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INVESTIGATION OF THE ROLE OF VENTURE COMPANIES IN THE EARLY STAGES OF THE PRODUCT LIFE CYCLE

ДОСЛІДЖЕННЯ РОЛІ ВЕНЧУРНИХ ФІРМ НА РАННІХ СТАДІЯХ ЖИТТЄВОГО ЦИКЛУ ТОВАРУ

Urgency of the research. To ensure the commercial success of innovations requires detailed study of the early stages of its life cycle. In Europe the greatest success in this field reached venture capital firms.

Target setting. An important task of the domestic economy is to increase the role of venture capital in innovation activity of enterprises

Actual scientific researches and issues analysis. The theoretical basis of life cycle of innovative products, especially technology, was laid by such scientists as S. M. Illyashenko, [3, 4], O. M. Gavris [5], I. N. Pogorelov [6], N. I. Pogorelov [7-10], D. Kozicki [11] V. L. Tovazhnyanskiy [12], R. E. Fiscal [13] and others.

Uninvestigated parts of general matters defining. The current situation of venture business in Ukraine does not establish the priorities of small businesses, which significantly reduces the commercial potential of their research.

The research objective. The aim of the study is to increase the role of small enterprises in securing commercial opportunities of innovation in the early stages of their life cycle.

The statement of basic materials. Conducted theoretical and practical research on the early stages of the life cycle of industrial innovation. Identify the existence of significant difficulties faced by the enterprises in the sphere of creation, development and bringing to market industrial innovation. It is proved that during the test, and experienced the development of innovations, through technical difficulties or the lack of needed funding, to stop the development of six features from selected 20 percent. To improve the efficiency of the innovative activities proposed in the greater use of the small innovative enterprises. It is proved that the largest contribution to the innovation process make small innovative firms and very large corporations having as their branches small and medium-sized knowledge-intensive firms.

Conclusions. The recommendations allow for the monitoring of intellectual-innovation activities of enterprises, to warn undesirable tendencies both at the enterprise and market his products.

Keywords: life cycle; innovation; development; efficiency; small businesses.

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Актуальність теми дослідження. Для забезпечення комерційного успіху інновації необхідно детальне вивчення ранніх стадій її життєвого циклу. В Європі найбільшого успіху в цій сфері досягли венчурні підприємства.

Постановка проблеми. Важливою задачею вітчизняної економіки є підвищення ролі венчурного бізнесу в інноваційній діяльності підприємств

Аналіз останніх досліджень і публікацій. Теоретичні засади життєвого циклу інноваційних продуктів, насамперед технологічних, були закладені такими вченими, як С. М. Ілляшенко, [3, 4], О. М. Гаврис [5], І. М. Погорєлов [6], М. І. Погорєлов [7-10], Д. Коцік [11], В. Л. Товажнянський [12], Н. Е. Фіяскець [13] та ін

Виділення недосліджених частин загальної проблеми. Існуюче положення венчурного бізнесу в Україні не дозволяє встановлювати пріоритети діяльності малих підприємств, що суттєво зменшує комерційний потенціал їх наукових розробок.

Постановка завдання. Метою дослідження є підвищення ролі малих підприємств в забезпеченні комерційних можливостей інновацій на ранніх стадіях їх життєвого циклу.

Виклад основного матеріалу. Проведено теоретичні та практичні дослідження ранніх стадій життєвого циклу промислових нововведень. Визначено наявність суттєвих труднощів, що стоять перед підприємствами у сфері створення, освоєння і виведення на ринок промислових інновацій. Доведено, що в ході перевірки і досвідченого освоєння нововведень, через технічні труднощі або відсутність необхідних фінансових коштів, припиняються розробки кожного шостого нововведення з відібраних 20 відсотків. Для підвищення ефективності інноваційної діяльності запропоновано більшою мірою використовувати малі інноваційні підприємства. Обґрунтовано, що найбільший внесок в інноваційний процес вносять малі інноваційні фірми і дуже великі корпорації, що мають в якості своїх філій середні та малі наукомісткі фірми.

Висновок. Розроблені рекомендації дозволяють здійснювати моніторинг інтелектуально-інноваційної діяльності підприємств, своєчасно попереджати небажані тенденції як на підприємстві, так і на ринку його продукції.

Ключові слова: життєвий цикл; інновації; розробка; ефективність; малі підприємства.

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Relevance of the research topic. Statistical studies show that the bulk of scientific-technical ideas born in research laboratories of large industrial companies, academic research institutes, departments of universities and academies [1, 2]. The role of small firms at this stage is insignificant, because of their technical and economic potential does not allow for basic or exploratory research, which is why they focus their efforts on scientific-technical development of an idea. This idea is usually imposed from outside in the form of new information or appears in the firm with the arrival of one of the leading employees who have acquired it while working at a large industrial enterprise, academic Institute or school. Economic environment of Ukraine last point is important in connection with residual principle of financing of scientific organizations, low material level of life support of scientific workers, and extremely high turnover of skilled workers.

Formulation of the problem. Due to the huge influence of the early stages of the product life cycle on the market (commercial) fate, it seems essential to determine the economic and commercial characteristics of the new product at the stage of its creation, design and development of industrial production.

Analysis of recent research and publications. Currently, in scientific literature there is a substantial amount of research, reflecting different aspects of the innovation life cycle. The theoretical basis of life cycle of innovative products, especially technology, was laid by such scientists as S. M. Illyashenko, [3, 4], O. M. Gavris [5], I. N. Pogorelov [6], N. I. Pogorelov [7-10], D. Kozicki [11] V. L. Tovazhnyanskiy [12], R. E. Fiscal [13] and others. However, it should be noted the different focus of the studies of these authors and the insufficient knowledge of many aspects of formation and development of the economic characteristics of the individual stages of the life cycle of innovative products, created and produced by venture enterprises.

Determination of unexplored aspects of the general problem. The authors of the study show that outside the field of view of economists with questions of determination of economic efficiency of scientific developments and their transformation into design and technological documentation, its preparation for industrial development of new products. A very important direction of research in this area are the practical aspects of designing tools for economic assessment of commercial potential of technological innovation in the early stages of their life cycle, the results of which it would be possible to determine more precisely priorities for commercialization of innovations inside the enterprise and target market of its products.

Setting an objective. The aim of the article is formation of economic characteristics of the innovative products developed at industrial enterprises of our country. Special attention is paid to the stages of the development, creation and industrial development of technological products and the role in this process of small innovative firms.

Research results. In the early stages of the innovation process, of Central importance among them belongs to the development stage of new products and technologies are still exogenous in relation to existing markets. In this regard, large enterprises with rather high level of financial stability in the market, consider them too uncertain from the point of view of potential commercial value and, therefore, risky investment of time and money. Because receptiveness to new technical systems and technologies of the industry as a whole is determined by the positions of large firms, at this stage, it is extremely low. At this stage of work the business model innovation process. What's happening at this stage of the process is reduced to the selection, testing and experimental development of new scientific and technical ideas. Is the selection of ideas, according to a survey of 50 U.S. companies, approximately 80 percent of projects implement these ideas were rejected [9, p. 44]. The remaining 20 percent of the innovations gain a higher degree of practical feasibility and commercial value. During the test, and experienced the development of innovations due to technical difficulties or lack of necessary funds to stop the development of six innovations selected 20 percent [1, p. 77].

Stage of development ends with the development of a product prototype and refinement of the commercial values of innovation, there is a certain kind of a filter through which passes approximately 15 percent of the adopted to the development of scientific and technical ideas. This stage is a broad field of activities of small high-tech firms. Funding for commercialization of scientific and technical ideas they get or any investment entity under certain financial obligations, or from a particular foreign

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Fund, support and encourage the development of scientific research in the country (INTAS, TESIS, TEMPUS, COPERNICUS etc.), or from large industrial enterprises in the form of contractual research. In case of failure, the loss of funds spent on the development of scientific and technical ideas, it becomes a catastrophic event threatening the very existence of small firms. In the end, the number of bankruptcies among small knowledge-intensive firms often even exceeds the dropout rates of scientific and technical ideas. But the venture capital firms still take the risk of the development of radical innovations, as in the case of success they are getting profits quickly and more than pay for the cost of creating innovations.

Venture capital firms play an important role in the economy of any country. According to foreign and domestic researchers, small businesses produce in the global economy of up to 40% of innovative ideas and samples of new products and technologies.

According to official statistics, industry of our country there 42564 enterprises, of which 233 are large (0,6 %), medium-4691 (11,0 %), 37640 small (88,4 %) [14]. However, the Ukrainian venture capital business currently generates just less than 10% of the domestic product, and employs only 17% of the economically active population [1; 9; 14]. The level of innovative activity of small business in Ukraine is very low (Tab. 1).

Table 1

**Dynamics of innovation (innovation activity) of Ukrainian enterprises,
depending on the size of the firm (%)**

The number of employees in the enterprise, people	Periods of time (years)			Average value for 2001-2015
	2001-2005	2006-2010	2011-2015	
From 1 to 199	9,6	10,3	7,9	9,3
200 to 499	7,3	7,2	8,1	7,5
From 500 to 999	1,5	1,4	1,8	1,6
From 1000 to 9999	42,8	41,2	44,3	42,8
Over 10 thousand	38,8	39,9	37,9	38,9
	100%	100%	100%	100%

Source: calculated by the authors using [14]

Table 1 suggests a significant gap between the level of innovative activity of small and large businesses in Ukraine that, in General, characterizes the lack of positive trends in the usage of the benefits of small innovative business. But these advantages, in our view, small innovative enterprises, there is quite a lot.

Small innovative firms that do not have bulky administrative apparatus not burdened by the need of a costly reorientation of mass production, flexibly react to changing market conditions and more prone to develop radical innovations based on scientific discoveries and is able to radically change the production or technological process of manufacturing products. Compared to them, large firms tend much less dynamism to respond to changing market needs, they are more willing to use inventions, modernizing or improving processes and products, and are less prone to risk associated with the transition to production of innovative products, technologies or services.

However, it should be noted that small innovative enterprises are still a small percentage of the total number of small businesses and they account for only a few percent of the total cost of scientific research in industry of any country. The rest use relatively small number of large enterprises and organizations. If we consider only these facts, it seems that the effectiveness of the use of scientific and technical resources of small high-tech firms is significantly superior to all the others. According to foreign sources [15, 16], in comparison with large corporations, they drive 17 times more innovations per dollar of costs and thus outperform them according to the degree of impact. Moreover, in our view, the role and importance of small innovative firms at the present stage of development of the economy should increase to an even greater extent. It is a fact that today on the front plan of the competitive struggle goes not price competition, and the competition of new products and services and, hence, the rate of renewal of products and the growth of services become a decisive factor in the commercial

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success of any market entity. This premise is confirmed by the results of several scientific studies of the peculiarities of innovative processes in Europe [1; 3; 10; 13; 14], a fragment of which we describe in table 2.

Table 2

Dynamics of innovation in economically developed countries, depending on the size of the firm (%)

The number of employees in the enterprise, people	Periods of time (years)					Average value for 1945-2015
	1945-1965	1966-1985	1986-1995	1996-2005	2006-2015	
From 1 to 199	16,0	11,0	14,0	17,0	19,0	15,4
200 to 499	9,0	6,0	8,0	7,0	6,0	7,2
From 500 to 999	3,0	6,0	4,5	3,0	2,5	3,8
From 1000 to 9999	36,0	26,0	20,5	14,0	12,0	21,6
Over 10 thousand	36,0	51,0	53,0	59,0	59,5	52,0
	100%	100%	100%	100%	100%	100%

Source: calculated by the authors using [4; 7; 9; 10; 13; 15]

Analysis of the data given in table 2 shows that the largest contribution to the innovation process make small innovative firms and very large corporations having as their subsidiaries, small and medium high-tech firms. A study of about 2,300 innovations in 35 industries shows that on the aggregate level, the share of innovations implemented largest corporations employing more than 10 thousand people increased from 36 per cent in 1945-1954 years to 59.5 percent in the years 1985-1998. However, the share of innovations introduced by small firms employing less than 200 people fell from 16 percent in 1945-1954 years, but then again began to increase and has already reached 19 % of the total number of innovations at the present time. The share of innovations implemented medium-sized firms (200-1000 employees) preserved in the analyzed period of time almost on the same level (10-12 %), while the percentage of firms employing from one to 10 thousand people in the innovation process has dramatically decreased from 36 to 12 %.

A slightly different picture is obtained if the same survey to produce at the level of structural subdivisions of the enterprises that presented by us in Table 3.

Table 3

Dynamics of innovation in economically developed countries, depending on the size of innovative structural units in the composition of firms (%)

The number of employees in the venture firm or the business unit, people	Periods of time (years)					Average value for 1945-2015
	1945-1965	1966-1985	1986-1995	1996-2005	2006-2015	
From 1 to 199	21,0	15,5	24,0	32,0	33,5	25,2
200 to 499	14,5	14,0	16,0	14,0	14,0	14,4
From 500 to 999	7,5	13,0	12,0	16,0	15,0	12,6
From 1000 to 9999	44,5	40,5	37,0	30,0	31,0	36,6
Over 10 thousand	12,5	17,5	11,0	8,0	6,5	11,2
	100%	100%	100%	100%	100%	100%

Source: calculated by the authors using [4; 7; 9; 10; 13; 15]

Analysis of the data table 3 shows that the most innovative activity have all those small innovative firms and large innovation departments of industrial enterprises. A very large branch corporations and associations (over 10 thousand employees) have the lowest innovation activity, due to its focus on production activities.

Conclusions. The analysis of the distribution of innovative activity of enterprises leads to the conclusion that successful innovative activity of small enterprises has certain limits that depend on the organizational and financial capacity of the enterprise. The relatively large share of innovations on these constraints, it would be virtually impossible for a small company. In an ever increasingly complex techniques and technologies used in large scale production and the growth of the value innovation

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process, large enterprises and their innovation departments have significant advantages over medium and small enterprises, as they have a large institutional and financial capacity for effective management of the research process. Significant financial resources of large firms allow them to also better organize and implement marketing researches, proper advertising of new products, patenting scientific achievements and the protection of their patent rights, etc.

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