Technological audit in the system of tools for assessing the innovative potential of technology transfer

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Abstract. The article deals with issues related to technology transfer. It is substantiated that in order to ensure the sustainable development of the Russian economy, it is necessary to organize the process of technological transfer between the subjects of innovation activity. It was revealed that technological audit is a demanded procedure that allows to give an objective assessment of the level of technological development of an economic entity, identify problems and reserves to increase technological potential.

Modern economic realities pose for commercial organizations the task of finding and introducing new innovative mechanisms and technologies into production and management processes. In this regard, it should be noted the increasing role of such areas of auditing as a technology audit. According to E. B. Vokina technological audit is an expert assessment of the existing technological solutions of the whole production, its separate divisions, individual technological solutions and recommendations on the complex of technological solutions aimed at improving the competitiveness of a particular production [2].

The purpose of technology audit is to evaluate the economic entity in terms of innovation from various points of view:
1) analysis of problems of a general type requiring solutions of an innovative nature: productivity, energy consumption and energy efficiency, environmental friendliness, quality control, flexibility, etc.;
2) definition and analysis of markets that can contribute to the sustainable and competitive development of the company;
3) product positioning and analysis of the range that ensures maximum profitability of sales;
4) the study of technological areas requiring priority attention: information technology, automation, logistics, packaging, etc.;
5) research on methods of technology transfer - corporate training, technical assistance, technology partnership (at the international and national level), intellectual property rights, patents, etc.;
6) analysis of the channels and sources of innovation and relations that require development: contractors, research organizations, educational and research institutions, technical centers, marketing organizations, etc.

In other words, the purpose of a technology audit is to assess the technological potential of an economic entity.

Technological potential is part of the production and innovation potential and is a complex economic category that characterizes the various possibilities of technical and technological resources of an economic entity in accordance with the goals of its development [4, c. 39].
At the same time, in an innovative economy, a technology audit solves the following major tasks:

1) assessment of the state and efficiency of the use of technological tools and objects of labor;
2) determining the competitive positions of the economic entity and markets for the sale of new types of products (goods, services);
3) analysis of the capabilities of the economic entity in the implementation of innovations and, at the same time, the determination of financial needs and opportunities;
4) development of expert proposals for the introduction of promising and (or) advanced production technologies or proposals for improving existing technologies in order to reduce their labor intensity, improve quality and reliability;
5) evaluation of priority technological areas of innovative production (production automation, use of new information technologies, ecology, energy, etc.).
6) the development of expert proposals on the feasibility of the introduction and (or) development of certain types of production, maintenance and development of individual technologies and the development of industrial cooperation;
7) development of technological solutions and feasibility studies for projects of technical re-equipment;
8) making proposals for the acquisition of modern equipment or modernization of existing technological equipment [5, p. 18] [3, p. 35].

Technological audit can be both internal (conducted by the forces of an economic entity within the framework of internal audit / control) and external (carried out by third-party specialized organizations and audit companies). At the same time, an external technology audit can provide a much more objective basis for making relevant decisions. At the same time, technology audit can be both voluntary and mandatory.

Currently, the national standard “Technology Transfer. Technological audit ”GOST R 57194.3-2016 (hereinafter - GOST 57194) [1].

According to GOST 57194, a technology audit consists of the following mandatory steps:
1) preliminary preparation and planning;
2) the implementation of the audit;
3) registration of results;
4) acceptance of the reporting documentation (results) by the audit client.

At the stage of preliminary preparation and planning the following tasks are solved:
1) formation of a working group of auditors and distribution of work;
2) obtaining information about the organization being audited - the subject of the audit;
3) analysis of primary information;
4) preparation of a plan and technology audit program;
5) coordination of the audit procedure with the subject of the audit.

GOST 57194 recommended form of self-assessment of the organization, formed on the basis of primary information about the subject of verification. On the basis of this assessment, a chart is constructed based on the scores of the key indicators of the questionnaire, on the basis of which the final picture of the technological development of the subject of verification is formed (recommended forms are also attached to GOST 57194). The deviation analysis allows to identify the strengths and developed sides of the subject of the audit and elements that require additional attention during the process of technological audit.

Technology transfer (TT) is a long-term and rather expensive process. Due to the fact that the initiator of technology transfer (the author or owner of the technology), as a rule, has an overestimated idea of the value of his invention, there is a need for an objective assessment of the potential of a particular direction of innovation activity. In the Russian context, when only a few entrepreneurs have an idea about the features of innovation, the problem of ensuring the objectivity of the assessment of the feasibility of the development and implementation of innovations becomes particularly acute. The leaders of the organizations have a question: are they capable.
Do they fully participate in the innovation process and act as a source or recipient of new technologies?

In many cases, specialists of organizations are not able to independently initiate the process of transferring knowledge and technology, which, according to the author, is the main problem of the Russian innovative business. In order to avoid monetary and other losses, TT should be preceded by a technology audit, which is the process of an objective assessment of the potential of innovation.

The greatest problems arise with the technological transfer from educational and scientific laboratories. One of the main conditions for a successful technological audit is the interest of the management of the customer organization in conducting such an event and the paid order of its holding. Another condition is that employees of the organization should be informed about the objectives and methods of the audit. At the preliminary stage of the technological audit, key employees of the company are subjected to sociological testing in order to identify strengths in their work. The final assessment of the technology is made with the participation of its author or developer.

The choice of evaluation criteria directly depends on the purpose of the audit, as well as on the industry to which the organization being audited belongs, on the business environment of a region or country, and on the specific conditions of the external socio-economic environment. In the general case, an innovative technology can influence (in its development) on various aspects of the existence and activities of this particular enterprise, as well as the specific author of the innovation. Therefore, the accents and relative weights of technology assessment criteria can vary over a wide range.

The main indicators of "survival" of a particular technology can be considered as the degree of its readiness for transfer, ie, further development, and the degree of commercialization. For the convenience of a qualitative assessment of the potential of a technology, it is possible to compile an evaluation matrix containing the main criteria for all the expected technological directions.

The following criteria for assessing the potential for technology commercialization are proposed for use: a reasonable cost of commercial development; the possibility of obtaining on its basis a number of products; market availability; competitive advantages; industrial technology has been or is being implemented. The criteria for assessing the potential of the TT include: the degree of technology readiness for transfer; having a group that can help in the development or transfer of technology; market demand for technology; reasonable time commercial development; the presence of actual or potential successors to the technology or license.

The matrix for assessing the potential of technology commercialization / transfer allows you to quantify the potential of each technology and identify the most preferred areas of activity of an innovative enterprise. As for the system of such assessments, different sources suggest different methods. The most widespread assessment on a 10-point scale. The highest score (10 points) implies full compliance of technology with a specific criterion, and the smallest (0 points) - complete discrepancy. Further

Estimates are summed up, and they are summarized by all technologies, on the basis of which a recommendation is formulated on the preferences for TTs that score maximum points.

It should be noted that this assessment method is based on a linear convolution of indicators, which does not allow us to characterize it as properly objective. A situation may arise when a certain technology, the product of which is not demanded by the market (has a low rating according to the relevant criterion), will receive a higher total score than the alternative technology, the product of which is in high demand due to high ratings on other parameters. As a result, such a summation of points may give the wrong direction in the development of the company, which will lead not only to financial losses, but also to wasting time. Both that, and another in the conditions of financial crisis and in the presence of a rigid competition, undoubtedly, will put the organization in a difficult situation.

Thus, the question of a rating system requires more detailed study. In order to obtain an objective assessment, it is necessary to use a larger number of criteria. In the final assessment, it is necessary to consider the degree of influence of each criterion, that is, its weight content in the total number of points. Obviously, for different activities, the degree of influence of each criterion will be different. Therefore,
one of the conditions for using the method we are considering is participation in the process of assessing a sufficient number of experts and taking into account local conditions.

To increase the versatility of this evaluation method can be as follows. For the most promising areas of innovation, it is necessary to identify a group of evaluation criteria that are common to each direction, and set a fixed scale for their assessment. Thus, when examining a particular organization, the criteria for assessing the transfer/commercialization potential will consist of two subgroups - general and local (taking into account specifics of the organization, regional innovation environment, etc.) criteria.

Technological audit should be an element of the system of regular management in the organization, at the same time acting as a tool for the formation and implementation of a technology strategy.

In addition to a matrix for assessing the potential for transferring a specific technology, there is an alternative way to select an organization’s priority direction for development, known as the technology portfolio analysis. The main goal of this analysis is to classify all the technologies used in the organization and determine priorities and prospects for their further development and use. The results of the analysis provide a clear idea of which of the technologies used in the organization should be further developed, and which technologies should be allocated additional financial, scientific, technical and other resources.

This stage of technological audit is focused on identifying the most efficient technologies which should form the basis of the technological strategy of the enterprise. Analysis of the technological portfolio of the company is a type of matrix analysis, which is actively used in the formation of the business portfolio of diversified companies. The results of such an analysis are taken into a matrix or graph (see Fig. 1), the axes of which are, in general, the importance of technology (i.e., their relative efficiency, performance compared with the corresponding reference technology) and the organization's position regarding the application of these technologies (strong or weak positions) [3].

The most important and attractive technologies fall into the upper quadrants (I and II), and the least significant and promising ones fall into the lower quadrants (III and IV).

At the same time, technologies found in the left quadrants (I and IV) are characterized by the weak positions of the organization in terms of the application of the solutions in question, and for the technologies of the right quadrants of the tasks facing the production. In the framework of the first stage of the technological audit, a customer’s team is visited by a team of 2–6 executor’s specialists. The tasks of these specialists include preliminary familiarization with the customer's production and personnel, working out further interaction, analyzing the existing equipment (composition, quantity, technical condition and organization of service). Specialists are also acquainted with the preparatory production, the organization of design and technological preparation of production, ensuring the functioning of production, etc.

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