Transformation of the enterprise cost model in an innovative economy

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Abstract. Innovative activities currently determine the competitiveness of enterprises in all sectors. A wide range of scientific studies is devoted to the analysis of the innovation economic efficiency, but most Russian and foreign researchers agree that innovation on the one hand causes an increase in production costs, on the other hand, requires additional efforts to commercialize market demand in order to compensate for the increase in costs. The inevitable increase in market prices for innovative products exacerbates the difficulties of an innovative enterprise and adversely affects its competitiveness and market capitalization. Currently, in practice there is no clear concept and methodology for assessing the results of the production enterprises participation in the innovation process. The concept of the “innovative activity economy” is introduced in the article, considered by the authors in comparison with the issues of the quality economy. The cost model of innovation-oriented manufacturing enterprises is also considered, combining the production of "traditional" products with innovation, in comparison with the traditional cost model of an enterprise that does not carry out innovative activities. This combination changes the mechanisms for the formation of enterprise’s economic indicators, complicates the relationship between them, changes the structure of risks and, accordingly, requires special approaches to decision-making, planning and results evaluation.

1. Introduction

The advent of the latest technological innovations, based on cyber-physical systems, cloud computing and the Internet of things, also sets the task of modifying industrial economic systems at all levels in order to create an environment for the balanced and efficient new technologies reproduction.[1,2]

In spite of a considerable scientific papers amount on the subject, the study found a significant amount of unfinished issues in the innovative development field of modern industrial business systems. [3,4] Because the principle of the information technology development implemented in the innovation economy in the digitalization direction leads to the cost model transformation of industrial business systems, providing a reduction in the effective size of the enterprise as a primary economic system.[5]

In the new “digital” economy, the concept of economic growth has been replaced by the concept of economic development related to the process of introducing innovations in all spheres of activity. The problems of ensuring the “innovation” of industrial development and the search for growth drivers for high-tech and high-performance industries to ensure the regions competitiveness come to the fore. At the same time, in view of the apparent transformation of all areas of the economy, the usual "classical"
methods, tools, criteria known in economic science lose their practical importance and there is a need for updating them taking into account the economy digitalization.

The works of R.R. Nelson should be noted as a scientific groundwork on innovation issues. In his book, the author [6] conducts a comparative analysis of innovative technical systems of various countries, ranking them by the level of GDP. The author explores the reasons for the slowdown in Western industrialized countries, as well as the growth of the Japanese economy, linking it with the technological progress achieved. The conclusions made by the author do not lose their relevance to this day.

The impact of innovation on various sectors of the economy, the strategies of firms in a dynamically developing external environment are investigated in J. Utterback [7]. When studying the problems of innovation management, one should turn to the works of classics - Burns & Stalker [8] and Freeman [9]. Such Russian scientists and economists as V.V. Glukhov and A.E. Karlik examined the mathematical foundations of the innovation theory of economic development, as well as issues of innovation management, in detail. V.V. Glukhov [10] considers innovative issues from various points of view. Of particular interest is the study of factors stimulating the innovative development of the national economy. Innovative development at the micro-level - the enterprise level is considered in the works of A.E. Karlik [11]. In the Gariffulin R.F. [12] article provides basic strategies for innovative development. Of interest is the author’s interpretation of the concept of innovative strategy, as well as the directions proposed by the author for further research in the field of managing innovative development strategies of an enterprise in the engineering industry. In an article by Vertakova et al. [14], the dynamics of the innovative development of the Russian Federation in the context of key indicators of innovative activity over a ten-year period is studied. The authors identified the main trends in the country's innovative development, made conclusions about the situation and prospects of Russia, the possibility of transition of its economy to an innovative socially-oriented development model. A comparison is made of the achieved level of the studied indicators of innovative development with the targets stated in the Innovation Development Strategy of the Russian Federation.

The principle of the traditional paradigm of closed business models of the second half of the 20th century was the implementation of centralized (platform-centric) business systems, when each enterprise used its own (proprietary) system of management incompatible with others. [15, 16] The degree of development of information technology caused the supporting role of information support for “manual” business processes (both technological and administrative), which determined a high level of both transformation costs and internal and external transaction costs. All this, in turn, led to an increase in the target size of the enterprise, since in these conditions only large, vertically integrated enterprises with a large amount of resources and a powerful research base could compete in the market. The markets in which such enterprises operated were characterized by inefficient oligopolistic and monopolistic structures. Thus, a significant drawback of the “closeness” of business models is the inefficient (excessive) consumption of resources, since large back-integrated enterprises are characterized by “linking” resources in a volume significantly exceeding the level of their average demand. [17]

The aim of the study is to develop an economic cost model for an innovation-oriented manufacturing enterprise.

The scientific and practical objectives of the study are defined as follows:

- Highlight the main economic problems of the transition of industrial enterprises to digital production and identify ways to solve them.
- Investigate the features of the cost structure of an innovatively-focused enterprise, identify differences from the traditional cost model of a manufacturing enterprise.
- Identify the possible consequences of changes in the cost structure of the enterprise economy.

It should be noted that the solution of the above tasks to improve the methods of economic management of enterprises require significant additional costs of limited resources (time, investment, labor, material, financial resources).
2. Materials and methods
To achieve the goals and tasks of the work, we propose using the methodology of system analysis, methods of econometric, document analysis, survey, content analysis, case studies, knowledge engineering and artificial intelligence, neural network methods of data processing, conceptual and ontological modeling, and intellectual analysis of poorly structured data and semantic analysis of texts.

3. Results
The “information explosion” of the 21st century ensured the emergence of open information systems and global industrial networks, the transition of most business processes into electronic form, as well as the emergence of such phenomena as digital production, the economy of “shared” (shared economy), collective consumption, “Uberization” economics, cloud computing model, distributed networks, decentralized management, etc. [18,19]. Thus, the modern development of information communications provides the ability to build open network-centric (cloud) business systems with a distributed structure, which provides the opportunity to achieve 100% resource efficiency, due to the leveling of excessive consumption during peak periods. In economic terms, the absence of the need to “link” resources in a volume significantly exceeding the level of their average demand leads to a general decrease in the level of fixed costs up to their complete transition to variables. [20] Under these conditions, the neoclassical concept of economies of scale (Figure 1a) loses its relevance, there is both a “change” of transformational and a decrease (in absolute terms to zero) of transaction costs (Figure 1b), and a reduction in the effective size of the enterprise, up to micro enterprises, increasing their mobility and readiness for continuous development.

![Cost model in an industrial economy](image1.png)

![Cost model in an innovative economy](image2.png)

Figure 1- The cost model transformation of an industrial business system in an innovative economy. (where TC is total costs; TCItac is total costs including transaction costs; TR is sales revenue)

The presence and consistent strengthening of all these tendencies that are characteristic of innovative activity leads to a reduction in transformation costs, which in this case cease to be producer costs and become its economy (hereinafter we will keep in mind the following situation: any “failed” costs / expenses represent manufacturer’s savings).

“Economics of innovation” in scientific research and practice is not allocated as an independent direction. At the same time, there is a “related” direction “quality economics”, but no one asks: “how does quality economics ”differ from“ economics of quantity ”- terminology, quality measurement
(qualimetry) are referred to this direction by default, cost classification and composition, methods and standards for assessing the economic efficiency of improving and ensuring product quality, pricing issues.

The economy of innovation is associated with improving the properties of products, with improving its quality. Product quality assurance, i.e. maintaining the achieved level of its properties may require improving the quality of production processes (directly during production or related processes). Therefore, the separation of issues related to the economy of quality also exists as an independent direction. Comparing issues of the economy of innovation and the economy of quality, generally speaking, is not advisable, but we can say that the economy of innovation is an independent direction.

The economy of innovation is aimed at creating new products with high added value - this is how the President and the government determine the goals and objectives of innovation. Value added is a mixed indicator. Maximizing value added is equivalent to maximizing production costs, while in production, as a rule, they strive to solve the inverse problem of minimizing costs, subject to existing restrictions. Therefore, it is no coincidence that few models of economic optimization based on the criterion of value added are known in the scientific literature. One of them is the well-known model of V.V. Novozhilov, which provides solution for maximizing the added value of manufactured products with known resource limitations and restrictions on the amount of financial risk [21].

4. Conclusion

Taking into account the costs changes features in an innovative enterprise, mentioned above it can be assumed that with an increase in sales of innovative products, the fixed costs of the enterprise will increase. Since new products are more capital-intensive, and the amount of fixed costs is directly related to capital investments (the greater the capital intensity of the products, the greater fixed costs). The share of fixed costs in sales can also increase because the variable costs will increase - for new products with high added value, the variable costs are higher. In addition, as mentioned, part of the fixed costs is transformed into variables. Of particular note is the transfer of a portion of variable costs from the enterprise (cloud technology). These trends may lead to lower sales at the breakeven point. This means that those products / projects that are not related to innovations will be more competitive in the market, the enterprises producing them will be in a more preferable competitive position, and vice versa, enterprises engaged in innovative activities will suffer loss of financial stability. Thus, an increase in the share of variable costs also reduces the share of fixed costs in sales.

5. Discussion

A reliable assessment of the innovation influence degree of on the enterprise economy is hindered by insufficient knowledge of the economic mechanism and the lack of development of methods for assessing this impact. The lack of a clear understanding of the economic aspects of the innovation impact on the economic performance of a manufacturing enterprise also affects the enterprise management system, as it impedes the adoption of optimal management decisions. At the enterprise level, this leads to instability of the financial situation and insolvency, at the level of industries and regions - to uneven and unbalanced development, instability of the innovation process, at the level of the national economy - to low rates of development and implementation of innovations, structural and regional imbalances and loss of competitiveness. The solution to all the issues identified in this article represents the direction of further research in the framework of innovative issues.

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