

ICEST 2021**II International Conference on Economic and Social Trends for Sustainability of Modern Society****INNOVATION PROCESS MODEL**

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Abstract

This paper presents the author's model of infrastructural nonlinear innovation process. In the authors' opinion innovation process consists of four stages: new concept formation (result: new idea); development of innovation (result: innovation); manufacturing (result: innovation); promotion (result: innovative product). The innovation process model provides various ways of work performance (own efforts, collaborative activities, and outsource) or different levels of independence for each stage. The use of the presented innovation process model permits to make it clearer for investors, leads to market mechanisms start in the sphere of innovations, and simplifies all innovation process stages coordination. This paper reviews the evolution of scientific images of innovation process. This paper introduces two main approaches to innovation process: linear and nonlinear. Essence of the innovation process concept is specified and expanded. The innovation process is the system of measures to the new knowledge transformation into the innovative product. The paper considers the examples of work performance with outsource involvement (crowdsourcing and integration).

2357-1330 © 2021 Published by European Publisher.

Keywords: Innovation, innovation process, crowdsourcing, integration

1. Introduction

Solution to the problem of competitive growth of innovative industrial enterprises is one of the strategic targets of the Russian economic development. Innovations, new type of management, and more skilled management methods play the crucial role in the competitive struggle for industrial products target markets. All this enhances the search for new forms of incorporation providing accelerated innovation development and mastering.

Currently, macroeconomic adversity continues and in combination with companies' extremely low investment opportunities materially prejudices conditions for innovative activity activation.

Up-to-date innovative development concept definition is necessitated by the need for solution problems in manufacturing industry related to increased competition after RF accession to the WTO, global innovative products (goods, services, and technologies) market grouping, and low industrial production research intensity.

The specified processes provide functional and structural changes in the system of innovation activity management. The further development of industrial production is impossible without in-depth and comprehensive analysis of innovative activity current status enabling to give an estimate and develop actual innovative policy based on modern concept of research and technology advancement of all sectors of economy.

2. Problem Statement

To improve the efficiency of scientific research in this area, a clear understanding of the essence and significance of innovative activity in industry is required. In this case, it is necessary, first of all, to highlight the main directions of the formation of the methodology for the study of innovative activity, which includes: clarification and further development of the theory of innovative activity; development of the organizational and economic foundations of innovative activity; development of methods for assessing the results of innovation; innovative products market grouping. Within the specified areas, the specification of problems and issues for their practical solution in the process of innovation is of certain importance. In particular, the development of the theoretical foundations of innovation provides for clarification of the innovation process essence, the concept of innovation, their goals and objectives in relation to production, refinement of the essence of innovative activity as an economic category.

3. Research Questions

Currently, the innovation process includes 6 types (models):

- Linear (up to 1960-s);
- Market (1960);
- Interactive (1970-s);
- Integrative (1980-s);
- Online (1990-s);
- Information (2000 till present).

The traditional innovation process model is the linear innovation model that gained acceptance during the Henry Ford era. Within the framework of the linear model, R&D was considered as the main and only source of innovation. In this model, the innovation process is based on fundamental research. They generate theories and discoveries that are embodied in applied research, then tested during development and then sold on the market as innovative products.

On the basis of the works of J. Schumpeter, economists joined in the discussion about the nature and stages of the innovation process, including criticizing the adequacy of the linear approach to innovation (Galanakis, 2006; Smith, 2007). One of the first nonlinear models, proposed by Rothwell (1994), was called the "conjugate model of innovations".

Within the scope of the market model, the initiator of innovation processes is the "market signal", that is, an innovative product appears as a result of consumer demand for it (Kotsemir & Meissner, 2013).

Increased competition and a shorter life cycle of goods have led to the need for a closer relationship between R&D and other stages of the innovation process. This led to the occurrence of an interactive model that combines market and linear models (Vuola & Hameri, 2006).

The emergence of an integrated business model of the innovation process was caused by the development of new ways of organizing production in Japanese enterprises. In these models, the emphasis was on integrating R&D with manufacturing, and on closer collaboration with suppliers and customers. The development of this model has resulted in the emergence of joint ventures and strategic alliances (Bernstein & Singh, 2006).

The online model is characterized by the availability of such strategic elements as - corporate flexibility, customer-oriented strategy, integration with the main supplier, the provision of horizontal technological cooperation, and the use of electronic databases (Musiolik et al., 2012).

The information model distinguishing feature of the innovation process is the use of information and communication technologies. The emerging of this model is associated with the role of knowledge increase as the main factor of competitiveness in the modern economy (Leiponen & Helfat, 2010).

According to the criterion of complexity, determined by the availability of external participants, the following types of innovation process can be distinguished:

1. Autonomous innovation process. At the same time, the entire range of works in terms of the innovation process was performed within the framework of the economic entity (enterprise, company) that had created the innovation. Forms of autonomous innovation process:

- autonomous linear innovation process;
- autonomous nonlinear (interactive) innovation process

2. Infrastructural innovation process. The innovation is the result of the joint activity of the innovative enterprise and outsourcing organizations. A distinctive feature of the infrastructural innovation process is that outsource organizations take part in the innovative product development. An innovative product is the result of the collaborative efforts of various project design teams and concerned parties.

The disadvantage of these schemes is that they do not reflect the continuity of the innovation process.

Most scientists agree that the innovation process consists of four stages (Ernst, 2002; Varjonen, 2006).

4. Purpose of the Study

It is necessary to develop a model of infrastructural nonlinear innovation process, which provides different levels of independence for performing work for each stage, reflecting the continuity of the innovation process.

It is necessary to clarify and supplement the essence of the concept of "innovation process" taking into account the diversity of organizational forms of innovation.

5. Research Methods

Innovation activity is a systemic category that includes a complex of scientific, technological, organizational, legal, financial, structural, and commercial activities. It is a system approach to innovation that provides a high degree of probability of innovation. Innovation as the end result of the research and production cycle must be considered inseparably with the innovation process. The innovation process is a system of measures to transform new knowledge into an innovative product.

In the innovation process, in addition to the innovatively active enterprise, various subjects of the innovation infrastructure (industrial parks, information and advice services, business incubators, venture funds, etc.) can take part. Figure 1 shows a model of the innovation process.

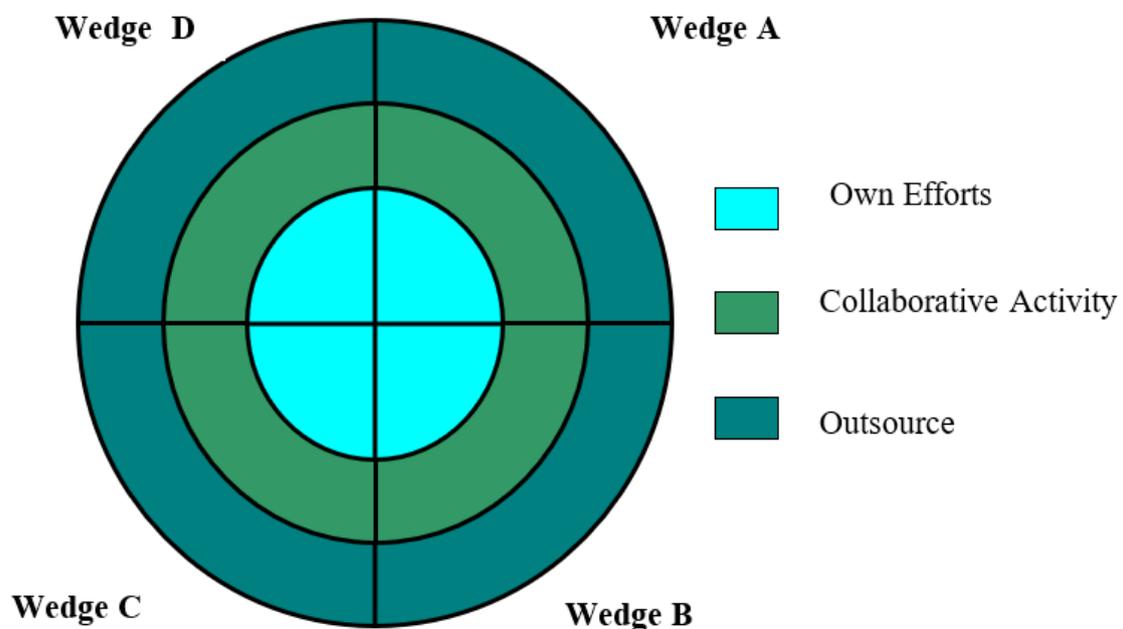


Figure 1. Innovation Process Model

The developed model clearly shows one of the most important advantages of the innovation process - cyclicity. Herewith, the final stages of the previous innovation cycle should underpin the initial stages of the next cycle, as only in this case we can talk about real continuing innovation activity and about maintaining the competitiveness of products at the proper level.

Each stage of the innovation process corresponds to a specific wedge in the model.

1. Wedge A. «New Concepts Developments». Result: new concept.

2. Wedge B. «Innovation Development». Result: innovation.

3. Wedge C. «Production». Result: innovation.

4. Wedge D. «Promotion». Result: innovative product.

At the first stage of the innovation process, the generation, assessment, and new ideas reduction takes place, which can be developed both within the organization and come from external sources. The second stage is the development of design and technological documentation based on new concepts. At this stage, the rights to the results of intellectual activity are registered, i.e. an innovation becomes an intellectual property item (IPI), i.e. can be an item of "sale and purchase". At the first two stages, some new knowledge is produced.

As part of the innovation process, "production" refers to the practical application of new knowledge. If we are talking about new or improved goods, then production means the direct manufacture of these goods. The production stage includes not only the on-site manufacture of new or improved goods, but also the preparation of production, i.e. manufacture or purchase of additional equipment and tooling.

Promotion of innovation can be carried out both in tangible form (product, service) and in intangible form (rights to IPI in the form of patents, licenses, etc.).

For each stage of the innovation process, there are three possible ways of performing work (level of independence):

- Level 1. «Own Efforts». Complete independence. The company independently performs the entire scope of work within one or more (up to four) stages of the innovation process.
- Level 2. «Collaborative Activity». High level of autonomy. The company, in cooperation with external (third-party) organizations, performs work at stages (from one to four) of the innovation process.
- Level 3. «Outsource». Low degree of independence. At the same time, outsource companies are entrusted with the implementation of certain types of work through the innovation process. At the same time, the activities of these organizations are supervised.

As an example of attracting outsource companies to carry out work for the purpose of the innovation process, let us consider crowdsourcing. "Crowdsourcing is a tool for solving problems facing business, government, and society based on the ability of the online community experts to generate new knowledge" (Bassi et al., 2020).

Organizations using crowdsourcing gain access to new ideas and solutions, deeper customer engagement, co-creation opportunities, optimization of tasks, and cost cutting. The Internet and social

media have brought organizations closer to their consumers, laying the foundation for new ways to collaborate and create value.

Let us consider the possibility of using crowdsourcing at every stage of innovative project. Obviously, at the stage of generating ideas, crowdsourcing will be most in demand. New ideas are constantly appearing on the Internet, which forces companies to use crowdsourcing and learn how to derive the maximum benefit from it, including new knowledge. The Internet provides an easy connection to experts and, when properly applied, can provide companies with new ideas as well as knowledge to solve emerging issues.

If there are no design or technological departments, no production facilities for the development and production of innovative products in the company, then by means of crowdsourcing it is possible to find the optimal solution to these concerns. A community of experts can help to the best advantage of the company to place development and production orders with outsourced contractors or to find partners for joint activity.

The use of crowdsourcing for innovative products promotion can be carried out in three main directions. First, an organization can ask experts to write content for their websites. In return, experts can get free links to their own sites.

Secondly, companies can use crowdsourcing for social media marketing. An organization can encourage people to share photos on social media, as long as there are innovative products in need of promotion in the frame.

Thirdly, if a company needs a new logo or needs to improve the packaging design, it is enough to go to the online platforms Crowdspring.com or Ponoko.com, to describe the desired result and name the price. Designers will respond with sketches and, if necessary, revised prices.

One of the most important results from the participation of the initiating company in the crowdsourcing project is that the employees of the company have the opportunity, through interaction with experts, to acquire an invaluable resource - new knowledge that can later be used in the development of innovative products (goods, services, technologies, business processes, etc.).

Integration is one of the most popular forms of joint activities of enterprises with various forms of incorporation for material and intellectual assets sharing, the development of new methods for developing high-tech products in the competitive business environment.

Competition, a constantly growing share of R&D costs, a high degree of innovation uncertainty force agro-industrial companies to respond promptly to constantly emerging new products (goods, services, technologies, etc.); take into account the opinion of potential consumers; constantly improve their products; use a variety of sources of new knowledge. The study of intercorporate interaction shows that the integration of enterprises is accompanied by an increase in their innovative activity. New products sales contribution is more substantial in those companies that are involved in integration processes.

Currently, the flow of more than half of the world's gross product in the value added chain and its sales take place in the structure of integration ties. Integration with partners is a factor that can enhance a company's innovative activity and contribute to the success of launched innovative products or services (Johnson et al., 2013).

The higher purposes a company sets for itself, the more important it is to integrate within the innovation project, which provides significant opportunities for learning and getting results from innovation activity. Thus, motivation and finding joint goals with partners becomes a fundamental and critical to the innovative development of companies.

Also, a positive result is the better information support of the enterprise in the case of integration. Better knowledge of the customer's needs and the threat of resource allocation disruptions from suppliers allows the company to anticipate and be better prepared for potential changes in the environment thereby increasing the company's competitiveness.

6. Findings

The developed model clearly shows one of the most important advantages of the innovation process - cyclicity. Herewith, the final stages of the previous innovation cycle should underpin the initial stages of the next cycle, as only in this case we can talk about real continuing innovation activity and about maintaining the competitiveness of products at the proper level.

Crowdsourcing can have a positive influence on all stages of the innovation process: at the stage of "idea generation", experts may receive RIAs, which can later become innovations; at the stages of "development" and "production" experts can provide the information necessary for the best placement of orders for the development of design and technological documentation and the production of innovative products; at the stage of "promotion" with the help of experts, the design of innovative products can be developed and the ways of conveying message about it to potential consumers can be improved. Obviously, with a correct approach, crowdsourcing can become an effective tool for the innovative activities development at any level.

Integration cooperation, regardless the forms of its manifestation - contractual relations (horizontal integration) and / or consolidation of firms under single management (vertical integration) – provides cost-effectiveness and allows gaining effect of range and diversity.

The use of the proposed model of the innovation process makes it more transparent for investors, it will lead to the launch of market mechanisms in the field of innovation, and will simplify the coordination of all stages of the innovation process.

7. Conclusion

The innovation process is a specific object of management, where all stages, steps, measures, and activities require significant investments, qualified scientific and technical, intellectual personnel, large-scale marketing activities, interaction and interconnection of all subjects of innovative development, constant building and improvement of innovative potential. Thus, for the innovation process management, a systematic approach is required that determines interrelationships and mutual dependencies of all subjects of innovation activity, revealing direct communication and feedback in the management structure.

Acknowledgments

The work was supported by the Act 211 Government of the Russian Federation, Contract № 02.A03.21.

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