

7. FUNDAMENTALS OF THE MANAGEMENT MECHANISM OF INNOVATIVE PRODUCTION COMMERCIALIZATION OF INDUSTRIAL ENTERPRISE

7.1 Theoretical and methodological principles of the management of innovative products commercialization of industrial enterprises

The commercialization of innovative products is the final stage of the innovative process, and the result of commercialization determines the economic efficiency of innovation activity. Accordingly, effective management of commercialization processes is an important component (subsystem) of the innovative management system at industrial enterprises that determines the innovative growth pace of the national economy as a whole. World experience shows that innovations and innovative activities are the most effective way of generating competitive advantages, of providing conditions for sustainable economic growth for both individual businesses and national economies as a whole. Increasing the efficiency of the innovation is one of the priorities of economic actors at different levels in the current conditions of economic transformation caused by changing economic cycles (from 5th to 6th) and the beginning of the 4th Industrial Revolution, to which is added a powerful influence of global pandemic crisis caused by COVID-19. The problem of its solution is particularly acute for domestic industrial enterprises, which lose to foreign competitors due to the inability to promptly commercialize their innovative developments that are not inferior to foreign counterparts.

It should be noted that the problem of commercialization of innovations in various spheres of economy is revealed in the scientific works of both domestic and foreign scientists. Lipkova L. and Braga D. explore methodological approaches, benchmarks, and a system of indicators for assessing the potential and effectiveness of innovation commercialization in EU countries¹. Farhan J., Kamariah I., and Nasir M. analyze the role and functions of university incubators and technology parks in the commercialization of innovations². Datta A., Reed R., and Jessup L. summarize existing approaches and develop their

¹ Lipkova L., Braga D. (2016). Measuring commercialization success of innovations in the EU. *Marketing and Management of Innovations*. n. 4. p. 15-30.

² Farhan J., Kamariah I., Nasir M. (2015). Review of Commercialization Tools: University Incubators and Technology Parks. *International Journal of Economics and Financial Issues*. n. 5. p. 223-228.

approaches to improving methods of commercialization¹. Marx M., Gans J., and Hsu D. consider a dynamic strategy for the commercialization of breakthrough technologies, highlight the features of their market launch². Hora M. And Dutta D. reveal specific features of alliances of entrepreneurial structures, analyze their impact on the success of innovation commercialization³.

Gosens J. and others analyze the features of the commercialization of biotechnologies created by the Chinese academic entities⁴. Datta A., Mukherjee D., and Jessup L. summarize the theoretical and practical aspects of commercialization of innovations, based on analysis of 194 articles in 62 scientific journals⁵. Mollick E. and Robb A. explore the role of crowdfunding in the democratization of access to capital to fund the commercialization of innovations⁶. Sløk-Madsen S., Thomas Ritter T. and Sornn-Friese H. investigate the evolution of the concept of commercialization over 30 years, propose a process-oriented concept of commercialization and set directions for its further empirical research⁷. Bashmakov A. I. and others consider an approach to comprehensive scientific, methodological, and informational support for the innovative process, covering all stages, including the creation of innovations⁸. Braga D. analyzes the processes of commercialization of innovations in EU countries, indicates the role of state stimulation of these processes⁹. Rui L. based on the analysis of the experience of 126 IT companies has developed an

¹ Datta A., Reed R., Jessup L. (2013). Commercialization of innovations: an overarching framework and research agenda. *American Journal of Business*. n. 28 (2). p. 147-191.

² Marx M., Gans J., Hsu D. (2014). Dynamic commercialization strategies for disruptive technologies: Evidence from the speech recognition industry. *Management Science*. v. 60, n. 12 Retrieved from: <http://pubsonline.informs.org/doi/abs/10.1287/mnsc.2014.2035>.

³ Hora M., Dutta D. (2013). Entrepreneurial Firms and Downstream Alliance Partnerships: Impact of Portfolio Depth and Scope on Technology Innovation and Commercialization Success. *Production and Operations Management*. v 1. n. 22(6). p. 1389–1400.

⁴ Gosens J., Hellsmark H., Kåberger T., Liu L., Sandén B., Wang S., Zhao L. (2018). The limits of academic entrepreneurship: Conflicting expectations about commercialization and innovation in China's nascent sector for advanced bio-energy technologies. *Energy Research & Social Science*. v. 37. March. p. 1–11. Retrieved from: <https://www.sciencedirect.com/science/article/pii/S2214629617302803>.

⁵ Datta A., Mukherjee D., Jessup L. (2015). Understanding commercialization of technological innovation: taking stock and moving forward. *R&D Management*. v. 45, i. 3. p. 215-316.

⁶ Mollick E., Robb A. (2016). Democratizing Innovation and Capital Access: The Role of Crowdfunding. *California Management Review*. v 58, i. 2. Retrieved from: <https://journals.sagepub.com/doi/abs/10.1525/cmr.2016.58.2.72>

⁷ Sløk-Madsen S., Thomas Ritter T., Sornn-Friese H. (2017). Commercialization in Innovation Management: Defining the Concept and a Research Agenda. *Academy of Management Proceedings*. n. 1. Retrieved from: <https://research.cbs.dk/en/publications/commercialization-in-innovation-management-defining-the-concept-a>

⁸ Bashmakov A. I., Popov V. V., Zhedyaevskii D. N., Chikichev D. N., Voyakin E. A. (2015). Generic heurithm of innovation management from generating ideas to commercialization. *European Research Studies Journal*. n. 18 (4). p. 47-56.

⁹ Braga D. (2016). Commercialization of innovation, selected aspects (European Union level). Economic, political and legal issues of international relations. Volume of Scientific Papers. Publisher: Vydavateľstvo EKONÓM. p. 56-60.

empirical model to characterize the impact of R&D investment and employee engagement on innovations commercialization efficiency¹.

Problems of commercialization of innovations are also revealed in the works of domestic scientists. In particular, Kuzmin A.E. and Kostsyk R.S. consider forms and methods of commercialization of innovative products of enterprises, form stages of realization of innovative products of machine-building enterprises as a method of commercialization of innovations². Kosenko O.P. and Balysheva V.D. consider the process of promotion of innovative products on the market and determine its features for the successful commercialization of innovations³. Malyuga L.M. performs an analysis of the concept of technology transfer and commercialization⁴.

Bogolib T.M.⁵ and Hruzdova T.V.⁶ consider the problems of commercialization of research and technological activities. Matselyuh N.P. and Demyanchuk G.V. investigate the problems of stimulating and financing the commercialization of innovations in Ukraine⁷. Chernomaziuk A.G. and Matsiuk I.R. explore the effectiveness of forms of commercialization of innovations⁸. Tsybynoga M.O., Starkova O.V., and Gnuchix L.A. consider the organizational

¹ Rui L. (2016). An Empirical Study on the Impact of R&D Investment and Employee Involvement on Innovation Commercialization: Evidence from IT Firms in China. *Journal of Modern Accounting and Auditing*. v. 12. n. 8. p. 429-442.

² Kuzmin A.E.6 Kostsyk R.S. (2013). Vybir metodiv komertsializatsii innovatsiinoi produktsii pidpriemstv. [The choice of commercialization methods of enterprises innovative products]. *Economics and state [Ekonomika ta derzhava]*. n. 9. p. 6-8.

³ Kosenko O.P., Balysheva V.D. (2013). Promotion as part of the marketing process of commercialization of innovations [Prosvannia yak skladova chastyna marketynhovoho protsesu komertsializatsii innovatsii]. *Bulletin of the National Technical University "KPI": Technical progress and production efficiency [Visnyk Natsionalnoho tekhnichnoho universytetu "KhPI": Tekhnichniy prohres ta efektyvnist vyrobnytstva.]*. n. 67(2). p. 54-62.

⁴ Malyuga L.M. (2014). Management of transfer and commercialization of innovations. [Upravlinnia transferom i komertsializatsiieiu innovatsii]. *Modern issues of economy and law. [Suchasni pyttannia ekonomiky i prava]*. n. 1. p. 47-51.

⁵ Bogolib T.M. (2014). Commercialization of universities' scientific developments [Komertsializatsiia naukovykh rozrobok universytetiv]. *Economics of Ukraine [Ekonomika Ukrainy]*. n. 1. p. 33-50.

⁶ Hruzdova T.V. (2013). Problems of commercialization of scientific and technical activities and their impact on innovation development of industrial enterprises [Problemy komertsializatsiyi rezul'tativ nauko-tekhnichnoyi diyal'nosti ta yikh vplyv na innovatsiynny rozvytok promyslovykh pidpriemstv]. *ulletin of Khmel'nitsky National University. Economic sciences [Visnyk Khmel'nyts'koho natsional'noho universytetu. Ekonomichni nauky]*. v. 2., n. 3. p. 59– 62.

⁷ Matselyuh N.P., Demyanchuk G.V. (2014). Financing and stimulation of innovations' commercialization in Ukraine: problems and solutions [Finansuvannya ta stymulyuvannya komertsializatsiyi innovatsiy v Ukraini: problemy i shlyakhy vyrishennya]. *Science and innovations [Nauka ta innovatsiyi]*. n. 3. p. 69-79.

⁸ Chernomaziuk A.G., Matsiuk I.R. (2015). Efficiency forms and methods of innovation commercialization [Efektyvnist' form i metodiv komertsializatsiyi novovveden']. *conomic sciences [Visnyk Khmel'nyts'koho natsional'noho universytetu. Ekonomichni nauky]*. v. 2. n. 2, p. 158-161.

mechanism of commercialization of innovations¹. Melnyk Yu., Sager L., and Sygyda L. explore the ways and strategies of commercializing innovative products, depending on their type². Butko M.P. and Popelo O.V.³ identify the main ways to commercialize innovative developments. In collective monographs, edited by Illiashenko S.M. and Bilovodska O.A.^{4,5}, the theoretical, methodological and methodological aspects of commercialization as the final stage of innovation activity are highlighted.

Melnyk Yu., Sager L., and Sygyda L. emphasize that innovative products can be implemented depending on the form (material or immaterial), the specificity and essence of innovative products (product or process innovation) in the following markets: intellectual property market; industrial market; product market (see Fig. 7.1). Thus, in the process of converting an idea to a finished product, innovation as an object of commercialization migrates through all three types of markets.

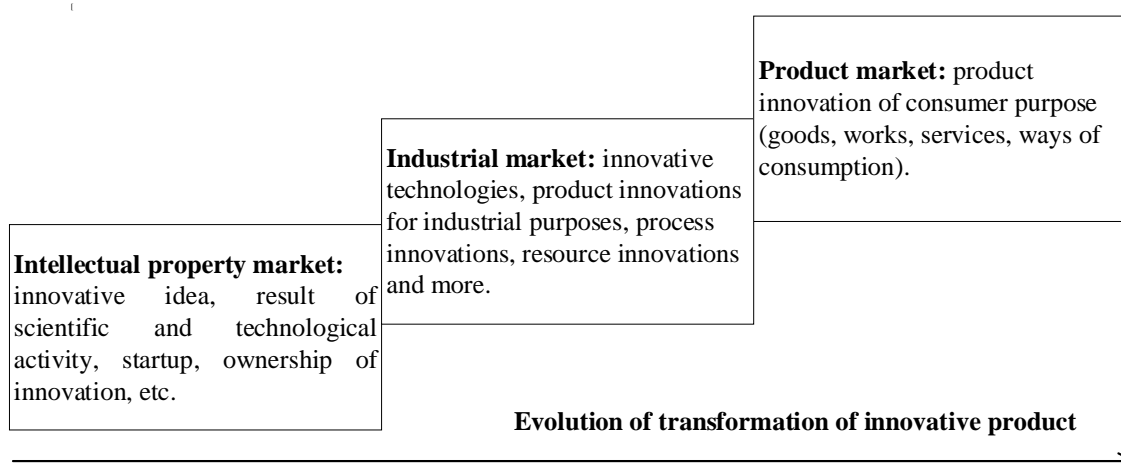


Fig. 7.1. Market vector of innovative products as an object of commercialization

On this basis, Melnyk Yu., Sager L., and Sygyda L. propose a set of

¹ Tsybynoga M.O., Starkova O.V., and Gnuchix L.A. (2011). The organizational mechanism of procedure commercialization innovations [Orhanizatsiynny mekhanizm protsedury komertsializatsiyi innovatsiy]. Information processing systems [Systemy obrobky informatsiyi]. n. 2. p. 273-276.

² Melnyk Yu.M., Sager L.Yu., Sygyda L.O. (2019). Theoretical aspects of strategies forming for innovative products commercialization. Odessa National University Herald. No 1 (74), pp 69-73.

³ Butko M.P. and Popelo O.V. (2015). Commercialization of the results of scientific and technological activities under integration processes deepening [Komertsializatsiya rezul'tativ naukovykh i tekhnichnykh diyal'nosti v umovakh pohlyblennya intehratsiynnykh protsesiv]. Problems and prospects of economy and management [Problems and prospects of economy and management]. № 1. C. 7-20.

⁴ Tools and methods for commercialization of innovative products [Instrumenty ta metody komertsializatsii innovatsiinoi produktsii]. (2018). S.M. Illiashenko, O.A. Bilovodska (Ed.). Sumy: Trytoriya.

⁵ Management of commercialization of innovative products [Upravlinnia komertsializatsiieiu innovatsiinoi produktsii]. (2019). S.M. Illiashenko, O.A. Bilovodska (Ed.). Sumy: Trytoriya.

strategic alternatives (see Fig. 7.2) for the commercialization of innovative products.

		Commercialization		
		Zero level	First level	Double
Market	Intellectual property objects	Scientific commercialization strategy is focused on the commercialization of the results of scientific activity, the product of which is the innovative ideas of stakeholders. The target audience may be research organizations, venture capital firms, investors, and more. The strategic concept is the foundation of innovative ideas.	Rapid commercialization the strategy involves the commercialization of innovative development rights created for the needs of one's own enterprise, but the objective factors have created the opportunity to generate rapid profits through the sale of intellectual innovative products to other entities. The strategic concept is to spread innovation in the industry.	Deep commercialization strategy involves the use of innovative products to create the latest progressive developments that can be implemented in the international market for intellectual property. A strategic concept is an innovative breakthrough (scientific or technological).
	Industrial	“Alienation” commercialization strategy involves the alienation of the right to an innovative idea by the subjects of the industrial purpose market. As a rule, these are innovative developments of scientific and technical nature, created not for their own use, but for-profit through alienation in the industrial market. The strategic concept is to strengthen scientific, technological, industrial, and innovation potential.	Internal commercialization strategy involves the creation of an innovative idea in the enterprise and its implementation in production or organizational processes, which allows gaining both commercial and non-commercial effect. improve working conditions.	Developmental commercialization strategy is the creation of innovative products for industrial purposes on the basis of both material (resources, technological lines, etc.) and immaterial (acquired patents, technologies, etc.) innovative products. Such a strategy requires considerable financial investment, and characterized by a high-risk level, but also involves high profits. The strategic concept is to create a competitive economy
	Product	Not applicable	Diffuse commercialization strategy is the implementation of the idea of innovation through the process of production into finished products and the realization of consumer product innovations to end consumers in the market of the products. The strategic concept is the creation of radical innovations, industry leadership.	Competitive commercialization strategy involves the use of innovative products (ideas, resources, production facilities, etc.) to create innovative products targeted at the mass consumer. A strategy can be used for both radical innovations and improvement, characterized by high competitiveness and mass coverage (for example, mobile phones).

Fig. 7.2. Strategic alternatives to the commercialization of innovative products (developed by the authors on the basis of ¹)

In general, we consider that the process of commercialization involves the formulation of an adequate strategy, which: is built in the conditions of the unpredictability of events; must be linked to market prospects; takes into account the phased deployment of activities, the presence of intermediate goals at each stage, and links these stages and goals to the sole basis for decision-making; takes into account the real availability of resources and the potential opportunities to obtain them.

¹ Melnyk Yu.M., Sager L.Yu., Sygyda L.O. Theoretical aspects of strategies forming for innovative products commercialization. Odessa National University Herald. 2019. No 1 (74), pp 69-73.

Summarizing the literature review, it should be noted that the existing domestic developments in the management of commercialization are fragmental, and the direct application of the development of foreign authors without an appropriate adaptation is problematic and discredit the idea of innovative acceleration. The specific features of the Ukrainian economy require the creation of an original mechanism for managing the commercialization of innovative products (undoubtedly, taking into account foreign experience) and adapted to domestic conditions. This research is focused on this.

Summarizing the results of publications on the analyzed problem subject (see above), we can conclude that the organizational and economic mechanism of commercialization of innovative products of industrial enterprises (OEMCIPIE) should include key components shown in Fig. 7.3. Consider these components in more detail.

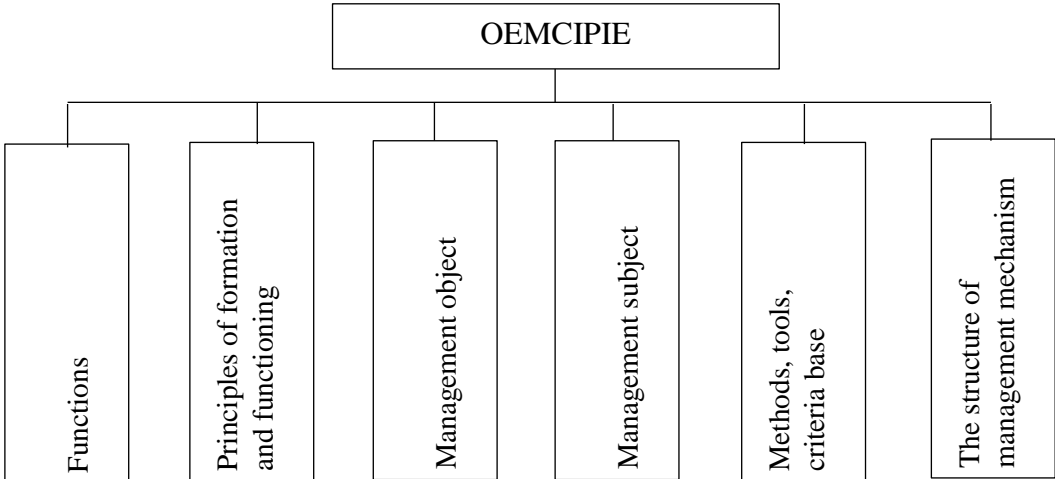


Fig. 7.3. OEMCIPIE components (author’s development)

The analysis of the essence of the commercialization of innovations allowed us to identify two main groups of its functions.

1. The orientation of innovative activity of the enterprise on the creation of perspective innovations which are directed on the solution of current and predicted problems of actual and potential consumers. At the same time, created innovations must solve the problems of the enterprises-innovators: alignment of internal opportunities (innovative development potential) to external ones, which are generated by the market. That is functions that are associated with the creation and production of innovations that have a high chance of being commercialized.
2. Formation and stimulation of demand for innovation, promotion of

innovations in the market, monitoring analysis of market trends (to respond to changes in external macro– and microenvironment), i.e. functions that are directly related to the commercialization of innovations.

Many scientists and experts practitioners consider only the second set of functions. However, the experience of the world leaders of innovative growth^{1, 2} shows that the success of commercialization is based on the stage of idea generation and development of the concept of innovation, which should, as far as possible, take into account consumer requests (consumer problems) or form those requests (for radical innovations).

Based on a systematic analysis and generalization of approaches presented by the co-authors of collective monographs^{3, 4, 5, 6, 7} the system of principles of formation and functioning of OEMCIPIE is formed (see Table 7.1).

The subject of management are strategies of commercialization of innovative products of industrial enterprise. Innovative process options and their respective strategies for the commercialization of innovative products are proposed to be identified depending on the completeness of the innovation cycle phases.

Figure 7.4 shows the options for the innovative process. They are detailed in Table 7.2. Table 7.2 shows the innovative strategies of the enterprise, as well as strategies for the commercialization of innovative products, corresponding to the selected options of the innovation process.

¹ Golysheva I.O., Gryshchenko O.F., Illiashenko N.S. The classification of the strategic directions of company's scientific and technological development. Bulletin of the Khmelnytsky National University. 2018. n. v.2. p. 128-131.

² Illiashenko N.S, Gryshchenko O.F, Golysheva I.O., Makarenko Ye.V. (2018). Practical aspects of successful international companies on the example of advanced development of Asian Tigers countries [Praktychni aspekty diialnosti uspishnykh mizhnarodnykh kompanii na prykladi vyperedzhalnoho rozvytku krain «aziiski tyhry»]. Advance innovative development: theory, methodology, practice [Vyperedzhaiuchy innovatsiyni rozvytok: teoriia, metodyka, praktyka]. N.S. Illiyashenko (Ed.). Sumy: Trytoriya.

³ Problems and prospects of market-oriented management of innovative development [Problemy i perspektyvy rynkovo-orientovanoho upravlinnia innovatsiynym rozvytkom]. (2011). S.M. Illiashenko (Ed.). Sumy: TOV “TD “Papyrus”.

⁴ Marketing aspects of innovative development management [Marketynhovi aspekty upravlinnya innovatsiynym rozvytkom]. (2014). S.M. Illiashenko (Ed.). Sumy: TOV “TD “Papyrus”.

⁵ Market-oriented management of innovative development [Rynkovo-orientovane upravlinnya innovatsiynym rozvytkom]. (2015). S.M. Illiashenko (Ed.). Kharkiv: Disa plus.

⁶ Managing economic growth: marketing, management, and innovations (2016). S.M. Illiashenko, W. Strielkowski (Eds.). 1st edition. Prague: Institute for Qualification Enhancement.

⁷ Innovative management: theoretical, methodical, and applied grounds. (2018). S.M. Illiashenko, W. Strielkowski (eds.). 1st edition, Prague: Institute for Qualification Enhancement.

Table 7.1. A system of principles of OEMCIPIE formation and functioning
(author's development)

Principles	Details
Systematicity	OEMCIPIE is a complex open adaptive dynamic probabilistic system characterized by the following: the presence of subsystems and their elements with complex interconnections; self-supporting exchange of information and knowledge between the subsystems of the mechanism and the external environment; constant changes of place and role of its subsystems and elements depending on changes of conditions of functioning; taking into account the factors of incomplete certainty caused by the need to make sufficiently substantiated decisions under conditions, incomplete, inaccurate and contradictory information regarding the subject matter of the decision and its possible consequences.
Focus on innovative development	Managerial decisions are based on the understanding that innovations are the source of formation, enhancement, and realization of competitive advantages that are capable of ensuring sustainable economic growth.
Continuity of creation and implementation of innovations	Understanding that innovations and innovative activities enable to respond to changing external and internal environment, to occupy and to strengthen position in target markets.
Knowledge orientation as a basis for innovative decision-making	Managing the processes of producing and commercializing new knowledge regarding the following aspects: trends in the product markets of an industry (or related industries); trends in the development of scientific and technological progress (STP) in the industry (or related industries); a level of innovative development potential (IDP) of the enterprise; STP trends. This knowledge transfers into new products and technologies for its production, new management methods, etc.
Balance of interests of actors of the commercialization process	The commercialization of innovations should benefit all involved actors of the innovative process (at least not to be at odds with their interests): economic counterparties and contact audiences.
Orientation to solving customer problems	Innovative developments should focus not on meeting the needs of consumers, but mostly on finding ways to solve their problems: existing or future.
A comprehensive evaluation of commercialization effectiveness	Provides a multi-criteria comprehensive evaluation of the innovations' commercialization project, in particular by the following indicators: financial; project risks; strategic value; satisfaction of interests of owners, managers, employees of the enterprise, and in some cases, society in general, etc.
Responsiveness to innovation culture	The commercialization project should be consistent with the innovative culture of the analyzed enterprise and the innovative culture of the society (in the target markets).
Alternativeness	Decisions are not made until all commercialization options have been considered.

Management activities of innovative product commercialization involve the choice of the innovation process type and innovative strategy, which most closely match the specifics and conditions of activity of a particular enterprise, as well as the definition of the commercialization strategy. As follows from the analysis of Fig. 7.4 and Table 7.2, the determination of the commercialization strategy of innovations is carried out taking into account the scale of activity of the enterprise (small, medium, large) and its potential of innovative development. The analysis of the potential of innovative development of the

enterprise should be carried out by its components¹:

- a market component that characterizes the availability of consumer requests for innovative products of the analyzed enterprise, or the ability to form them (for radical innovations);

- an innovative component, which characterizes the ability of the personnel of the analyzed enterprise to transform the latest achievements of science and technology in products that can satisfy existing and future customer requests;

- a production and marketing component, which characterizes the technical ability and economic feasibility to manufacture and promote innovative products.

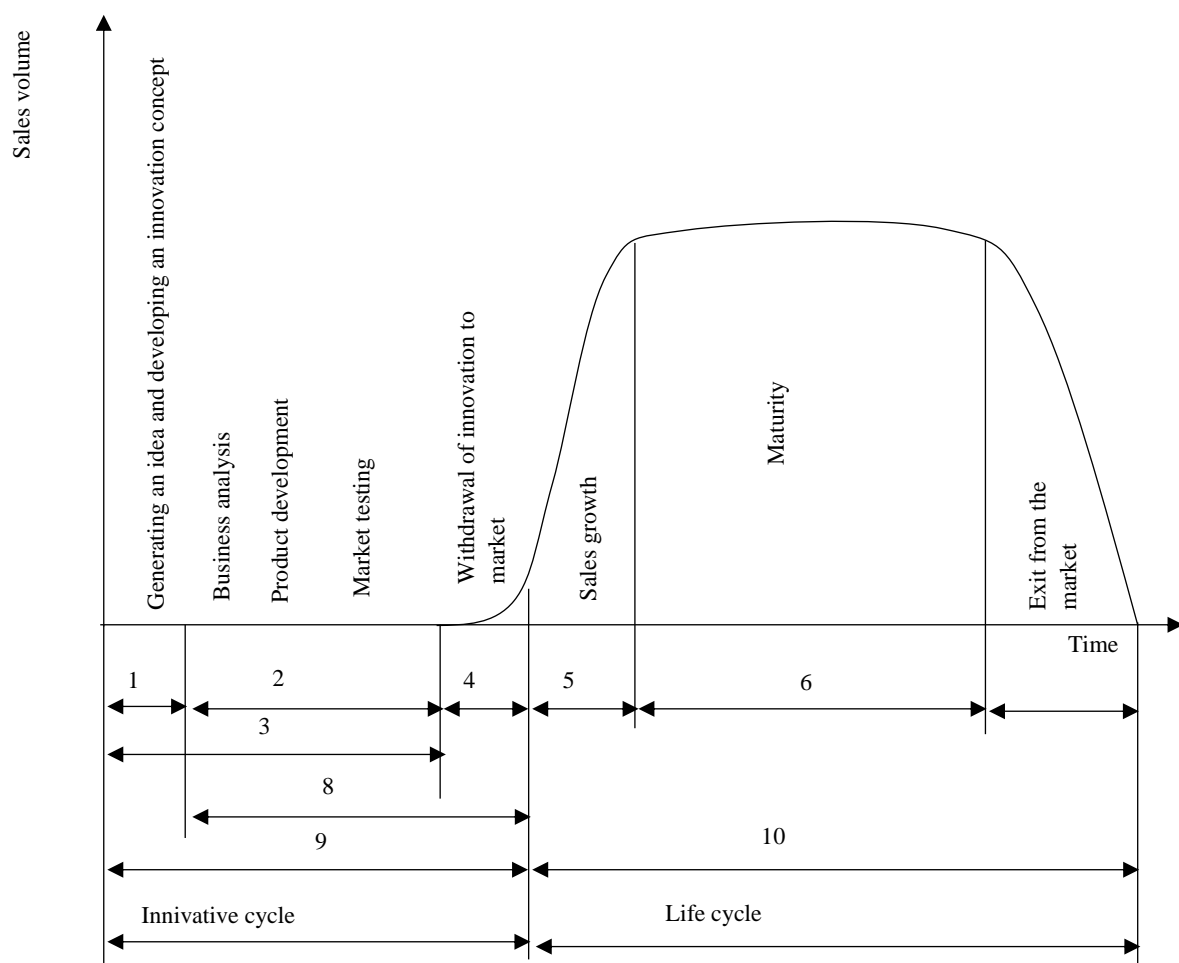


Fig. 7.4. The variations of innovative process ²

¹ Shypulina Yu.S. (2006). Indicators, criteria and methods of diagnostics of innovative potential of industrial enterprise [Indicators, criteria and methods of diagnostics of innovative potential of industrial enterprise]. Marketing and management of innovative development [Marketing and management of innovative development]. S.M. Illiashenko (Ed.). Sumy: VTD "Universytetska knyha".

² Illiashenko S.M. Innovative process rational choice grounding in organization. Marketing and Management of Innovations. 2015. n. 2. p. 11-20.

Table 7.2. Correspondence of innovative strategies and innovation commercialization strategies¹ (modified by the authors)

Strategy number and name (see Figure 2)	The size of the enterprise	The essence and content of innovation commercialization strategies
5, nicher	Small	Improvement (modification) of innovation, promotion of modifications to the market
6, traditional (protective)	Medium, large	Deployment of production and sale of innovative products analogs
7, nicher	Small	Modification of the product to the needs of outsiders, sale of modifications
10, protective	Medium, large	Improvement (modification) of innovation, deployment of production and sale of innovative products analogs
2, imitative	Small	Purchasing a patent, creating an innovation based on it, developing a technology for its manufacture, selling a license for manufacturing the innovation
4, imitative	Small	Purchase a license, manufacturing, and promotion the innovation on the market
8, imitative	Medium, large	Purchasing a patent, creating an innovation based on it, developing a technology for its manufacturing, production of innovation and promotion it on the market
1, licensing	Small	Generating the idea of innovation, patenting a technological or/ and technical solution, and selling a patent
3, licensing	Small	Generating the idea of innovation, creating an innovation, developing a technology for its manufacturing, selling a license for manufacturing the innovation
9, offensive	Medium, large	Generating the idea of innovation, creating an innovation, developing a technology for its manufacturing, production of innovation and promotion it on the market

The subject of managerial activities is the enterprise's management and organizational units.

7.2 Methodical principles of management of innovative products commercialization of industrial enterprise

We consider the methodological toolkit of commercialization management taking into account two main groups of its functions. The first group performs the task of marketing justification of the characteristics of the created innovations from the standpoint of solving them existing and future consumers' (or enterprises', or industry's, or related industries') requests. The second group performs the task of marketing support for the promotion of innovations.

¹ Illiashenko S.M., Shypulina Yu.S., Illiashenko N.S. (2020). Management of commercialization of enterprise innovative products [Upravlinnya komertsializatsiyeyu innovatsiyanoi produktsiyi pidpnyemstva]. Proceedings from: Vseukrayins'ka internet-konferentsiya «Ekonomichna kibernetyka: doslidzhennya, rozrobka i vykorystannya modeley ekonomichnoyi povedinky sub'yektiv hospodaryuvannya» – All-Ukrainian Internet Conference "Economic Cybernetics: Research, Development and Use of Economic Behavior Models of Business Entities" (p. 185-189). Dnipro: NMetAU.

Next, the toolkit features for solving the above problems will consider.

1. Developing a market-oriented concept of an innovative product as a prerequisite for the success of commercialization activities. It is performed based on the knowledge given in Table. 7.3. The methods (methodical tools) for obtaining these complexes of knowledge are indicated.

Table 7.3. Types of knowledge based on which managerial decisions are made to determine the concept of an innovative product and its characteristics, as well as methodological approaches to their developing (author's development)

Types of knowledge	Methodical principles of knowledge acquisition
Trends in the markets where the enterprise operates or in the related industries	Traditional market research tools, as well as methods for forecasting future developments ¹
STP trends in the markets where the enterprise operates or in the related industries	Expert assessments, such as the author's method ²
Innovative development potential of the enterprise	Methods for assessing the potential of an enterprise's innovative development ³
Problems of consumers (in the markets where the enterprise operates or in the related industries)	An approach to the analysis of consumer problems ⁴

The knowledge in Table 7.3 is the basis for developing the concept of an innovative product. To enhance the validity of relevant innovative solutions, it seems appropriate to use formalized methods (see Table 7.4).

In general, the following complexes of analytical work are performed to develop the concept of an innovative product of the enterprise: enterprise's market positions analysis; market trends analysis; industry's (or related industries) STP trends analysis; analysis of customers' problems on the industry of the enterprise (or related industries) and determination the strategies to overcome them; analysis of market opportunities for innovative development of

¹ Illiashenko N.S., Rosohataya A.S. (2011). Trendwatching as the tool of definition of strategic directions of development [Trendvotchinih yak instrument vyznachennia stratehichnykh napriamkiv rozvytku]. Marketing and management of innovations [Marketynh i menedzhment innovatsiy]. n 1. p. 29–35.

² Illiashenko S.M. (2010). Conceptual bases of marketing forecasting of strategic directions of scientific and technological innovative development of Ukraine on the basis of expert evaluations [Conceptual bases of marketing forecasting of strategic directions of scientific and technological innovative development of Ukraine on the basis of expert evaluations]. Bulletin of Lviv Polytechnic National University. Problems of economy and management [Bulletin of Lviv Polytechnic National University. Problems of economy and management]. n. 668. p. 68-74.

³ Shypulina Yu.S. (2006). Indicators, criteria and methods of diagnostics of innovative potential of industrial enterprise [Indicators, criteria and methods of diagnostics of innovative potential of industrial enterprise]. Marketing and management of innovative development [Marketing and management of innovative development]. S.M. Illiashenko (Ed.). Sumy: VTD "Universytetska knyha".

⁴ Doron Adam (2018). Are You Solving Your Customers' Real Problems? Here's How To Find Out. <https://www.forbes.com/sites/forbesncouncil/2018/02/21/are-you-solving-your-customers-real-pr>

the enterprise (SWOT, GAP, etc.); development of innovative product concept; business analysis and development of a marketing program to promote the innovations on the market (i.e., expected characteristics are defined in the concept); assessment the implementation prospects at a particular enterprise.

Table 7.4. Methods for developing innovative product concepts (modified and supplemented on the basis of¹)

The name and the essence of the method	Field of application	Advantages	Disadvantages
Prototype Improvement. Identification of the prototype shortcomings (prototype = the best market sample) and identify the ways to improve the prototype.	Improvement of existing products: improvement of their design, functional characteristics, economic characteristics, etc.	The relative simplicity of imitation of a product known to consumers (if the prototype is in demand then modification is in demand too).	The product is not always subject to improvement, minor improvements can lead to a loss of competitiveness.
Brainstorming Generating a group of ideas to solve a problem (critique of ideas is forbidden), after generating all ideas are evaluated.	To solve a problem as many ideas as possible are generated in short time frames.	Responsiveness; increasing the chances of finding a viable solution; multidimensional analysis of the problem.	The quality of an idea is almost independent of the search term; the obtained results require further investigation
Synectics The orientation of spontaneous intelligence activity of a group of experts (with the help of different kinds of analogies) to analyze and to solve the problem	Find the general solution of the problem	Allows you to overcome the bias of developers and solve problems in unconventional ways	It requires an experienced and strong manager, careful selection of specialists and their prior training
Deadlock situations elimination The search for new options for solutions when traditional have failed	Solution of a complex, non-traditional, large-scale problems in traditional search frames.	It allows for solving problems in situations when there is no acceptable solution.	Difficulties with access to search directions beyond the expertise, experience, traditions of developers.
Morphological maps Expanding the search area to solve the problem	Finding solutions to new problems	It allows to quickly generate several alternatives and find the best solution.	Requires the experience of developers and their knowledge of the problem structure.

Based on the above, an integrated graphical information model of developing the concept of an innovative product is proposed. It is presented in Fig. 7.5. The concept of an innovative product should include: defining its usefulness for the innovator, the consumer (ideally – for all subjects of the innovation process); description of the main characteristics (name, price,

¹ Jones J.K. (1986). Design methods [Metody proyektirovaniya]. Moskva: Mir.

specifications, etc.); a system of marketing activities aimed at enhancing consumer appeal of innovation, etc. The blocks of decision-making are indicated by figures in Fig. 7.5.

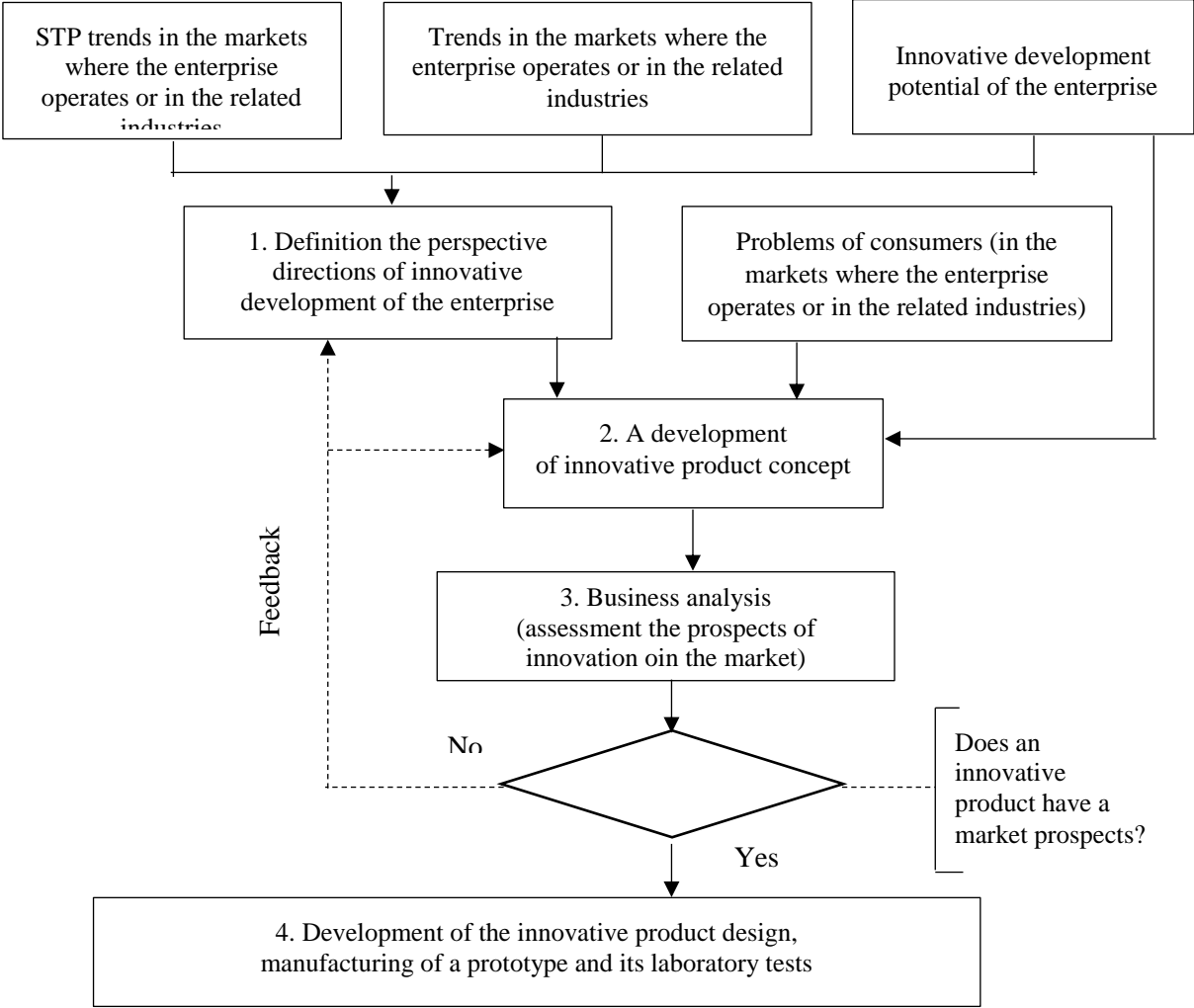


Fig. 7.5. The graphic information model of innovative product concept development (author’s development)

2. Commercialization of innovative products of industrial enterprises (choice of commercialization strategies).

Taking into account the deliverables outlined in paragraphs 1 and 2.1, the algorithm for managing the commercialization of innovative products of the industrial enterprise was developed (see Fig. 7.6). It reflects the sequence and content of decision-making procedures, the types of information on which they are made, the criteria for decision-making, the reference to the methods of calculating the performance indicators.

Next, consider the main stages of the commercialization algorithm in detail.

1. The adequacy of the level of each component of the innovative development potential of industrial enterprise is performed according to the method of one of the authors¹. The evaluation is performed for a specific innovative project, which involves the creation and promotion of product innovations. It is based on the deliverables described in paragraph 2.1 (see Fig. 7.5, Block 4).

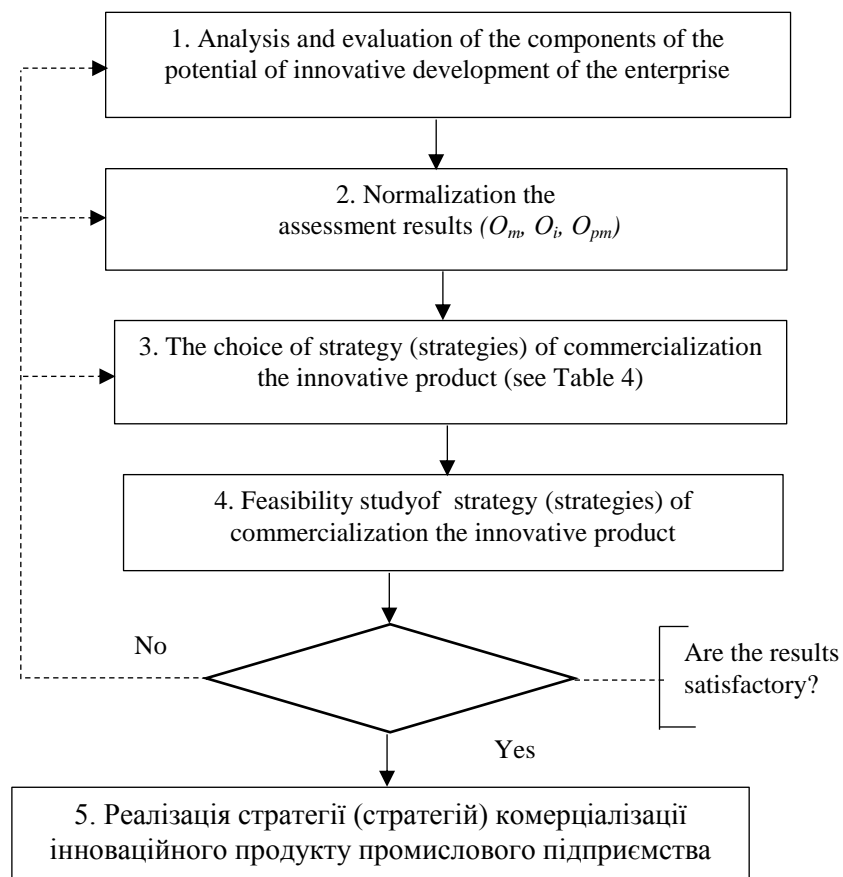


Fig. 7.6. The algorithm for managing the commercialization of innovative products of industrial enterprises (author's development)

2. Normalization the assessment results is performed according to the following:

- the estimate (O_i) of the relevant component is assumed to be 1 if the level

¹ Shypulina Yu.S. (2006). Indicators, criteria and methods of diagnostics of innovative potential of industrial enterprise [Indicators, criteria and methods of diagnostics of innovative potential of industrial enterprise]. Marketing and management of innovative development [Marketing and management of innovative development]. S.M. Illiashenko (Ed.). Sumy: VTD "Universytetska knyha".

of the component is sufficient;

– the estimate (O_i) of the relevant component is assumed to be 0 if the level of the component is insufficient.

3. The choice of a particular strategy for the innovative product commercialization is performed following the recommendations of Table. 7.5.

Table 7.5. Commercialization strategy selection table¹
(modified by the authors)

The innovation's novelty degree	The estimates of each subsystem's component of the innovative development potential of an industrial enterprise, respectively: O_m, O_i, O_{pm}							
	1, 1, 1	1, 1, 0	1, 0, 1	0, 1, 1	1, 0, 0	0, 1, 0	0, 0, 1	0, 0, 0
Radical	9	2, 3	8		4	1		
Improving, modifying	5		6	7, 10				

Table 7.5 shows the normalized estimates of the market (O_m), innovative (O_i), production, and marketing components (potentials-subsystems) (O_{pm}) of the innovative development potential of the analyzed industrial enterprise. The cells of Table 7.5 indicate the numbers of variants of the innovative process according to Fig. 7.4 and Table 7.1. For the convenience of use, Table 7.5 highlights the strategies of commercialization: separately radical and improving / modifying innovations.

4. Technical and economic analysis of the technical capacity and economic feasibility of implementing the selected commercialization strategy (strategies) is performed by standard methods. According to its results, the following options possible:

– to start the process of implementation of the selected variant of the innovative process (see Fig. 7.4) and the corresponding commercialization strategy (see Table 7.5) for the innovative production of the analyzed industrial enterprise envisaged by the innovative project (in case of positive results of the analysis);

– to move (in case of negative results of the analysis) to the previous blocks to make necessary adjustments to the innovative project and repeat these procedures.

Summarizing the above, it should be noted that the authors have developed a methodological approach to step-by-step management (according to

¹ Illiashenko S.M. Innovative process rational choice grounding in organization. Marketing and Management of Innovations. 2015. n. 2. p. 11-20.

formalized procedures) of commercialization of innovative products of the enterprise:

1) development of the concept of an innovative product, which is highly likely to gain market success;

2) control of the selection of strategies for commercialization of innovative product of industrial enterprise.

Practical testing of the proposed approach in small and medium-sized industrial enterprises producing machinery and equipment confirmed its effectiveness in managing the innovative process at the stage of selection of strategies for commercialization of product innovations.

The obtained results allow us to proceed to the formation of theoretical and methodological foundations of organizational and economic mechanisms for managing the commercialization of innovative products of an industrial enterprise.

7.3 The structure and features of formation and functioning of the organizational and economic mechanism of commercialization of innovative products of industrial enterprises

Based on the deliverables of paragraphs 7.1-7.2, the conceptual diagram of the organizational and economic mechanism of the commercialization of innovative products of industrial enterprises (OEMCIPIE) is presented in Figure 5. The arrows in the diagram show the flows of information and knowledge that underlie the relevant management decisions. Bold arrows show the direction of management effects on the internal components of ensuring the market success of strategies of commercialization of innovative products (creation of innovations and development of strategies of their commercialization); the influence of the commercialization strategy on the external micro-environment (implementation of strategies).

Interaction of blocks 1, 2, 4 implements the OEMCIPIE functions, which are oriented to the process of creating and manufacturing innovations to solve actual and potential consumer problems (see Paragraph 1). Such innovations have a high chance of being successfully commercialized.

Interaction of blocks 1, 3, 4 implements the OEMCIPIE functions, which are oriented to the commercialization of innovative products: the formation of a

communication system and stimulation of demand, as well as the formation of a marketing system and the implementation of innovation. The procedures of the commercialization system are formed depending on the chosen variant of its strategy (see section 2).

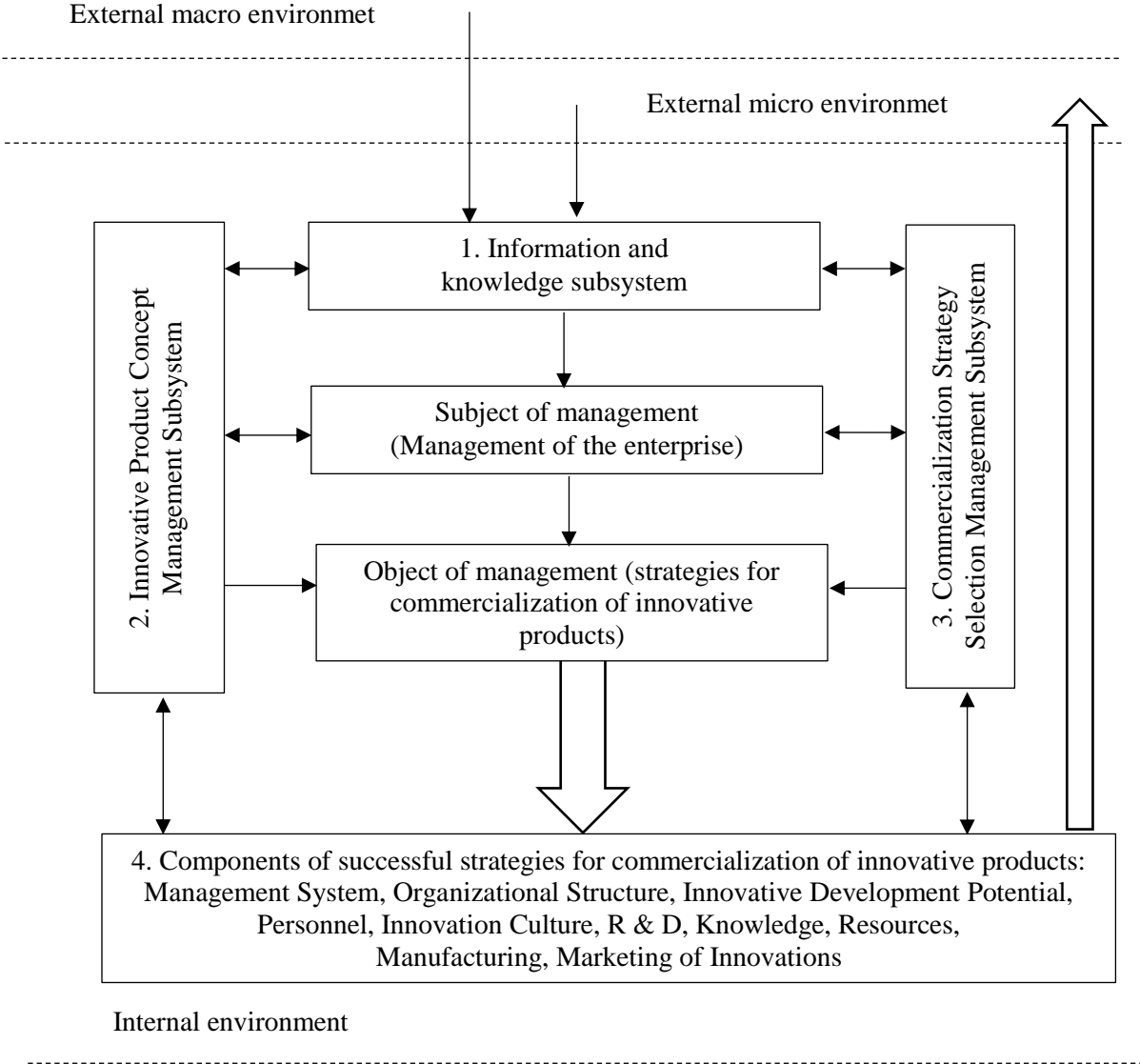


Fig. 7.7. OEMCIPIE scheme (author’s development)

Block 4 (see Fig. 7.7) outlines the main components of an enterprise system, the impact of which ensures the effectiveness of industrial enterprise innovative product commercialization strategies. Next, we consider them in more detail from the standpoint of ensuring the effectiveness of the commercialization strategies management:

1. Management system. Managerial activities should address to the

following: rationalization of organizational structure; providing a dynamic and flexible response to changes in dynamic conditions, programming and change management; risk management; formation of an effective communication system (direct and feedback connections); improving the efficiency of the motivation system; ensuring effective control of management decisions implementation, etc.

2. Innovative development potential. Management actions should be aimed at ensuring a high level of its constituent subsystems and their elements. It is recommended to develop a system of appropriate measures based on the results of diagnostics of their condition and assessment of adequacy or insufficiency for the implementation of specific innovative projects¹.

3. Personnel. Managerial activities should be aimed at improving the level of skills, knowledge, creativity of staff, ensuring its rational age and gender structure, psychological compatibility, etc.

4. Innovative culture. Innovative culture management should be directed to the following: ensuring a high degree of support of individual employees, groups of employees (units) and the enterprise as a whole to innovations, readiness to transform them into new products, technologies, managerial decisions, etc.; motivation of creative activities, ensuring creativity, legal protection of copyright, etc.; promotion of the creative potential of the staff, continuous learning, and self-improvement, etc.

5. R&D. The management activities should be aimed at the development of the experimental and testing base, methodological support of R&D, support of patent activity of personnel, formation and development of research units, practical orientation and efficiency of R&D, etc.

6. Knowledge. Management of formation and actualization of the knowledge base of the enterprise. Ensuring the effectiveness of the enterprise knowledge management system (their production and use).

7. Resources. Maintenance of an adequate level of material, technical and financial support.

8. Manufacturing. Improvement of the production system, maintaining it at a high level: technologies, contacts, personnel, traditions, production areas, efficiency, etc.

¹ Shypulina Yu.S. (2006). Indicators, criteria and methods of diagnostics of innovative potential of industrial enterprise [Indicators, criteria and methods of diagnostics of innovative potential of industrial enterprise]. Marketing and management of innovative development [Marketing and management of innovative development]. S.M. Illiashenko (Ed.). Sumy: VTD "Universytetska knyha".

9. Marketing of Innovations. Formation of the marketing system of innovation (strategic and operational marketing): personnel, experience, practical orientation, organizational structure, relations with economic counterparties and contact audiences, methodical and information support, efficiency.

Considering that in the last decades among the functions of management (analysis, organization, motivation, control), the organization goes to the first positions and at the same time its role is constantly growing, the organizational aspects of the OEMCIPIE functioning are investigated. According to the results of the research, the functions of the industrial enterprise divisions, which are involved in managing the strategies of commercialization of its product innovations, are systematized in Table 7.6.

Table 7.6 provides an overview of the division functions between of industrial enterprise at different stages of commercialization of its product innovations. Based on Table 6, it is advisable to form a matrix organizational structure for the implementation of OEMCIPIE functions.

The matrix organizational structure of OEMCIPIE supposes the involvement of qualified specialists of different departments of the enterprise. While carrying out the OEMCIPIE tasks, they gain experience in related fields of knowledge. At the same time, most specialists are well aware of the possibility of the creative performance of specific tasks assigned to them, which are solved within the framework of the proposed project-oriented matrix structure. And this is an additional element of motivation of intellectual and creative activity of personnel.

Summarizing the above, the authors have developed and scientifically substantiated the methodological and theoretical and methodological foundations of the formation and functioning of the organizational and economic mechanism of commercialization of innovative products of industrial enterprises (OEMCIPIE). The essence and content of the OEMCIPIE components, the main functions, principles of functioning and structure, instrumental and methodological support, organizational aspects of functioning are determined. An approach to developing a market-oriented concept of an innovative product, as well as an approach to managing its commercialization strategies, are proposed and substantiated.

Table 7.6. OEMCIPIE functions and management actions of industrial enterprise divisions (author's development)

Key functions	Divisions, separate employees									
	Top management	Financial & economic	Marketing	Technological	Конструкторські	R&D	Production	Informational & analytical	HR	Logistics & technical support
Market trends analysis on the industry of the enterprise (or related industries)	D, DC		I, DI			C				
Industry's (or related industries) STP trends analysis	D, DC			DI	DI	C		I		
Analysis of enterprise's innovative development potential	D, DC	DI	DI	DI	DI		DI	I	DI	C
Analysis of customers' problems on the industry of the enterprise (or related industries)	D, DC		DI					I		
Identification of potential directions of innovative development of the enterprise	D, DC	DI	DI	DI	DI	C	DI	I	I	C
Development of innovative product concept	D, DC	C	DI	DI	DI	C	C	I	C	C
Business analysis (analysis of market prospects of innovation)	D, DC	C	DI	C	C	DI	C	I	C	C
Design of innovative product, production of prototype and its laboratory tests	D, DC	C	I	DI	DI	DI	C	I	C	C
Choice of commercialization strategies of innovative products	D, DC	C	DI	DI	DI	C	C	I	C	C
Feasibility study of the commercialization strategy (strategies)	D, DC	DI	DI	DI	DI	C	DI	I	C	C
Implementation of the commercialization strategy (strategies) of the innovative product of the industrial enterprise	D, DC	DI	DI	C	C	C	DI	I	C	DI

Legend: Actions for the implementation of OEMCIPIE functions by enterprise units: D – management decisions; I – information support of management decisions; C – coordination of management decisions; DI – implementation of decisions, DC – control of decisions.

The practical implementation of the scientific and applied research deliverables will provide an opportunity to solve the problem of increasing the efficiency of the commercialization strategies of innovative products of industrial enterprises, which operate in conditions of high degree uncertainty and risk.

The obtained results deepen theoretical and methodological foundations of innovations' management in terms of forming the principles of the organizational and economic mechanism of commercialization of innovative products of industrial enterprises. Further research should aim at improving the system of management tools, according to formalized procedures of strategies for commercializing innovative products.