

# Intensification of Innovation Activities of Enterprises Based on Innovative Development Strategies in the Context of the Impact of Industry 4.0

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## Abstract

*On the basis of the research conducted, the article defines the features of economic development, the practical application of innovations and the main factors of influence; researched the essence and trends of Industry 4.0 on a globally, analyzed and identified the main directions of implementation of the Industry 4.0 achievements into enterprises operation, as well as ways to create added value; the development stages of a strategy for innovative development of enterprises proposed by domestic and foreign scientists are reviewed, the development stages of an innovative development strategy in the context of Industry 4.0 are established.*

## Introduction

The question of the innovative activities intensification at enterprises is becoming one of the determining ones in the modern conditions of enterprises' activities, especially considering the constantly growing influence of Industry 4.0. Today it is Industry 4.0 that determines the development trends of most enterprises seeking to create their own competitive advantages and strengthen their positions in the global market. Most of the world's leading enterprises are already actively aligning their innovation activities with the challenges of Industry 4.0, which allows them to find new solutions and achieve the desired results with lower costs and greater added value. Accordingly, there is a need to adapt innovative activities to Industry 4.0, under the influence of which the concept of «innovative development strategy» is formed, which requires further detailed research. An important issue today is to provide an opportunity for domestic enterprises to become worthy competitors for foreign manufacturers, to prove that their products are of high quality, interesting for consumers and comply with world trends. This can be helped by the transition to innovative development, which is advisable to be carry out considering the specifics

## Keywords:

innovation, development strategy, innovation activities, innovative development, enterprises, Industry 4.0, information technologies

of Industry 4.0.

### **Literature Review**

Issues related to innovations have been sufficiently developed and are reflected in the works of Russian scientists, in particular M.D. Lyutoev, E.E. Manokhin. [1], Sukhanova A.S. [2], Osipov V.A., Shashlo N.V., Kuzubov A.A. [3], Maksimenko A. [4,5] and others. However, an unresolved issue is related to the Industry 4.0 conditions impact upon the process of developing a procedure for forming a strategy for innovative development of enterprises.

### **The aim of the article**

The purpose of the article is to determine the stages of developing a strategy for the innovative development of enterprises operating in the conditions of Industry 4.0.

### **Methodology**

While preparing the article, the following research methods were used: system-structural and logical analysis - in the study of the theoretical foundations of innovation and the essence of Industry 4.0; the method of comparative analysis and generalization - when studying the opinions of scientists regarding the stages of forming an innovative development strategy and developing the author's vision of the process of implementing an innovative development strategy.

### **Results**

To understand better the features of the transition to innovative development, it is necessary to consider the main factors of economic development, the main of which, in the opinion, are Bryukhovetskaya N.E., Chernaya A.A. [6], Kuzubov A.A. [7] is:

- availability of its own economic development strategy based on an innovative and investment approach, considering the socio-economic characteristics of the country and timely identification of promising areas.
- political stability, minimization of the procyclicality of politics.
- active state regulation of economic processes with the orientation of reforms towards saving and accumulating capital, creating an attractive investment climate.
- transparency and accessibility of the banking system.
- state support of the national economy development: simplification of bureaucratic procedures and tax pressure, stimulation of entrepreneurship and venture business.
- stimulation of scientific and technological development: financing of research activities, fiscal stimulation of investment and innovation activities of enterprises, development of new high-tech devices, modernization of traditional industries.
- production and export of high-tech products.
- an actively involved component of cultural traditions, a system of spiritual and moral values aimed at the transition of a consumer society to a post-industrial, information society.
- motivation to work.
- a flexible education system that meets the country's strategic goals, investment in human capital, technological development of society.

In addition, we would like to emphasize the importance of increasing the innovative activity at Russian enterprises, as evidenced by some of the factors below Saifudinov B.N., Azat uulu A. [8], Kuzubov A.A., Shashlo N.V. [9], Maksimenko A.N. [5]:

- enterprises are characterized by slow development of effective forms of innovative activities due to economic instability and ambiguity of legislation.

- a significant number of enterprises are not able to introduce innovations at their own expense, and the economic climate does not facilitate the attraction of external capital or borrowed funds.

- the state needs deep structural reforms in the economy.

- most enterprises are characterized by significant wear of fixed assets.

- there is an urgent need to preserve and develop scientific and technical potential and innovative entrepreneurship.

- rapid development of global information resources, automation, and transition to virtual spaces in the process of enterprise reorganization.

- The problem of creating new jobs is urgent.

The problem of innovative development is of relevance in the context of the transition to Industry 4.0.

In general terms, Industry 4.0 assumes deep integration of information technologies into the production process, implemented by building production based on cyber-physical systems, that create virtual copies of objects of the physical world, control physical processes and make decentralized decisions. They can integrate into a whole network, interact in real time, self-adjust, and self-learn. Internet technologies play an important role in the communication between people and machines. Enterprises manufacture products in accordance with the requirements of an individual customer, optimizing the cost of production. Afonina E.V. [10].

The use of engineering methods and tools for the assessment and analysis of performance indicators makes it possible to combine the physical and virtual cybernetic worlds Maksimenko A.N., Simonovich M.Yu. [5].

Thus, Industry 4.0 is a combination of cyber-physical systems, the Internet of things and the Internet of systems, that is, it unites the physical world with the digital one.

The main trends that characterize Industry 4.0 are described by Yu.D. Karpova, M. Bubin. [11]:

- advanced automation and robotics.

- communication "machine-machine" and "man-machine».

- artificial intelligence and machine learning.

- sensory technologies and analytical data.

Note that these trends are influenced by four main factors:

- an increase in the volume of data, computing power and communication.

- opportunities for the development of analytics and business intelligence.

- new forms of human-machine interaction such as touch interfaces, virtual reality systems.

- improved transmission of digital instructions to the physical world such as robotics and 3D printing.

To better understand the areas of influence of Industry 4.0 on enterprises, consider the results of a study conducted by BCG in US enterprises (380 executives of American enterprises of various sizes and different industries were interviewed). According to this study, the main areas in which the positive impact of Industry 4.0 is manifested are [2]: production costs (47%); improving product quality (43%); efficiency of operations (42%); costs in the supply chain (37%); product innovation (33%); time to market (31%); improving customer service (28%); increase in income (28%); a new model of income (13%).

These trends show that businesses need to focus on improving both costs and revenues within the frameworks of Industry 4.0.

A number of businesses have identified and tested some of the ways to create value in the context of Industry 4.0, including: quality improvement; process

optimization; reduction of development costs and work execution time; acceleration of entry to a market; creation of new services.

Summing up, it should be noted that Industry 4.0 is becoming an effective tool for creating added value, and, consequently, increasing the enterprises' competitiveness.

Among the main advantages and opportunities of Industry 4.0:

- Improving communication between consumers and suppliers through access to information about production, logistics and monitoring in real time.

- greater flexibility of enterprises, which is achieved through the introduction of simplified processes and joint open infrastructures that allow the production of differentiated products and services to identify unmet consumer needs, compete in global markets and seize new opportunities.

- strengthening safety in the workplace, in the production process and improving the entire value chain.

- increasing productivity, for example, by automating processes or realization of the possibility for using innovative engineering methods.

- quality improvement, for example, by providing real-time monitoring and quick intervention to prevent errors.

Thus, enterprises that do not want to keep up with the challenges of our time need not only to actively engage themselves in innovations, but also to adapt them to the requirements of Industry 4.0.

The transition to innovative development means the formation of an appropriate strategy of action. Formation of an innovation strategy is a long and complex process, and there is no general universal algorithm of actions. In each case, this is a unique activity. In general, all innovative development strategies can be divided into three groups:

- searchers for needs: strategies focused on involving consumers in the product development process.

- market readers: strategies focused on the gradual introduction of changes to the product.

- change drivers: strategies aimed at introducing significant changes to products.

Each of these types of strategies has its own application requirements and can be adapted by enterprises to their own operating conditions.

Let us consider in more detail the views of Russian and foreign scientists and practitioners on the problem of forming a strategy for innovative development (table 1).

Table 1

*Stages of design of enterprises innovative development*

Author	Stages
Horst G. [12]	<ol style="list-style-type: none"> <li>1. Analysis of the current situation.</li> <li>2. Determination of activities directions.</li> <li>3. Definition of search areas.</li> <li>4. Evaluation and selection of search areas.</li> </ol>
Valitova Sh. M., Khakimov A. Kh.[13]	<ol style="list-style-type: none"> <li>1. Statement of the mission.</li> <li>2. Highlighting the goals of innovation policy.</li> <li>3. Assessment and analysis of the external and internal environment.</li> <li>4. Determination of indicators of innovative activities.</li> <li>5. Analysis of strategic innovative alternatives.</li> <li>6. Determination of the criteria for justifying the choice of an innovation strategy.</li> <li>7. Choosing an innovative strategy.</li> <li>8. Implementation of the innovative strategy.</li> <li>9. Strategy evaluation</li> </ol>
Myllylä J. (2014)	<ol style="list-style-type: none"> <li>1. Setting goals and a strategic approach to innovation.</li> <li>2. Research of consumers and competitors in the market.</li> <li>3. Determination of the commercial proposal essence.</li> <li>4. Assessment and development of basic abilities.</li> <li>5. Installation of innovative technologies and systems.</li> </ol>

<p>Saifudinov B.N., Azat uulu A. [8]</p>	<ol style="list-style-type: none"> <li>1. Definition of the enterprise mission.</li> <li>2. Assessment of the environmental instability level.</li> <li>3. Choice of management methodology.</li> <li>4. Analysis of the strategic level based on the survey results.</li> <li>5. Analysis of the external environment, identification of the strengths and weaknesses of third parties of the enterprise.</li> <li>6. Conducting a SWOT analysis of the enterprise environment.</li> <li>7. Identification of industry development trends.</li> <li>8. Development of an alternative innovation strategy.</li> <li>9. Choosing an innovative strategy for the development of the enterprise.</li> </ol>
<p>Bardovsky V.P. [15]</p>	<ol style="list-style-type: none"> <li>1. Determination of the general concept of the strategy and, within its framework, various options.</li> <li>2. Determination of the company's prospects for each of the areas of activity, assessment of their competitiveness, short-term and long-term prospects for growth in production volumes.</li> <li>3. Choosing the enterprise innovative strategy in all areas of activity, the forming a portfolio of projects of scientific and technical events.</li> </ol>

Source: developed by the authors

Thus, summarizing the approaches to the formation of the innovative development strategy, it can be noted that the opinions of the authors largely coincide. However, it should be noted that Russian scientists propose more detailed stages in the process of an innovation strategy development.

In addition, the authors are united by the fact that the stages of setting a mission / goal, studying the internal and external environment are mandatory, as well as the formation of alternative options for an innovative strategy, allowing you to conduct a deep and comprehensive analysis and choose the best innovative strategy.

Accordingly, considering the stages of designing a strategy for innovative development proposed by scientists and the specifics of the activities of enterprises in the context of Industry 4.0, we believe that the process of designing a strategy for advanced innovative development should contain the stages shown in fig. 1.

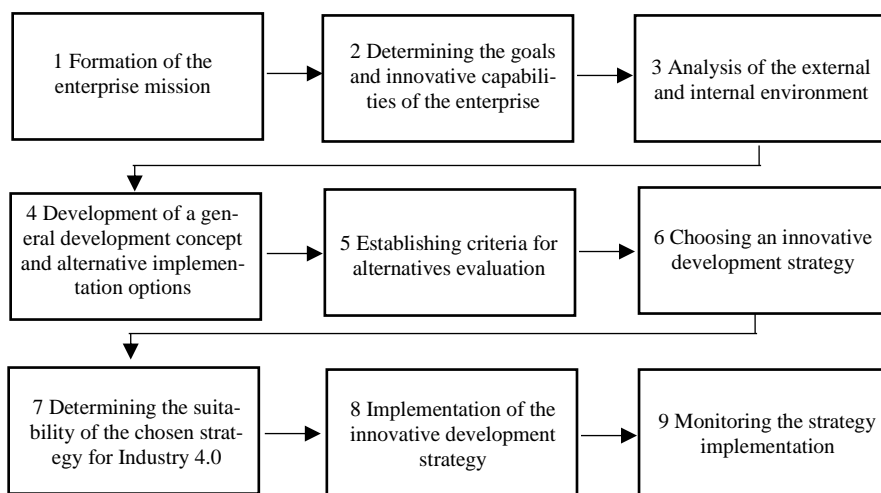


Fig. 1. Stages of designing a strategy for an enterprise innovative development

Source: developed by the authors

Thus, the proposed design stages of a strategy for advanced innovative development simultaneously consider the specifics of conducting innovative activities and the tasks of Industry 4.0.

This allows, first, to ensure a constant search for options to expand innovative opportunities, create conditions for increasing the capabilities of employees, and, secondly, to explore all the interconnections and potential of Industry 4.0 as the main legislator of innovation processes in the 21st century.

### **Conclusions**

The study examined the nature and characteristics of Industry 4.0. The main opportunities and directions for further development, as well as potential directions for introducing the achievements of Industry 4.0 into the activities of enterprises, have been identified. In addition, based on the analysis of approaches and considering the study of Industry 4.0, the stages of formation of a strategy for advanced innovative development are proposed, to which, in addition to the classical ones related to the establishment of the mission, the analysis of the environment, the stages are added, which emphasize the importance of Industry 4.0 as a key factor in ensuring advanced development. Prospects for further research will be aimed at development of methodological approach to determination of the economic efficiency of the implementation of the innovative development strategy into the enterprise's activities.

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