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FLOW BUSINESS MODEL FOR THE PROCESS OF CREATING OF PRODUCT INNOVATION

The article outlines an approach for describing the process of creating product innovation in the frame of flow business model. It is proposed to consider the product innovation process as a system of the goods flow along a logistically connected chain. This approach and understanding of the main parameters of the model allows us to analyze the process of creating innovation and draw conclusions about the drivers and obstacles to the flow of product innovation at various levels.

Keywords: *product innovation*, *flow model*, *scorecard*, *chain*, *knowledge transfer*

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ПОТОКОВАЯ БИЗНЕС-МОДЕЛЬ ПРОЦЕССА СОЗДАНИЯ ИННОВАЦИОННЫХ ПРОДУКТОВ

В статье излагается подход к описанию инновационных процессов на основе потоковой модели создания инновационного продукта. Предлагается рассматривать создание инновационного товара как систему движения потока по звеньям логистически связанной продуктовой цепи. Данный подход и понимание основных параметров модели позволяет провести анализ закономерностей создания инноваций и сделать выводы о драйверах и препятствиях процесса производства инновационных продуктов на различных уровнях.

Ключевые слова: *инновации*, *потоковая модель*, *система показателей*, *цепь*, *трансфер знаний*

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Introduction

Today there are several questions with growing relevance: how to launch the processes of creating product innovation within the country; how to use the potential of existing organizations, including scientific organizations and institutions of higher education; how to ensure the commercialization of existing scientific developments; how to provide the country's entry into the world product innovation markets [1].

The management of the processes of creating product innovation at the organization level, national and international level should be based on the regularities of these processes at various levels of the economy, as well as on knowledge about the main parameters that are controlled [2].

The process of creating a product innovation includes a number of stages: fundamental and applied scientific research, development and design, production, sale product innovation on the market [3]. From the standpoint of the logistic approach, the implementation of the above stages can be considered as the process of promoting the goods flow along the product innovation chain. The links in this chain are the organizations participating at various stages in the process of creating a product innovation.

This research is an attempt to apply a logistic approach and a flow model to describe the process of creating product innovation. Such approach allows us to analyze a number of innovative development patterns and to draw conclusions about the drivers and obstacles of the product innovation creating flow (further – product innovation flow) at various levels.

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The main parameters characterizing the movement of a separate product innovation flow

***Where does the goods flow come from and where does it move to*?** The flow of goods moves from a place where goods can be produced cheaper to a place where they can be sold for more [4].

If we are talking about the process of product innovation creating, starting from fundamental and applied research stages, then the movement of the goods flow in the innovation creating chain is advisable to consider by development stages. In this case a supply of resources starts from geographic points where they are available at a cheaper price, the transformation of these resources takes place, and the movement of goods flow aims to points where the finished product innovation can be sold at the maximum price.

***What is the path of the goods flow*?** Flows in nature typically follow the path of least resistance. The work of resistance forces in the economy can be considered on the one hand as time spent and costs. On the other hand, the factors that stimulate the movement of the flow are the wages and profits of the participants, that are added as value created in the chain. Accordingly, the goods flow moves from the points of origin to the points of consumption through countries, organizations and individual specialists in the way that can provide a minimum of time spent and costs on the one hand and maximum added value on the other [4].

Thus, the main parameters characterizing the movement of a separate product innovation flow are:

1. Added value created in the chain. Measured in monetary units.
2. Time spent in the chain for the development and production of a product innovation. Measured in days, months.
3. The value of the costs in the chain. Measured in monetary units.

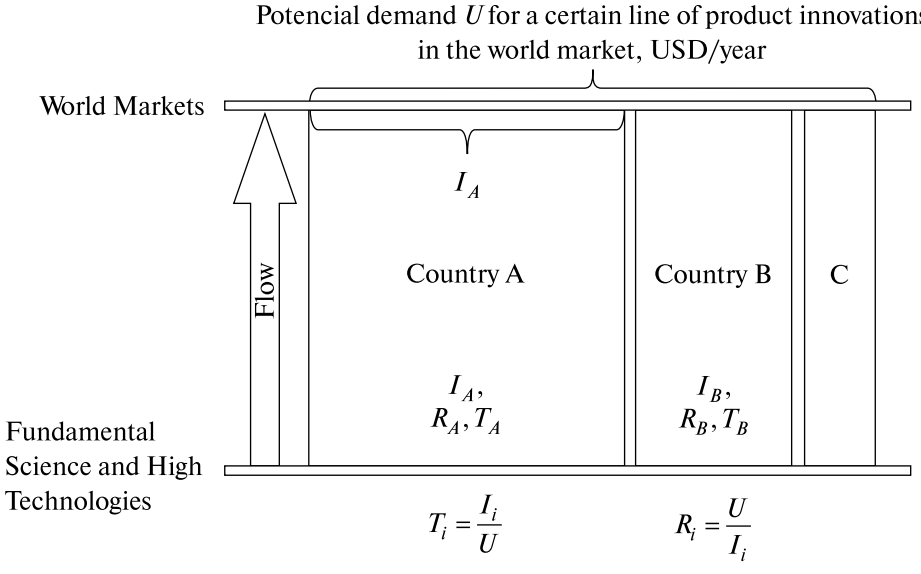
It should be noted here that the quality of a product innovation must correspond to the time spent and cost involved in its creation. Taking into account the work conditions in the product innovation markets, the quality as well as the time spent can be precisely the decisive factors in the «quality – time – cost» bundle, but not the costs. A product innovation is in demand as long as its properties are unique, and it can be successfully sold at a high price that covers the increased costs of product creating. At the same time if the launch of a product innovation to the market is carried out with a delay or with a lag in time from competitors, this is associated with large losses.

Parameters that determine the movement of product innovation flows on a global scale

***What parameters determine the movement of flows on a global scale* (*between countries*)?** The geographic points of the flow origin are the countries which possess fundamental science and the so-called high technologies. The fact is that the basis and the source of innovation is science. Market and market relations contribute to the creation of product innovation. But it is precisely the development of technology that makes it possible to transform human needs and wants into a product innovation. The consumption points of the flow are the world markets (see Figure).

Let's consider the following situation. The potential demand for a certain line of product innovation in the world market is equal to U dollars/year. The U value can also be understood as the total value added that can be created and extracted in the process of creating products to meet a specific demand.

The innovation systems of different countries have different ability to create a product innovation. Some of them can create a larger volume of product innovation, others – a smaller one. Let's say a particular country can provide the creation of product innovation in the amount of I_i dollars per year. The value of I_i in terms of marketing can be considered as the volume of product innovation created in a country per year, and in terms of logistics can be as the intensity of the flow of creating a product innovation in a particular country.



Parameters characterizing global (international)
product innovation flows and their movement between countries

S o u r c e: author's developed.

In this case, the value of I_i/U can be understood in terms of marketing as the share of the i-th country in the total sales of a certain line of product innovation in the world market. In terms of logistics, this value can be defined as the conducting or generating capacity of a particular country (or subsystem), in accordance with which the country conducts or generates a product innovation flow. We denote it by T_i.

Then the value U/I_i reciprocal of T_i can be understood as the number of years (turnovers) during which the particular country is able to release the volume of product innovation consumed in the world market per year. Also, the U/I_i value is a resistance that the innovation system of a particular country has on the path of the product innovation flow from the point of its origin to the point of its consumption. We denote it by R_i.

Thus, the relationship of the main parameters determining the movement of product innovation flows at the macro level can be expressed by the following formula:

$$I_i = UT_i,$$

where I_i – is the intensity of the product innovation flow in a particular country (in the i-th country), dollars/year; U – potential demand for a certain line of product innovation in the world market, dollars/year; T_i – conducting or generating capacity of the particular country innovation system (the i-th country), is a dimensionless coefficient.

Parameters characterizing individual links of the chain conducting the product innovation flow, and the working conditions of these links

The links in the chain of creating a product innovation are organizations participating in this process at various stages, including various industrial enterprises, scientific organizations, higher education institutions (HEI), etc. The development of individual organizations and groups of organizations is proposed to be assessed by three blocks of indicators:

1) potential in creating innovations, which characterizes the availability in the organization of the resources necessary to create innovations: the staff and the amount of R&D funding;

2) potential of an organization in the commercialization of innovations which reflects the capabilities for the production and transfer of a competitive product and includes indicators that determine the presence of the product innovation itself (the number of registered results of intellectual activity) and that determine the conditions for commercialization;

3) the effectiveness of innovation. This block of indicators allows you to assess the overall effect of the work of all elements that make up the innovative environment of the organization.

Parameters characterizing individual specialists (human resources) working in individual links of the chain (organizations), and the working conditions of these specialists

Specialists working in organizations can be regarded as a kind of smaller links that provide conduction and generation of the product innovation flow. The quality of the specialists and their work make up the conducting and generating capacity of the organization.

It is advisable to include two blocks of indicators at this level:

1) indicators characterizing the qualification level of a specialist;

2) indicators characterizing the level of remuneration of a specialist.

The system of indicators characterizing the innovation process at various levels

On the basis of the groups of indicators discussed above, it is possible to draw up a system of indicators characterizing the innovation process at four levels (see Table).

Four levels of indicators characterizing the innovation process

Level 1. Indicators characterizing global (international) product innovation flows and their movement between countries
$I_i = UT_i$ I_i – the intensity of the product innovation flow in a particular country (in the i-th country), dollars/year U – potential demand for a certain line of product innovation in the world market, dollars/year T_i – conducting or generating capacity of the particular country innovation system (the i-th country), is a dimensionless coefficient
Level 2. Indicators characterizing a separate product innovation flow
V_a – added value created in the chain, dollars C_t – time spent in the chain for the development and production of a product innovation, days C_c – value of the costs in the chain, dollars
Level 3. Indicators characterizing individual links of the chain conducting and generating the product innovation flow, and the working conditions of these links
1. Indicators characterizing the potential for creating innovations 2. Indicators characterizing the potential in the commercialization of innovations 3. Indicators characterizing the effectiveness of innovative activities
Level 4. Indicators characterizing individual specialists (human resources) working in individual links of the chain (organizations) and working conditions of these specialists
1. Indicators characterizing the qualification level of a specialist 2. Indicators characterizing the level of remuneration of a specialist

The indicators of the first level allow us to analyze the movement of product innovation flows at the global level (between countries), as well as compare individual countries with each other in terms of their ability to participate in the global product innovation flows.

Based on the indicators of the second level, a comparison of various options for the chain of creating a product innovation or its fragments can be made and the optimal option can be selected.

Based on the indicators of the third level, individual organizations participating in the chain of creating a product innovation can be assessed and compared with each other in terms of participation and competitiveness in the creation of product innovation.

Based on the indicators of the fourth level, an assessment and comparison of individual specialists and their groups among themselves and an assessment of the prospects for their participation in the creation of product innovation can be done.

All levels of indicators are interconnected. Specialists (level 4) make up organizations (level 3), and organizations make up product innovation creating chains (level 2). These chains at different stages of the creation of a product innovation pass through countries in which the best conditions are provided (level 1).

Ultimately, the proposed system of indicators characterizes, first of all, the conductivity and generating capacity of the innovation system at various levels, or in other words, characterizes the resistance to the movement of the product innovation flow at various levels.

The place and role of countries with relatively small economies in the global innovation process

In a modern economy it is almost impossible to implement the entire chain of creation and consumption of a product innovation within one country. Only in a particular case, the chain of creating a separate product or group of products can be implemented within a relatively large country that has high technologies and a large domestic market. Such, for example, as the USA or China [4].

Different stages of the innovation cycle are usually implemented in different countries. The flow can enter and leave the country at different stages of the innovation cycle. So, for example, basic and applied research can be carried out in the USA, and the production stage – in China.

The goal of a particular country is to get for the implementation on its territory the phases of the innovation cycle, which are most consistent with the general strategy of country's economic and innovative development. It is possible to cite examples of countries that carry out on their territory only such phase of the innovation cycle as production.

Since fundamental science requires large funds, usually budget funds, small countries with relatively small national economies do not have high technologies at their disposal. Such countries also do not have a sufficiently large internal market. The product innovation flow does not originate and is not extinguished in such countries. They can consume only a very small part of the world's production of product innovation.

Therefore, for a country with a relatively small economy it is advisable to direct strategic efforts to ensure that some of the world flows pass through its economy and its territory. As for the purposes of development, the most attractive for implementation on the territory of a country with a relatively small economy are the phases of applied research, R&D, design and development and the sale of a finished product innovation.

In order to direct a part of the global product innovation flows through the territory of a particular country, it is necessary to reduce the resistance to the movement of the flow within the country, in other words, to increase the conductivity and generating capacity of the country's innovation system. This means, first of all, to reduce the time spent on the implementation of the stages of the innovation cycle and to make the costs of processing the product innovation flow within the country comparable to those of competing countries.

If a separate country is isolated from world flows for some reason, the efforts to increase the conductivity of its innovation ecosystem can only facilitate the passage of micro-flows that originate within the country and are consumed in its internal market.

The same patterns are characteristic of the movement of the product innovation flow between individual organizations, for example, between manufacturing enterprises and high educational establishments (HEI) [5]. The flow follows the path of least resistance.

For the HEI subsystem the implementation of such stages of the innovation cycle as applied research and R&D is the most attractive. Universities within the country can act as links in the chain of promoting the flow of innovation only if they provide, first of all, low «resistance», that is, first of all, an acceptable time to complete a certain stage of the innovation cycle, as well as acceptable costs.

When conducting interviews with experts, one can hear such recommendations for involving HEI into the process of creating product innovation, as, for example, increasing the prestige of scientific work, increasing the level of payment for scientific work, creating branches of departments at enterprises, participation of enterprises representatives in conferences held by the university, etc.

However, it seems that today the main problem is the time it takes for the university to fulfill the order. In modern conditions, Belarusian innovative enterprises operating in foreign markets do not start developing a new product if they see that it will take more than six months. Because in the long run, the course of events is unpredictable.

Scientific and applied research in HEI in modern conditions is organized in such a way that the development cycle usually takes a year or more.

Conclusion

The product innovation creating process can be considered as the process of promoting the goods flow along the links of the logistics chain. The goods that flow in the chain is characterized by the same general patterns that are inherent in any flows. Flows in nature typically follow the path of least resistance.

As a result of the application of the flow model to the analysis of the process of creating innovative goods, a system of indicators has been developed. It characterizes, first of all, the resistance to the movement of the product innovation flow at various levels, or, in other words, describes the conductivity and generating capacity of the innovation system at various levels.

All levels of indicators are interconnected. Specialists (level 4) make up organizations (level 3), and organizations make up chains for creating product innovation (level 2). These chains at different stages of the creation of a product innovation pass through countries in which the best conditions are provided (level 1).

This system allows to analyze the regularities of innovation processes at various levels and draw conclusions about the drivers and obstacles to the product innovation flow.

For countries with relatively small economies, it is almost impossible to carry out a full innovation cycle. For such countries, it is advisable to direct strategic efforts to ensure that some of the world flows pass through their economies and territories. At the same time, the most attractive stages for implementation on the territory of a country with a relatively small economy are the phases of applied research, R&D, design and development and the sale of a finished product innovation.

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References

1. Bonaccorsi A., Piccaluga A. A theoretical framework for the evaluation of university-industry relationships. R&D Management, 1994, vol. 24, no. 3, pp. 229–247. https://doi.org/10.1111/j.1467-9310.1994.tb00876.x

2. Efremova P. V. Indicators for assessing the effectiveness of the development of innovative activities of universities. *Voprosy innovatsionnoy ekonomiki* [Issues of innovative economics], 2019, vol. 9, no 3, pp. 989–1009 (in Russian).

3. Innovation process. Available at: https://ru.wikipedia.org/wiki/Инновационный_процесс (accessed 30 June 2021) (in Russian).

4. Bowersox D. J., Kloss D. J. Logistical management : The Integrated Supply Chain Process. McGraw-Hill, 1996, p. 730 (in Russian).

5. Belitski M., Aginskaja A., Marozau R. Commercializing university research in transition economies: Technology transfer offices or direct industrial funding? Research Policy, Elsevier, 2019, vol. 48 (3), pp. 601–615. https://doi.org/10.1016/j.respol.2018.10.011

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