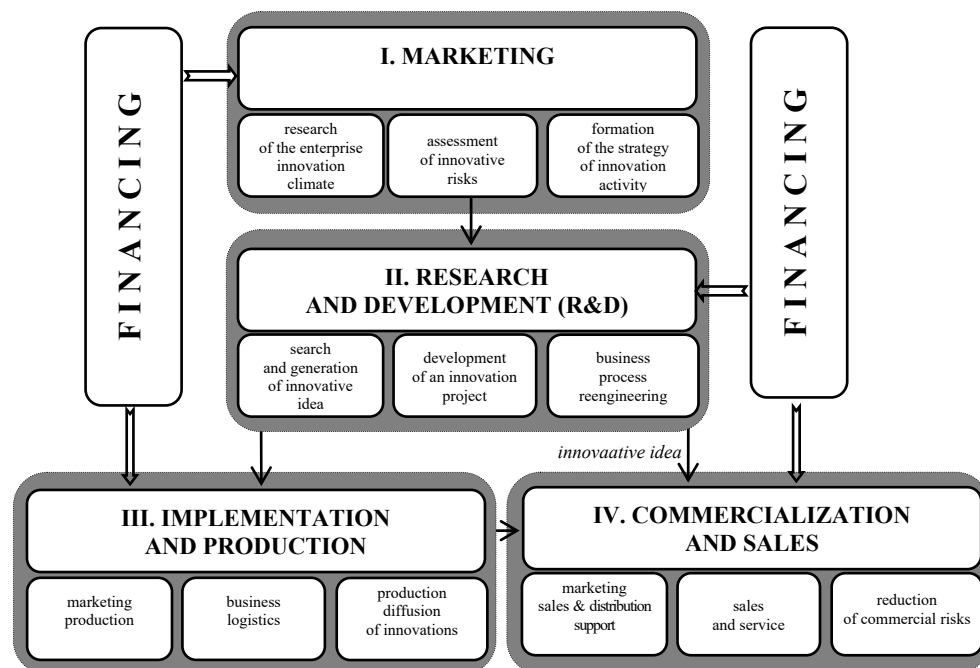
Scientists point out the conjugated (connecting) nature of the IA. However, the issues of its content are complex and inconsistent in terms of different authors, therefore, it needs special attention precisely at the enterprises of the machine-building industry and specification through the system of protocols, which determines the relevance of the research.

The **aim** of the article is the presentation of the author's vision of the structure of the IA and the specification of its content through the formation of a set of protocols of enterprise innovation.

Materials and methods. Theoretical, methodological and informational basis of the research are scientific developments of domestic scientists on the problems of the IA. The tasks have been solved using the following methods: analysis and synthesis (for substantiation of theoretical positions and practical recommendations), grouping (in the division of business processes in separate stages of innovation activity); formalization (for modeling the structure of innovation activity of the enterprise).

Results. Innovative activity involves a step-by-step implementation of the project, aimed at optimizing the process from decision-making to obtaining final results, taking into account market requirements and opportunities of the enterprise [2, p. 364].

Thus, it is advisable to carry out the IA at the machine-building enterprise on the following main stages: marketing, research and development (R&D), implementation and production, commercialization and sales (*figure*).



The structure of the innovation activity of an enterprise

Source: developed by the author based on his own research.

An integral part of all stages of the innovation process is the financing of the IA. All stages of the IA are linked and are a condition for further steps. In turn, each stage consists of individual stages containing a number of business processes (BP) that can be identified and presented in the form of protocols of innovative actions (a document in which a clear and logical sequence of business processes of the IA is recorded).

Business processes create a continuous movement within the IA of an enterprise.

Innovative activity at the machine-building enterprise should begin with marketing, namely: research of the innovative climate; assessment of innovative risks; formation of the IA strategy.

The *research report on the company's innovation climate* should include the following BP: defining the purpose of the IA; the decision to collect the necessary information (at the macro, meso, and micro-level); determination of the source and methods of information collection and processing; developing a procedure for collecting information; collection of information; processing and analysis of the collected information with the help of the determined methods; interpretation of the processed information; preparation and presentation of research results; evaluation of the effectiveness of the research of the enterprise's innovation climate (according to the criteria: relevance, reliability, completeness, relevance); making a decision on the assessment of innovative risks.

The report on *the assessment of innovative risks* should cover the following BP: definition of the goals and objectives of the assessment of innovative risks; analysis of information on the innovation climate in terms of innovation risk assessment; identification of the source of innovation risks; determination of external and internal factors of innovation risks and availability and nature of risk for implementation of IA; making a decision on the development and implementation of measures to reduce the risk (in case of unacceptable degree of risk); making decision on the formation of the IA strategy.

The content of the protocol of *formation of the strategy of innovation activity* is as follows: to form the strategic goal of innovation activity; to determine the strategic innovation position of the enterprise based on the assessment of the innovative climate and innovative risks; to formulate strategic criteria and limitations; to develop an innovative strategy of the enterprise (to define strategic alternatives; to evaluate strategic alternatives; to develop an optimal strategy); to coordinate an innovative strategy with other enterprise strategies; to approve the innovative strategy of the enterprise; to develop a mechanism for implementing an innovation strategy.

The next stage of the IA of the machine-building enterprise is R&D, which includes: the search and generation of innovative ideas; development of innovative project; reengineering of BP.

When *generating innovative ideas*, firstly, it is necessary to decide on the independence of generation of these ideas or their involvement. In the first case, the protocol will cover the following BP: to create conditions for their own search research (fundamental, applied, etc.); to provide attraction and motivation of creative staff; to determine the task of generating innovative ideas in accordance with the chosen innovation strategy; to develop a mechanism for interaction of personnel and resources; to formulate innovative ideas; to carry out analysis and selection of innovative ideas by experts; to make innovative ideas; to get ownership title on innovative ideas; to make a decision on the implementation of innovative ideas (development of an innovative project). In the second case (with the attraction of innovative ideas), the protocol will include the following BP: to provide monitoring of the market of innovations; to evaluate the possibility and feasibility of acquiring innovative ideas (patent, licenses, know-how, etc.); to evaluate the feasibility and possibility of participation in the joint venture in order to obtain innovative ideas; to evaluate the possibility and expediency of venture business development; to decide on the attraction of innovative ideas; to make a decision on the implementation of innovative ideas (development of an innovative project).

The protocol of *the development of an innovation project* includes the following BP: to define the objectives of the project; to form the structure and content of the project; to determine the necessary resources for project implementation; to draw up a budget; to determine the organizational structure of the project; to draw up a project in the form of a document; to provide feasibility of the study of the project; to form basic indicators on the effectiveness of the implementation of an innovation project; to make a decision on reengineering of BP at the enterprise.

Business processes of the protocol of *business process reengineering*: to define the concept of reengineering of BP; to define goals and tasks of the reengineering of BP; to form a team of reengineering personnel; to provide documentation of the BP (construction of graphic models of BP, timing of the components of BP operations); to conduct a comparative analysis of BP with leading BP subdivisions or competitors; to develop the image of the future enterprise; to provide analysis of problems and redesign of BP as well as technologies (identification of bottlenecks); to introduce new BP and technologies; to evaluate the results of new BCs [9, p. 82]; to make a decision on marketing production.

The R&D phase can go both into the stage of development and production of innovations (if the enterprise independently develops innovative developments), as well as into the stage of commercialization and marketing (if the enterprise considers it appropriate to assign the right of ownership to its development to other economic entities on a commercial or non-commercial basis).

The stage of development and production of innovations involves the following stages: marketing production, business logistics, production diffusion of innovations.

The protocol of the stage of *marketing production* includes such BP: to introduce and develop production technologies; to carry out an advertising campaign on the market; to determine the forecast price for an innovative product; to release a trial batch of innovative product; to research and assess the demand for an innovative product; to make a decision on the resource support of production and business logistics.

In the protocol of the stage of *business logistics* there should be such BP: to develop a production plan; to form a package of orders; to determine production costs; to make schedules for loading equipment; to draw up schedules for the regulation of the volume and structure of raw materials in time and space; to ensure the procurement and supply of raw materials; to organize maintenance of stocks of raw materials and goods [10]; to decide on the diffusion of innovation.

The protocol of *production diffusion of innovations* includes the following BP: to define production technologies; to consolidate operations for jobs; to determine the time of the production cycle; to make normative documentation concerning volumes of production; to make normative documentation on the quality of production; to start production (technological processes); to ensure quality control of production processes; to ensure quality control of the innovative product; to decide on the sales of an innovative product.

The final stage of the innovative activity of the machine-building enterprise is the commercialization and marketing of an innovative product, which includes the following stages: marketing sales & distribution support; sales and service; reduction of commercial risks.

The protocol of *marketing sales & distribution support* includes the following BP: to define the goals and objectives of the marketing support of the innovative product; to explore traditional and new markets, to identify niches for an innovative product; to distribute marketing functions among the executors at the enterprise; to develop and implement a system for promotion of an innovative product; to identify and engage the marketing channels of an innovative product; to provide control over the results of marketing support of an innovative product; to decide on the sales of an innovative product.

The sales and service protocol consists of the following BP: to develop a sales strategy; to provide focus and choice of target market; to choose sales methods; to determine the place, time and method of entering the market; to develop a service support program; to conduct pre-sale service; to make sales of innovative products; to conduct merchandising actions; to provide additional services; to carry out after-sales service; to conduct marketing audit and evaluate service activities; to decide to reduce commercial risks.

The protocol of *reduction of commercial risks* covers such BP: to identify threats to the sale of innovative products from the external and internal environment; to determine the degree of risk (estimate the possibility of the risk, assess the threat, to determine the importance of risk); to implement measures for the leveling of risks [10, p. 49]; to decide on further development of innovation activity at the enterprise.

Proposed BP protocols allow the company to have a clear algorithm for innovation. However, each machine-building enterprise may, if necessary, adjust these BPs depending on the strategic priorities.

Conclusion. Innovative activities at the present stage have a significant impact on the results of the development of the country, region, industry, enterprises. As a complex process, the innovation activity at an enterprise involves a series of interconnected stages, namely: marketing, R&D, development and production, commercialization and sales, which are specified in separate stages. The scientific novelty of the research is to determine the business processes of a particular stage of innovation, which are proposed in the form of protocols of innovative actions. Prospects for further research are laid down in the field of specification of business processes for investing in innovation.

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Лохман Н. Інноваційна діяльність підприємств машинобудування.

Постановка проблеми. Інноваційна діяльність – це складна та неоднозначна діяльність, яка має бути детально досліджена та інтерпретована з точки зору окремого машинобудівного підприємства для успішної її реалізації.

Аналіз останніх досліджень і публікацій показав відсутність результатів досліджень з питань конкретизації структури і змісту інноваційної діяльності на підприємствах машинобудування.

Метою статті є виклад авторського бачення структури інноваційної діяльності та конкретизація її змісту через формування системи протоколів як документів, що містять обов'язкові дії на кожному з етапів.

Матеріали та методи. Теоретико-методологічною та інформаційною основою дослідження є наукові розробки вітчизняних вчених з проблем інноваційної діяльності. Поставлені завдання вирішено з використанням таких методів: аналіз і синтез, групування, формалізація.

Результати дослідження. Інноваційна діяльність на машинобудівному підприємстві має складатися з основних етапів: маркетингу, досліджень та розробок, освоєння та виробництва, комерціалізації та маркетингу. Ці етапи конкретизуються через окремі стадії інноваційного процесу (дослідження інноваційного клімату, оцінка інноваційних ризиків, формування стратегії інноваційної діяльності, пошук і генерація інноваційних ідей, розробка інноваційного проекту, реінжиніринг бізнес-процесів, маркетингове виробництво, виробнича логістика, виробнича дифузія інновацій, маркетингове супроводження збуту, збут та сервісне обслуговування, зменшення комерційних ризиків).

Висновки. Усі етапи інноваційної діяльності пов'язані та є умовою здійснення подальших етапів. Кожен етап складається з окремих стадій, які містять ряд бізнес-процесів, що визначаються як протоколи інноваційних дій.

Ключові слова: підприємство, інноваційна діяльність, бізнес-процеси, етапи, протокол інноваційної діяльності, машинобудування.