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Approaches to the development a foresight vision of the future in the long term: on the example of the electronics industry

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Abstract

The article shows that the lack of an optimal choice of priorities can become a significant limitation for the development of the national economy, especially if the industry under study is an infrastructure-significant electronics industry. It is shown that in order to solve the presented problem through a meta-analysis of modern approaches to the use of foresight technologies, the author proposed the concept of an algorithm that determines the sequence of stages in the formation of a vision of a future change in the technological cycle of the telecommunications industry. At the same time, it is shown that based only on the combination of economic-mathematical or expert methods, it is impossible to form an objective forecast about the economic and technological development of the industry. In conclusion, the article substantiates the need to form approaches to taking into account industry specifics when forming a strategic vision for the development of the national economy sector, which can become the basis for choosing an institutional model of state support for the real sector of the economy. This article states that the modern institutional model for the introduction of innovative technologies has significant limitations, largely related to the lack of a strategic vision for the technological development of the industry.

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Keywords

Foresight technologies, technological cycle, electronics market technological innovations, strategic vision.

Introduction

From the most general positions, the level of economic development can be judged on the basis of a system of indicators that determine the state of innovation activity. These include, for example, the level of introduction of high technologies, the development of knowledge economy institutions. Obviously, the development of the real sector of the economy in general and the provision of economic growth in particular is the result of various factors. At the same time, not only indicators of production volume are very significant, but also the qualitative characteristics of products, the efficiency of the structure of the economy, as well as other sources that characterize the formation of additional profit.

Forecasting the development of the electronics industry is a complex task that involves a large number of factors. Some of the features of forecasting in this area include factors such as:

- rapid development of technology, since the electronics industry is one of the most dynamic and rapidly developing in the world, new technologies and products appear on the market all the time, which makes forecasting difficult;

- global nature of the industry, since electronics is a global industry that depends on many factors, such as the economy of different countries, the political situation, changes in legislation, etc.;

- high level of competition in the electronics industry, as its level is very high and can affect supply and demand in the market;

- large number of factors affecting demand, such as economic conditions, technological innovations, changes in consumer preferences, etc.

In general, forecasting the development of the electronics industry is a complex task that requires taking into account many factors and constantly monitoring changes in the market, so the development of foresight vision technologies is a very significant area of research.

Main content

According to a number of expert opinions, the future of the economic system, first of all, depends on the choice of the most effective scenario for scientific and technological development. To date, many scientists have come to the conclusion that alternative directions for innovative development are the following: import of technologies or development of own technologies in the system of the national economy [Chan, Daim, 2012].

In most countries, research and development is carried out to some extent, as well as the fact that even the most high-tech developed economies borrow technologies. Based on this, in order to select the optimal development model, it is necessary to predict various options for technological development, which should reflect not only an assessment of the possibilities for developing existing and creating innovative technologies as such, but also, to a greater extent, the effectiveness of their implementation, the impact of institutional conditions on attraction of domestic and foreign investments. At the same time, it is obvious that each of the presented alternatives is not used in all types of economic activity [Havas, Schartinger, Weber, 2010].

According to the author, scientific research in this area should be carried out in relation to the development of a methodology for predicting the transformation of approaches to the development and implementation of innovations in high-tech industries of the real sector of the economy, which, first of all, is the electronics industry. In modern macroeconomics, it is a proven fact that the influence of the technological cycle of the development of new technologies is the cause of cyclical phenomena in the economy. That is why technological forecasting of their occurrence is significant not only for an

individual company or industry, but also for the national economy as a whole [Martin, 2010].

A significant number of studies show that the institutional model of technology transfer in the global economy is not effective [Anderson, 1997; [Battistella, De Toni, 2011; Havas, Schartinger, Weber, 2010; Meissner, Gokhberg, Sokolov, 2013].

The institutional model of technology transfer is a system of organizations and processes that help transfer technologies from their sources to consumers [Martin, 2010]. This model includes elements such as:

- research institutions that are the source of new technologies that can be transferred to other organizations;
- commercial organizations that can acquire the rights to use technologies from research institutions or develop their own technologies;
- technological parks that create space and infrastructure for the development of new technologies;
- investors, which are organizations or individuals who invest money in technology development, research projects, start-ups or commercial organizations;
- government organizations that can play an important role in technology transfer by providing financial and legal support to research institutions, commercial organizations and technology parks.

The institutional model of technology transfer helps to accelerate the development of new technologies and their transfer to the market, which contributes to economic growth and the improvement of people's quality of life. In this regard, it is necessary to select tools for technological forecasting of the technology introduction cycle in various industries, including in such significant infrastructure sectors of the economy as infocommunications.

For the conditions of developing economies in such countries as China or Russia it is especially relevant to search for solutions in the field of strategic management of the innovative development of individual industries in order to determine the most effective way of innovative development.

One of such solutions is the technology of foresight research, which is increasingly used to determine the forecast for the development of various socio-economic systems. To solve the problems of technological forecasting of the economic and technological development of the electronics industry within the framework of the national economy, it is necessary to use technologies that allow us to formulate a vision of the future, as well as to identify hidden patterns in the processes of economic development of the industry, both in the field of production and in terms of demand for products.

The peculiarities of applying the results of foresight studies are not the presence of a definite answer received in the form, for example, of the value of specific quantitative indicators. More significant in this method is the identification of a vision of the upcoming structural changes, often going beyond the initial setting of the goal of forecasting. At the same time, the technology of forming a vision of the future is constantly evolving through the inclusion of new tools and methods that allow taking into account the characteristics of the object of study. The conceptual basis of foresight research is the monitoring and analysis of the opinions of leading experts regarding the development of various types of socio-economic systems and technologies, as well as the impact of these systems on society.

The development of tools that allow solving applied problems of a particular industry is the most relevant direction in the development of foresight technologies used in various fields. However, to a greater extent, their application is relevant in relation to the future of the real sector of the economy as a whole, or a separate socio-economic subsystem, such as a separate industry [Rohrbeck, Gemünden, 2011].

A significant number of studies show that the most widespread, depending on the goals of determining the vision of the future and the methodology used, are the following foresight research

approaches: assessing the likelihood of new technologies, technological business intelligence, predicting the development of technologies, determining the most promising options for the development of technologies [Meisner, 2012].

Public authorities, as well as research organizations and companies, use foresight technologies by assigning certain types of management actions to them. As a result of using this technology, the end result can take the form of both an answer to specific questions and broader formulations.

The following models are used to predict further development [Chan, Daim, 2012]:

- big data analysis and artificial intelligence methods (modeling);
- assessment of the level of statistical indicators of risk;
- correlation and regression analysis (statistical analysis);
- modeling of growth curve (trend analysis);
- Delphi method and focus groups (expert assessments);
- method of "road map";
- scenario method;
- economic analysis;
- assessment of the regulatory impact of public authorities;
- analysis of sustainable development (institutional analysis).

To obtain a vision of changing the stages of development, diffusion and replacement of innovative technologies in the electronics industry, it is necessary to apply a combination of these technologies that most fully meet the objectives of the study.

The technological cycle for the production of high-tech services, which include electronics, depends on factors such as the impact of government regulation; level of investment attractiveness; investment size; the development of technologies both in the market itself and in related markets that provide the infrastructure for the provision of services of the telecommunications complex.

In turn, electronics products are a key industry for other types of economic activity, while its importance in the modern economy is only increasing.

According to the analysis of modern research, in international practice it is incorrect to use such methods in relation to the production of electronics, where development processes are not linear, and the use of some technologies is actually completely replaced by others. Predicting transformations in the economy and technology in this area, using economic and mathematical methods, is very difficult. The reason for this is the need to use a more complex economic and mathematical apparatus, including those associated with the processing of big data, which significantly increases the need for a significant reduction in the number of research hypotheses and consistency in interpreting the results.

Conclusion

In the practice of modern management of the development of industries or individual companies, a vision of the most likely direction of economic and technological changes is a source of future profitability in the short and long term. At present, elements of the vision of the most probable direction of technological changes are given in the reports of public companies, and are used by public authorities when searching for an institutional model to support the development of the real sector of the economy. Therefore, the search for new methods and tools for algorithmizing the formation of a predictive vision, the application of a sequence of technologies, including those including methods and tools of big data and artificial intelligence, is the direction of further scientific research.

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Подходы к разработке форсайт-видения будущего в долгосрочной перспективе: на примере отрасли электроники

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Аннотация

В статье показано, что отсутствие оптимального выбора приоритетов может стать существенным ограничением для развития национальной экономики, особенно в случае, если исследуемой отраслью является инфраструктурно значимая отрасль электроники. Показано, что для решения представленной проблемы посредством мета-анализа современных подходов к применению форсайт-технологий автором предложена концепция алгоритма, определяющего последовательность стадий формирования видения будущего изменения технологического цикла отрасли телекоммуникаций. При этом показано, что на основании исключительно совокупности экономико-математических или экспертных методов

невозможно сформировать объективный прогноз об экономическом и технологическом развитии отрасли. В заключение статьи обоснована необходимость формирования подходов к учету отраслевой специфики при формировании стратегического видения развития сектора национальной экономики, который может стать основой для выбора институциональной модели государственной поддержки реального сектора экономики. В данной статье говорится о том, что современная институциональная модель внедрения инновационных технологий имеет существенные ограничения, в большей степени связанные с отсутствием стратегического видения технологического развития отрасли.

Для цитирования в научных исследованиях

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Ключевые слова

Форсайт-технологии, технологический цикл, рынок электроники, технологические инновации, стратегическое видение.

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