Improving the management efficiency of machine-building enterprises (on the radio industry example)

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The article is devoted to research of problems of the mechanism development for the machine-building enterprises management (on the example of the radio industry corporations) in the process of vertical and horizontal integration. These problems include: the lack of a unified approach to understanding the content development process of the corporate governance mechanism of high-tech production businesses, the universally accepted methodology of diagnostics of corporate governance mechanism of knowledge-intensive scientific and industrial corporate entities, models of increase of efficiency of integration processes. The economic essence of the categories "knowledge-intensive corporate education" and "corporate governance mechanism" is clarified. An algorithm for developing a mechanism for managing integrated corporate entities in mechanical engineering has been developed. The study proved the positive effects of integration processes on the effectiveness of engineering corporations and determines the direction of development of the mechanism for managing knowledge-intensive corporate entities; vertical integration, horizontal consolidation of the relationships of participants in scientific and industrial corporate entities. The effectiveness of the development of the management mechanism of integrated research and production corporations of the radio industry is determined by quantitative and qualitative assessment of the effectiveness and efficiency of partnerships using a multi-factor system of generalizing and specific indicators. The theoretical and practical significance of the work consists in the classification of methods and tools of corporate governance, the development of approaches and principles for the integration of corporate structures, the possibility of using the proposed developments in the development of corporate governance mechanisms in mechanical engineering.

1. Introduction
The problem of corporate governance of machine-building enterprises is relevant both for the national economic system of Russia and within the framework of global trends in economic development. In Western countries, the integration of research and production complexes is accompanied by a decrease in the intensity of competition in the domestic market and the desire to participate more actively in the system of international division of labor and foreign economic cooperation. Russian science-intensive engineering corporate entities participate in global competition, increasing their research and production potential to the level of foreign companies in the context of expanding support measures for
manufacturers of the latest civil, military and dual-use products. According to the strategy for the development of the radio and electronic cluster as an advanced knowledge-intensive industry sector, its revenue can increase by 22.5% per year due to the creation of new products and the integration of companies in priority market segments.

The tasks of corporate governance in the domestic machine-building industry include: development of sales markets and production factors, diversification of activities, attraction of partner capital, creation and strengthening of horizontal business cooperation. The importance of corporations for the national economic system and the urgent need to develop corporate governance mechanisms in mechanical engineering have determined the relevance of this research area.

The purpose of the article: based on the study of theoretical approaches to the problems of corporate governance and analysis of corporate entities in mechanical engineering, to offer recommendations for improving the effectiveness of the mechanism of corporate governance of machine-building enterprises.

The article has the following structure. Analyzes the concept of corporate governance, the development trends of vertical and horizontal integration in Russia, the technique of analysis of corporate entities in engineering, approach to the choice of strategic alternatives of development of integrated corporate structures, recommendations for the assessment of the effectiveness of the process of integration of corporate entities radio industry. In conclusion, the main conclusions are indicated, and the theoretical and practical significance of the research results is determined.

2. Analysis of the "Corporation" concept

Different authors reveal the content of the category "Corporation" through the following characteristics (table 1, compiled by the authors): the form of business, ownership, legal status, concentration of management functions in the hands of professional managers, diversification of production and sales, the presence of a wide network of relationships and partnerships, the size of integrated structures.

| Approach                                    | Essence of the approach                                                                 |
|---------------------------------------------|----------------------------------------------------------------------------------------|
| Size-based approach [1, 2, 3]              | Corporation - an effective and socially responsible monopolist in the market that successfully uses the economies of scale |
| Integrative approach [4]                   | Corporation - an Association of enterprises to participate in a single production cycle |
| Entrepreneurial approach                   | Corporation - an Association of creative individuals in the era of digital technology distribution |
| Interaction-based approach [5]             | Corporation - a complex of hierarchical and functional relationships                    |
| The approach is based on the ownership relations [6] | Corporation - a complex of commercial and non-profit organizations                        |
| An approach that takes into account the company's business structure [7] | Corporation – a legal entity with a share of the authorized capital                     |
| Approach based on the corporation contractual nature [8] | Corporation - a set of agreements between stakeholders                                   |

As a result of the analysis of table 1, it can be concluded that in a post-industrial society, a corporate entity is a commercial organization that arose as a result of the inability of individual enterprises that are part of it to provide a sufficient degree of concentration of equity capital.

The basic economic characteristics of corporate education, due to its size, are: effective conversion of factors of production into competitive products, a variety of market strategies used, search and use of reserves for cost optimization, and improving performance.

Integrated corporations contribute to the coordination of multidimensional relationships of counterparties in an innovation-oriented economy. The creation of strategic groups, integration and quasi-integration of industrial corporations can be considered as one of the stages of business development that aims to form a stable basis for economic growth. Integration processes are studied at the micro-and macro-levels. R. Kose understands integration as a mechanism for reducing transactions
due to organizational and structural transformations [9]. In [10], it is indicated that integration is a stage in the development of productive forces that increase the efficiency of intersectoral interaction. In [11] it is stated that integration is a combination in order to achieve maximum competence in each area of specialization of the merging subjects.

The goal of corporate governance is to increase shareholder value. In [12], this type of management is defined: "Corporate governance is considered as an economic system that includes a number of components-subjects of financial interests united by intra-organizational ties." Corporate governance is an organizational model for regulating relations between company managers and their owners, which makes it possible to clarify the goals of various stakeholders to ensure the effective functioning of the enterprise. The corporate governance models used in Russia are mixed. It should be borne in mind that most Russian corporations clearly develop a close relationship between the socio-economic status of the region and the development of corporations on its territory. The object of empirical research is knowledge-intensive industrial corporate entities (for example, the radio-electronic industry).

To consolidate radio and electronic industrial enterprises, form a unified policy of scientific and technical development, and improve their financial health, the “Roselectronika” holding was created. It is part of the strategic dual-use and defense assets of the state Corporation “Rostechnology”. “Roselectronika” includes 56 joint-stock companies. Diagnostics was performed (table 2, compiled on the balance sheets, profit and loss statements for five years from 2015 to 2019) of the management mechanism of high-tech corporations of the radio industry of the Saratov region.

### Table 2. Organizational and management indicators of “Contact” and “Almaz”.

| No | Indicators | Years | 2015 | 2016 | 2017 | 2018 | 2019 |
|----|------------|-------|------|------|------|------|------|
|    | “Almaz”    |       |      |      |      |      |      |
| 1  | Number of employees, people | 1649 | 1680 | 1694 | 1838 | 1818 |
| 2  | Percentage of administrative staff | 0.10 | 0.11 | 0.11 | 0.12 | 0.12 |
| 3  | Net profit per administrative employee, thousand rubles | 152 | 118 | -160 | -136 | 132 |
|    | “Contact”  |       |      |      |      |      |      |
| 1  | Number of employees, people | 3004 | 2837 | 2766 | 2596 | 2293 |
| 2  | Percentage of administrative staff | 0.8 | 0.10 | 0.8 | 0.9 | 0.7 |
| 3  | Net profit per administrative employee, thousand rubles | 80.54 | 3.19 | -603.74 | -512.51 | 395.77 |
| 4  | Labor remuneration Fund (without social insurance contributions), thousand rubles | 391210 | 415762 | 413538 | 404429 | 377283 |

According to table 2, it was found that during 2015-2019, the share of administrative and managerial personnel increased by 20% at the “Almaz” enterprise and decreased by 11% at the “Contact”, which is due to changes in the management mechanisms of industrial corporations, the complexity of intersubjective relations of integrated organizations, which makes it difficult to make and implement management decisions. A significant share of management personnel in the list of employees (from 0.08 to 0.12) is largely due to the complexity of production processes of high-tech enterprises of the radio industry and the design parameters of products.

From table 3 (compiled on balance sheets, profit and loss statements for the five years from 2015 to 2019), it can be seen that for fixed assets for the period from 2015 to 2019, the level of shelf life at “Almaz” increased, at “Contact” decreased by 11%. In general, during the analyzed period, the coefficient of renewal of fixed assets in “Almaz” doubled. Contact has a coefficient for updating fixed assets for the period from 2015 to 2019. It decreased by 16%, which means that the company did not introduce new fixed assets or update outdated technologies during the specified period. For all indicators of profitability for radio industry enterprises, there is a downward trend (table 3) in 2019 compared to the previous year. The main reason for the decline in profitability is a reduction in profit.

### Table 3. Validity and renewal of fixed assets (FA) "Almaz", "Contact".

| Enterprise | Coefficients |
|------------|--------------|
|            |              |

3
Validity FA

| Year | 2015 | 2016 | 2017 | 2018 | 2019 |
|------|------|------|------|------|------|
| Renewal FA |
| 2015 | 0.51 | 0.56 | 0.64 | 0.61 | 0.60 |
| 2016 | 0.60 | 0.60 | 0.15 | 0.26 | 0.33 |
| 2017 | 0.30 | 0.18 | 0.005 | 0.11 | 0.005 |
| 2018 | 0.33 | 0.60 | 0.58 | 0.56 | 0.032 |
| 2019 | 0.15 | 0.26 | 0.33 | 0.18 | 0.30 |

For modern science-intensive engineering corporations, the majority of which is owned by the state, the most effective type of organizational structure is vertically integrated holdings and horizontal integration on a territorial basis in the form of research and production clusters. The vertical should be built on the principle of holding (parent company) - developer company (manufacturer) – subcontractors (suppliers) and partners of the enterprise. In horizontal integration, the Foundation of integration is the unity of the main technologies (instrumentation, optoelectronics). This type of integration increases the manageability of the continuous process of creating value, reduces costs, and increases the effectiveness of implementing plans for the development of military products. For each enterprise that is part of a horizontally integrated cluster, it is necessary to solve problems in four main areas: improving the efficiency of implementing tasks in the framework of state orders for military products; civil diversification; improving operational efficiency; improving the efficiency of management.

We propose to evaluate the effectiveness of the corporate governance mechanism of integrated research and production enterprises of the radio industry based on a set of indicators (table 4, compiled by the authors).

Table 4. Evaluation of the effectiveness and efficiency of the mechanism for managing the clustering process of radio industry enterprises.

| Name of the indicator | Evaluation |
|-----------------------|------------|
| 1. Effectiveness of the integration management mechanism in 2017 to 2012 | +561916 |
| 1.1. Growth in the output of high-tech products, thousand rubles | 125 |
| 1.2. Increase in the output of high-tech products due to a more complete capacity utilization, thousand rubles | +140570 |
| 1.3. Labor productivity growth rate, % | 13.7 |
| 1.4. Change in net discounted income, thousand rubles | 11128 |
| 2. Evaluating the effectiveness of the management mechanism. Effectiveness | 0.76 |
| 2.1. Mutual compliance | 3.8 |
| 2.2. Mutual interest | 3.7 |
| 2.3. Satisfaction with interaction | 3.8 |
| Satisfaction with the counterparty "Almaz" | 3.8 |
| Satisfaction with the counterparty "Contact" | 3.4 |
| Partner satisfaction with mutual interaction | 4.24 |

According to table 4, it can be concluded that the management mechanism for integrated corporate cluster in the radio industry has become more effective after the creation of a regional cluster of high-tech enterprises (vacuum microwave cluster of the electronic industry). From 2015 to 2019, the volume of production of high-tech products by the corporation compared with the indicators of output volumes by the basic structures of the radio industry separately in 2019 increased by 25%, the unit cost per ruble of products sold decreased by 13.5%, and labor productivity increased by 9%. Evaluation of the effectiveness of the management mechanism of the regional cluster of radio equipment enterprises based on a set of qualitative indicators allowed us to determine the level of effectiveness by 76%.

3. Conclusion

The considered theoretical approaches, methods and tools of corporate management of machine-building enterprises may not cover the existing range of theoretical constructions, methodological and methodological developments, performance indicators in their entirety and diversity. The authors see the need to further deepen research in both theoretical and methodological, as well as in the design and
empirical planes. The main results of the work are new knowledge of theoretical, methodological and applied nature to solve the actual problem of developing the mechanism of corporate governance in modern economic conditions; the proposed developments can be successfully used by enterprises of radio equipment and other industries.

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