

Specific Aspects and Resources of Knowledge-Intensive and High-Tech Productions



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Abstract: *It is difficult to overestimate the importance of modern knowledge-intensive and high-tech productions for the economic growth of this country. The knowledge-intensive and high-tech industries are considered to be the basis for innovation-driven development and economic security of any country in the current environment.*

This article studies specific aspects of development of knowledge-intensive and high-tech productions, results of their functioning and specifics of activities with particular focus on the issues of resource allocation for the research and production activities of modern enterprises in this sector of the economy. The article analyzes the current accumulated problems in the field of resource allocation in order to further identify opportunities for their early resolution. The results of the student survey aimed at studying their opinions concerning the existing technical education problems are presented.

Keywords: *knowledge-intensive and high-tech productions, research and production activities, resource allocation, problems, student survey.*

I. INTRODUCTION

Knowledge-intensive and high-tech productions should be referred to as the industries that manufacture products by implementing advanced innovative technologies.

The innovative technologies for such industries are the indicator of their efficiency, the basis for their long-term functioning.

The knowledge-intensive and high-tech production enterprises are capable to successfully and efficiently develop and function even despite the acute rivalry and potential economic instability.

Activities of the knowledge-intensive and high-tech enterprises are characterized as versatile and often intersectoral.

Revised Manuscript Received on January 30, 2020.

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The importance of the knowledge-intensive and high-tech productions for the economic growth of the country is determined by the following indicators [1, 2]:

- Work is carried out with financial support (from the state funds);
- Higher wages of employees;
- Intensive innovation activity of such enterprises, which contributes to the extension and creation of new markets and more efficient use of resources;
- A greater share of added value in final products (it contributes to higher employment and wages of employees);
- Growth rates exceed those in other sectors of the economy (by 3 to 4 times);
- Large product export volumes;
- Results of research and development activities carried out in the sectors in question contribute to the accelerated development of other sectors.
- The Organization for Economic Cooperation and Development uses two criteria to classify an enterprise as a high-tech knowledge-intensive production [3] as follows:
- Intensity of use of modern technologies in the production process;
- Knowledge intensity of the final product is defined as exceeding a certain level of the ratio of research and development (R&D) costs to the output volume, added value or value of the main factors of production.

II. THE FEATURES OF THE KNOWLEDGE-INTENSIVE AND HIGH-TECH PRODUCTIONS

Modern economic science distinguishes the following features of the knowledge-intensive and high-tech productions [4]:

- High percentage in the total volume of scientific and technical products (up to 90%) the main part of which is the results of research and development activities;
- Production of single samples of the developed products (limited production volumes) and the need to make significant changes in their design; this reduces the life cycle of the manufactured products;
- Significant share of specialized productions and unique equipment;

- Long cycles of development and creation of new technical facilities, implementation of large programs, production of prototypes and production-line items;
- High requirements to the quality of the manufactured products and to the quality of the materials delivered to the enterprises;
- Considerable volume of parallel works (experimental development, production and modernization of machinery);
- Continuous improvement of the technology level, and predominant use of the latest achievements of science and technology for production;
- Production of special-purpose products for the state that is the only customer of such products and that determines the need for these products, finances and regulates their production (more than 70% of the production of high-tech enterprises);
- Significant share of highly qualified personnel (industrial and production personnel and engineers and technicians) in the total number of employees;
- High percentage of intellectual property (as part of the company's assets in the form of patents, licenses, copyrights for inventions, utility model, etc.);
- Presence of innovative products;
- Carrying out research and development activities at different production process stages and their results;
- Increased risk of implemented projects is associated with the development and implementation of new high-tech products.

Therefore, the results of functioning of the knowledge-intensive and high-tech productions are as follows [5, 6]:

Creation of high-tech products or services and introduction thereof to the market,

Availability of more expensive, high-quality resources,

Much higher added value,

Opportunity for more intensive participation in trade in the world market of high-tech goods (increased export of high technologies, goods and services),

Growing competitiveness of traditional industries (due to the transfer of new technological solutions, equipment and management models from the high-tech sector).

Based on the foregoing, a requirement to carry out continuous research and development is one of the specific aspects of the knowledge-intensive and high-tech productions; this leads to additional costs and necessitates the involvement of such a category of personnel as scientific personnel.

In this regard, it would be reasonable to discuss the resources of the knowledge-intensive and high-tech productions, including those required to carry out research and production activities.

III. THE RESOURCES OF THE KNOWLEDGE-INTENSIVE AND HIGH-TECH PRODUCTIONS

In general, the resources of research and production activities as well as production activities can include [7]:

- 1) Technological resources;
- 2) Financial resources; and

3) Human resources.

However, there are also some specific features of resource allocation for the research and production activities of the knowledge-intensive and high-tech enterprises.

The first feature is the use of various information technologies and resources in the research and production activities; this contributes to the constant development of information resources in organizations and enterprises.

The second one is that the research and production enterprises are a form of integration of science and production. However, in order to ensure the effectiveness of such integration it is necessary to have high intellectual, technological and financial potential which is determined by the resources allocated for the enterprise's activities.

The third feature is closely related to the specificity of the resources used in the research and production activities. These are new knowledge, new ideas, new scientific theories and concepts that are partly the result of scientific studies on the one hand and the effective use thereof in the implementation of high-tech projects on the other.

Let us discuss in more detail the specific aspects and problems of resource allocation for the research and production enterprises.

Basically among the problems of technological resources are the problems of equipment wear and tear (due to the lack of investments in retooling and modernization) as well as the problems of introduction of new production technologies.

As to financial resources, the issue of correlation of needs with the real capabilities of the budget, identification of additional sources and methods of financing the programs of development of enterprises remains topical at the present time.

Human resources have been a sort of connecting link between other resources (for example, various technological and technical decisions to perform research and production activities are made by personnel, equipment for research and production activities is used by personnel, amount of funds is distributed for orders that are fulfilled by employees of the enterprise, etc.). Thus, all the above mentioned resources have a meaningful effect only when integrated with the human resources.

Human resources are considered to be the most problematic issue at the modern knowledge-intensive and high-tech enterprises [4, 8].

Human resources are understood as an appropriate number of personnel with relevant qualifications, contributing to the implementation of research and production activities of the enterprise. And it would be necessary to distinguish two subgroups of personnel, according to the main types of operations performed by the enterprise, such as:

- A research group that carries out applied research and development activities;
- A production group that carries out the production process.

It can be noted that although the enterprises have the appropriate total number of employees, still there is a lack of professional engineering staff and middle-ranking managers.

IV. RESULT AND DISCUSSION

At the present time, the current problems in the provision of human resources for the research and production enterprises in the Russian Federation are basically caused by the following [4]:

- 1) Low level of wages as compared with representatives of some other professions;
- 2) Turnover of young staff and middle-aged labor force (in particular, and as a consequence of low wages, as well as due to poor adaptation to specific work environment);
- 3) Unwillingness and unreadiness of graduates to work in the chosen profession (partly due to the low prestige of the profession).

It can be noted now that on the one hand the state is interested in having technical specialists and on the other hand young people are becoming less interested in technical professions. This contradiction necessitates studying the problems and identifying the prospects of modern technical education in Russia.

In order to study the opinions of modern students concerning the existing problems of technical education, a survey was conducted [9]. In the course of the survey conducted in 2017 (using a mass survey method) 162 questionnaires were collected. The 1st to 4th year students of the RTU MIREA participated in the survey.

The respondents to the survey expressed their opinions on the existing problems of higher technical education. Let us discuss the results (Fig. 1).

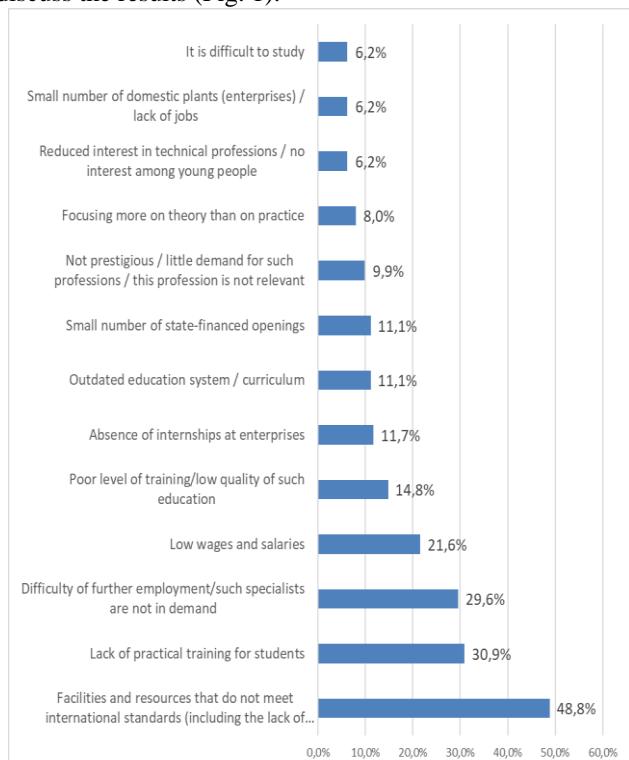


Fig. 1. Main problems of higher technical education (according to contemporary students, In % of total number of respondents)

Almost half of the respondents (48.8%) believe that the old facilities and resources is the main problem. When respondents pointed out that the equipment and facilities lag behind the world standards, they wrote not only about the special equipment for laboratory classes, etc., but also that not

all the classrooms are equipped with the equipment required to ensure better learning outcomes (interactive whiteboard, projector, and up-to-date software). About one third of the respondents (30.9%) mention the lack of practical training for the students at the manufacturing enterprises. And 29.6% of the respondents think that it is difficult to find a job in their specialty and 21.6% mention low wages.

It should be noted that the survey was conducted in 2017 and at the moment the problems with the purchase of modern equipment for students and with the equipment of classrooms are being intensely addressed. Such problems have been identified in order to define the opportunities and the ways to solve them.

V. CONCLUSION

The current situation and survey data also show that modern technical education needs modernization (including improvement of the quality of education). Training of highly qualified specialists that can be fully attributed to the new generation of the Russian scientific and technical intelligentsia with their best traditions, love for the country and desire to work and create for the sake of the country's prosperity is one of the most important factors of improving the required level of safety and accelerating the pace of modernization in the country [10, 11].

As was mentioned above, one of the staffing problems is the issue of lack of middle-ranking managers. It is important to focus here on the compliance of the managerial personnel with modern requirements and their commitment first and foremost to the innovative development of production, increase of its efficiency through constant comparison of the achieved results and the costs for achievement thereof and to the minimization of such costs [12].

Based on the foregoing, one can say that further development of the knowledge-intensive and high-tech enterprises in the Russian Federation is associated with the training of highly qualified specialists, raising the prestige of technical areas of education and technical professions and raising the level of remuneration.

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