Economics of knowledge-intensive and high-tech enterprises and industries. Management in organizational systems

Экономика наукоемких и высокотехнологичных предприятий и производств. Управление в организационных системах

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RESEARCH ARTICLE

Electronics inventory as the foundation of a breakthrough into global leadership

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Abstract

Objectives. In the context of aggressive sanctions and unfriendly behavior of competitors, the multi-sectoral structure of the Russian economy is undergoing a process of rapidly restructuring to increase its competitiveness and import independence. The locomotive of this process is the electronic industry, whose products influence almost all aspects of the economy and society. This indicates the decisive role of the electronic industry in the lives of Russians. Thus, the inventorization of the productive forces of the electronic industry presented in this article constitutes a necessary step towards an effective and optimal solution to the problems at hand.

Methods. Classical methods of studying the socioeconomic relations of a complex system are used to consider the example of the electronic industry along with its sub-sectors, enterprises, and other organizational forms. The system analysis method is applied to management problems emerging at three levels: macro-, meso- and micro-level. The induction method of inventory management is supplemented by the deduction method representing an analytical movement from the electronic industry as an integral system to individual factors of the reproduction process.

Results. The first step of a practically feasible implementation chain of digital technologies in industry management should consist in an inventory of all reproduction factors. The presented rationale and detailed inventory program are compiled into a management block diagram in the format of digital twins of electronic industry enterprises.

Conclusions. The barriers facing the Russian electronic industry in the form of foreign competitors are not insurmountable. Sanctions and unfriendly actions of foreign competitors represent an opportunity the Russian electronics industry to overcome such barriers to significantly accelerate the scientific and technological, organizational, and managerial development of the industry. The country's leadership and industry actors are aggressively implementing a program for developing the electronic industry as the locomotive of the entire economy. The inventory presented in this article will serve to facilitate a resurgence of the Russian electronics industry with respect to foreign competitors.

Keywords: inventory, electronics, microelectronics, general scheme, GISP, multi-agent model

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НАУЧНАЯ СТАТЬЯ

Инвентаризация электроники – фундамент прорыва в лидеры

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Резюме

Цели. Многоотраслевая структура российской экономики в условиях агрессивных санкций и недружественного поведения конкурентов приняла этот вызов и ускоренно реструктуризируется, повышая свою конкурентоспособность и импортонезависимость. Локомотивом этого процесса является электронная промышленность, продукция которой определяет и влияет практически на все стороны экономики и общества. Это свидетельствует об определяющей роли электронной промышленности в жизни россиян. Настоящая статья показывает первый шаг на пути к эффективному и оптимальному решению стоящих задач – инвентаризацию производительных сил электронной промышленности.

Методы. Использованы классические методы исследования социально-экономических отношений сложной системы, которой является электронная промышленность с входящими в нее подотраслями, предприятиями и организациями. Применен метод системного анализа проблем управления на макро-, мезо- и микроуровнях. Метод индукции, к которому относится инвентаризация, дополнен в исследовании методом дедукции, т.е. аналитическим движением от электронной промышленности как целостной системы к отдельным факторам воспроизводственного процесса.

Результаты. Выстроена реальная и практически осуществимая цепочка внедрения цифровых технологий в управление отраслью, первым шагом в которой должна стать инвентаризация всех факторов воспроизводства. Представлены обоснование и развернутая программа инвентаризации, которые выводят на реалистичную цель, скомпонованную в блок-схему управления в формате «цифровой двойник электронной промышленности – цифровые двойники предприятий электронной промышленности».

Выводы. Отставание российской электронной промышленности от иностранных конкурентов не является непреодолимым. Санкции и недружественные действия иностранных конкурентов позволили российской электронной промышленности их нивелировать, преодолеть и существенно ускорить как научно-технологическое, так и организационно-управленческое развитие отрасли. Руководство страны и отрасли наступательно реализуют программу развития электронной промышленности как локомотива всей экономики, а проведение инвентаризации позволит направить отрасль в обгон иностранных конкурентов.

Ключевые слова: инвентаризация, электроника, микроэлектроника, электронная промышленности, генеральная схема, ГИСП, мультиагентная модель

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Автор заявляет об отсутствии конфликта интересов.

INTRODUCTION

The development of any complex economic system becomes more effective when there is an objective and complete understanding of the actual means for its achievement. The development of the Russian electronics industry in recent years has demonstrated stable positive dynamics in accordance with the goals set by the country's leadership. However, in order to maintain and increase the pace of development, it is necessary to work on increasing the efficiency of interaction between all industry participants. A basis for this consists in constructing a general scheme of development and location of productive forces of electronics. A systemic idea of the available resources for the basis of the general scheme can only be provided by a large-scale and all-encompassing inventory of all production factors available to public and private enterprises.

1. IMPLEMENTATION OF THE STATE POLICY FRAMEWORK IN THE ELECTRONICS SECTOR

Since the approval in January 2020 of the Strategy for the Development of the Electronic Industry of the Russian Federation for the Period until 2030[1], the industry has been demonstrating notable growth in all key indicators (Fig. 1). Despite external restrictions (COVID-19 pandemic, intensifying sanctions, etc.), the volume of Russian electronic products has been growing every year. By the end of 2024, according to preliminary data, Russia will produce electronic products, including components and equipment, worth RUR 3.36 tn.

Over the same period, the number of employees in the industry grew by only 10%. On the one hand, this is insufficient, with estimating showing that the industry workforce will need to be bolstered by at least another 50000 people by 2030. On the other hand, the faster growth of production volume as compared to the number of employees shows that labor productivity in the industry is growing faster with output per employee/year having already reached RUR 6 mln.

An important indicator of the effectiveness of the state policy in the electronics sector is the accelerated growth of the nomenclature of Russian electronic products. By the end of 2024, the register of Russian radioelectronic products[2] contained more than 29000 items, of which at least 20% were electronic components. This applies not only to the industrial sector, but also to consumer goods. In particular, Russian laptops and tablets are no longer rare. Such products have reached the retail market, with many brands demonstrating competitiveness in price and quality with foreign analogs.

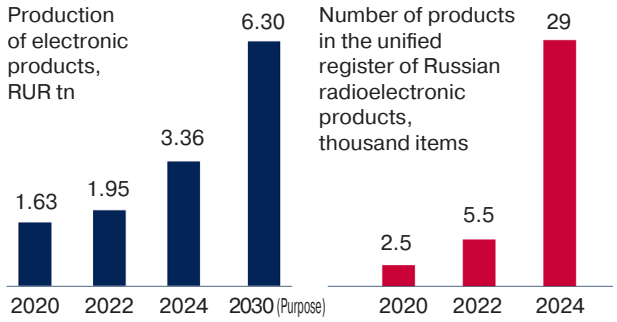

Fig. 1. Dynamics of industry development indicators in 2020–2024

Such dynamics became possible largely due to the launch of a systemic set of support tools and increased sources of industry financing (Fig. 2). Here it is important to note that the range of support measures is designed for all stages of the life cycle from development to production and introduction of electronic products [1]. These are mainly subsidy support measures, where a part of organizational costs for the creation of new technologies and products is compensated in exchange for achieving the indicators for the commercialization of developments. In total, as of the beginning of 2025, more than 500 projects are being implemented in the outline of the Ministry of Industry and Trade of Russia[3], of which more than 100 are at the stage of commercialization. New products have already been sold to a value of about RUR 100 bn. Budget financing in the period of 2020–2024 amounted to over RUR 430 bn, while for the next three-year period, it is planned at the level of RUR 250 bn.

In addition, more than 240 projects in the field of electronics are being implemented by foundations and development institutions, including the Russian Science Foundation[4], Innovation Promotion Fund[5], Advanced Research Foundation[6], Industrial Development Fund[7],

[1] Order of the Government of the Russian Federation No. 20-r dated January 17, 2020 "On Approval of the Strategy for the Development of the Electronic Industry until 2030." http://government.ru/docs/38795/ (in Russ.). Assessed May 07, 2025.
[2] https://gisp.gov.ru/pp719v2/pub/prod/rep/ (in Russ.). Assessed May 07, 2025.
[3] Ministry of Industry and Trade of the Russian Federation. https://minpromtorg.gov.ru/ (in Russ.). Assessed May 07, 2025.
[4] https://rscf.ru/ (in Russ.). Accessed May 07, 2025.
[5] https://fasie.ru/ (in Russ.). Accessed May 07, 2025.
[6] https://fpi.gov.ru/ (in Russ.). Accessed May 07, 2025.
[7] https://frprf.ru/ (in Russ.). Accessed May 07, 2025.

Fig. 2. Measures to support the industry

Skolkovo Fund[8], and the Technological Development Agency[9].

In addition to direct financial measures for stimulating specific projects, one of the most important measures to support enterprises and organizations in the industry is the provision of tax benefits in terms of insurance premiums and income tax[10, 11]. To date, more than 600 companies in the industry have benefited from these incentives. In 2022–2024, electronics companies and organizations will save more than RUR 180 bn as a result, which is comparable to the amount of direct state support.

Although the Russian electronics industry is already demonstrating healthy growth, the country's leadership has set even more ambitious goals. A new impetus to the industry development was given by the decision of the President of the Russian Federation Vladimir Putin, who approved the "Fundamentals of the State Policy of the Russian Federation in the field of development of electronic and radioelectronic industry for the period up to 2030 and further prospect"[12], representing the main strategic document for the development of electronics. The general goal is proclaimed technological sovereignty of the Russian electronics industry. The documents also approved indicators for achieving this goal (Fig. 3), including:

(1) continued growth of industry revenue up to RUR 6.3 tn per year (2.4 times growth by 2023);
(2) meeting domestic demand for electronic products by at least 70%;
(3) ensuring sovereignty over resources and means of production;
(4) further technological development and industrialization of topological standards of 28 nm and lower.

[8] https://sk.ru/ (in Russ.). Accessed May 07, 2025.
[9] https://atr.gov.ru/ (in Russ.). Accessed May 07, 2025.
[10] Resolution of the Government of the Russian Federation No. 1310 dated July 22, 2022 "On Approval of the List of Electronic (Radioelectronic) Products for the Purposes of Application of Reduced Tax Rates for Corporate Profit Tax and Tariffs of Insurance Contributions." http://publication.pravo.gov.ru/Document/View/0001202208010004 (in Russ.). Accessed May 07, 2025.
[11] Resolution of the Government of the Russian Federation No. 1311 dated July 22, 2022 "On Approval of the List of Materials and Technologies for the Production of Electronic Component Base (Electronic Modules) for the Purposes of Applying Reduced Tax Rates for Corporate Profit Tax and Insurance Contributions Tariffs." http://publication.pravo.gov.ru/Document/View/0001202208010009 (in Russ.). Accessed May 07, 2025.
[12] Decree of the President of the Russian Federation No. 344 dated May 12, 2023 (in Russ.).

Fig. 3. Ensuring technological sovereignty in electronics

It is also necessary to ensure the development of new materials, which are especially important for microwave electronics, power electronics, and optoelectronics. To date, in particular, specific plans have been drawn up for the development of technologies for the use of gallium arsenide and gallium nitride, as well as silicon-germanium and silicon carbide [1].

In order to maintain the dynamics of the industry's development and to achieve the target benchmarks, it is necessary to improve the efficiency of work within the industry in order to optimize support measures and obtain a synergetic result. At the micro level, i.e, at the level of the economy of the enterprises of the industry, the main specific goal is to improve production efficiency and labor productivity growth. Here relevant tools include the principles of lean production [2] and scientific organization of labor[13], whose positive effects have been repeatedly confirmed[14].

At a higher level of organization, which can be referred to as the meso-level of management [3], it is the growth of efficiency of interaction of all industry participants both among themselves and with external suppliers and consumers of electronics products in order to achieve the strategic indicators set at the highest macro-level by the President of the Russian Federation and the Government of the Russian Federation (Fig. 4). In this respect, the achievements of the Russian electronics industry in the recent past serve as a foundation [4, 5]. An effective tool consists in the proven technology of sectoral planning and management as set out in the General Scheme of Development and Location of Productive Forces of the Electronics Industry for the strategic depth of planning [6, 7]. Quality planning requires a reliable basis in the form of complete information on the real state of productive forces of the electronics industry. This can only be provided by a complete inventory in the industry carried out irrespective of the various organizational and legal forms of legal entities and their forms of ownership. Such an inventory will present a real picture of the electronics industry economy to enable organizations to identify the optimal application of their competencies and qualifications.

2. SCIENTIFIC APPROACHES OF PROFESSOR V.M. SIMCHERA

Professor V.M. Simchera defined the general inventory of electronics and the entire economy of Russia as a one-time accounting (census, censorship, audit, revaluation) of all available material, labor, financial and intellectual assets of the industry (country), comprehensively characterizing its general condition and wealth, its total national wealth in all forms of ownership, types, and areas of activity in specific conditions of space and time[15].

According to Simchera, the results of the inventory serve as "the most complete source of primary data, the most reliable tool for verification of existing

[13] https://национальныепроекты.рф/news/umnaya-optimizatsiya-chto-takoe-berezhlivoe-proizvodstvo-i-zachem-ego-vnedryat/ (in Russ.). Accessed May 07, 2025.
[14] https://производительность.рф/ (in Russ.). Accessed May 07, 2025.
[15] Manuscript archives of Dr. of Economics, Prof. V.M. Simchera (in Russ.).

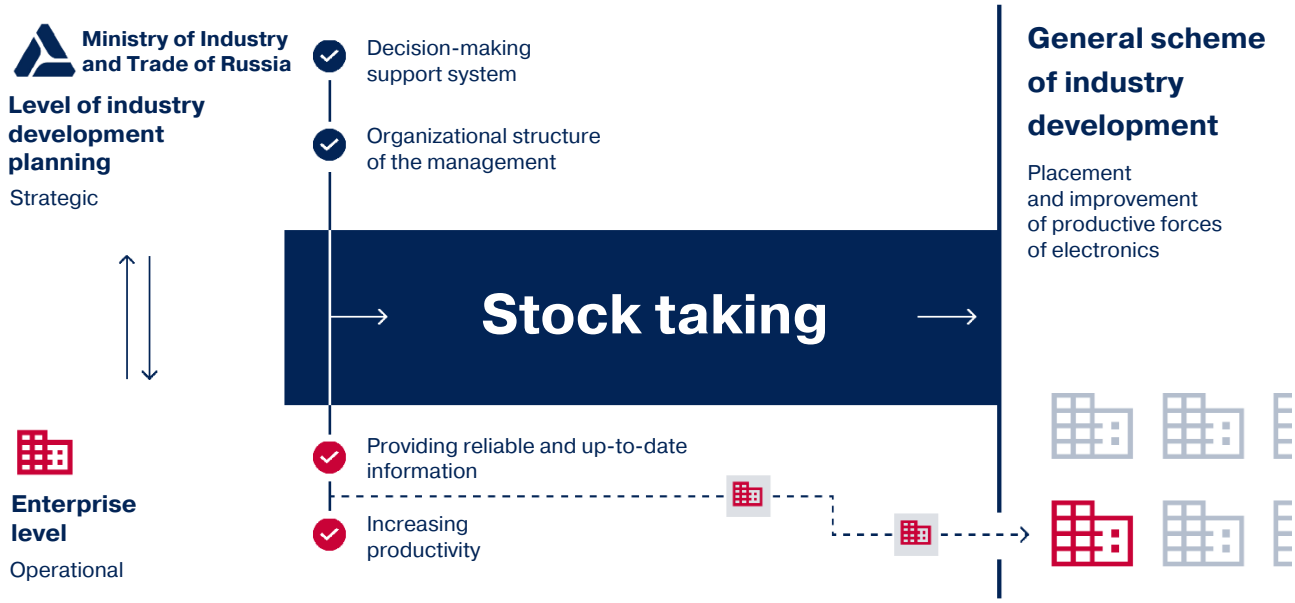

Fig. 4. Strategic planning of industry development

assessment databases of big data and knowledge bases, their basis of foundations, a kind of initial reference point, outside or bypassing which it is impossible to verify and nominate the state of the country even in the crudest form."[16] The development of events since February 2022 demonstrates the acute nature of the issue of inventory management. At that point, the Russian economy began to receive unexpected blows of Western attackers on its most vulnerable points, which until then had seemed quite solid.

Whether at any particular moment or in terms of the dynamics from the past to the future, it is impossible to see the whole without precise knowledge of the state of productive forces of the economy. This involves measuring achievements and failures to objectively assess its state and potential in both favorable and critical situations. Thus a deep knowledge of the entire system of productive forces of the country's economy in all the diversity and integrity of production and economic relations is necessary to avoid gross errors and develop a capable management system.

It still seems astonishing that the Russian privatization was carried out by its executors without scientifically substantiated data on the role of each enterprise in the life of the country, which could be obtained only as a result of a total inventory. This fact alone calls into question the ideas underpinning the irresponsible and inequitable privatization of property that belonged under the Constitution[17] to all citizens of the country in an equal, inheritable, and inalienable share. In the first place, these ill-considered, hasty, and harmful actions affected the most advanced sectors of the national economy in general—and electronics in particular.

Since is very difficult to quantify the damage that was caused to Russia by the leaders of privatization in the 1990s, we will refer to the estimates of V.M. Simchera, who considered the damage to the national economy and population of Soviet Union during the Great Patriotic War at 1.0 tn American dollars of the mid-20th century or USD 17.9 tn, which were circulating in the 1990s. V.M. Simchera estimated privatization and collapse of the USSR no less than 100 tn modern American dollars [8, 9]. The President of the Russian Federation and the Government of the Russian Federation are actively engaged in trying to compensate for this damage.

Taking the form of classical census surveys, inventorization has been conducted on a regular basis every 5–10 years in developed countries since the middle of the nineteenth century. However, in Russia there have never been general regular censuses; as a consequence, there is a lack of reliable cadaster of data and full-fledged statistics of the Russian economy.

[16] Manuscript archives of Dr. of Economics, Prof. V.M. Simchera (in Russ.).

[17] Constitution of the USSR, Chapter 2 "Economic System", Article 10 (adopted at the Extraordinary Seventh Session of the Supreme Soviet of the USSR of the Ninth Convocation on October 7, 1977 (in Russ.).)

3. JUSTIFICATION OF THE NEED FOR INVENTORY

More than 80 different strategic planning documents and development programs have been adopted in Russia (e.g., "Strategy for the Development of the Russian Electronic Industry until 2030,"[18] "Strategy for the Production of Stringed Musical Instruments,"[19] etc.). All of these are based on different worldview platforms, methods of goal-setting, dimensionalities, as well as variations in the scope and coverage of the tasks to be solved. Since each initiator of such documents sees their strategy as the dominant one, mechanisms and technologies are proposed to achieve the set goals. However, due to the lack of even the most general idea of actually available resources and opportunities, one has a holistic view of the structure, capacity, and distribution of productive forces today. It is clear that disparate and unconsolidated strategic planning documents and development programs can be implemented only accidentally—and, as previous experience shows, only fragmentarily. And, if a disruption in the production of stringed musical instruments will be an unpleasant fact, the lack of electronic components, equipment and electronic products will be a disaster for the economy of the whole country.

Clearly, the other extreme of investing all funds in electronics should also be avoided: electronic products must grow proportionally to demand. However, it is remains impossible to metrically determine the existing proportions in the country's economy and dynamically forecast the optimally balanced development of industries and enterprises of both electronics producers and consumers without a total and coherent inventory. Consequently, it already becomes clear at this step of scientific analysis that only multidirectional detailed and reliable knowledge of the structure of productive forces of each industry and the country's economy can ensure the growth of electronic products production in proportion to the growth of productive capacities and solvent demand of electronics consumers.

The necessary total inventory should be based on unified databases and knowledge, as well as on unified functional and instrumental support, which is unfortunately still only being formed in the academic community. In terms of its dimensionality, structure, scale, and coverage, involving a multitude of fixed factor indicators and schemes of their multidimensional functional-cost analysis, technical regulations, standards, registers and other fundamental system characteristics, the Russian electronic industry has no analogs in the world. For this reason, any borrowing of foreign tools will be unsuitable for practical purposes.

Successful management of the country's economy, industry, enterprise, city, family requires reliable information that represents an undistorted image of any managed object or process. Such an adequate virtual model can now be formed digitally. However, since an image cannot be created on the basis of analytical "average ceiling" representation, it will be necessary to obtain first-hand genuine (ontological) primary data, which can be collected and processed only through a total inventory of economic and business objects and processes in which they are involved. Between two related inventories, it is necessary to regularly conduct clarifying continuous or selective, statistical, and non-statistical measurements of changes and dynamics of productive forces. The necessary inventory of intellectual, organizational, material-technological, and financial resources allocated for the development of electronics is currently being formed in the Ministry of Industry and Trade of Russia. This task, which falls within the achievement purview of Russian developers of big data platforms [10], can be easily supported by the current capabilities of Russian supercomputers[20].

The process of adaptation to Western sanctions and planning for the development of the Russian economy can become more effective if reliable data on all elements of the structure of productive forces (production facilities and qualified personnel) are obtained along with the potential for their effective utilization in the current environmental conditions. In order not to assume unfulfilled obligations, it is necessary to carry out a complete inventory and establish specific responsible executors for the efficient use of production funds.

As a result of the lack of reliable information about the country's productive forces, including the lack of strict control over top managers, the Russian economy

[18] Order of the Government of the Russian Federation No. 20-r dated January 17, 2020 "On Approval of the Strategy for the Development of the Electronic Industry until 2030." http://government.ru/docs/38795/ (in Russ.). Accessed May 07, 2025.

[19] Order of the Government of the Russian Federation No. 1582-r dated June 11, 2021 "On Approval of the Strategy for the Development of the Musical Instruments and Sound Equipment Industry for the Period until 2030." http://government.ru/docs/42466/ (in Russ.). Accessed May 07, 2025.

[20] http://top50.supercomputers.ru/newsfeed (in Russ.). Accessed May 07, 2025.

is developing at an insufficient pace to overtake modern leaders in electronics. This applies to electronics, foreign exchange reserves, durable goods, and food. However, without scientifically sound and verified practices, in which total inventory plays a paramount role, it will be extremely difficult to move to the stage of sovereignty. While the task of responding to sanctions and other challenges is undoubtedly urgent, the important business of inventory cannot be neglected, since in the long term this will provide the country and the population a sustainable positive boost in development terms.

For decades already, instead of joint and creative work on the inventory of the economy, "effective managers" have been fighting for some Western ratings, like Moody's[21], Fitch Ratings[22], in order to report about the increase in the rating of the country, or a particular university, bank, etc. What ended their struggle is now clearly visible, despite nothing catastrophic having happened to the Russian economy as a result.

Under the new conditions of the economic war of the West against Russia, it is obvious that it the development and nationwide discussion of an independent inventory strategy-program is required. This should be transferred to the development of organizational structures of industry management and the creation of the general scheme of development and location of productive forces of the country in sectoral, territorial, and generalizing formats [1]. The first step in the form of the General Scheme of Electric Power Industry Development by the Government of the Russian Federation[23] has already been taken.

4. INVENTORY OBJECT

When taking a systematic approach to the creation of an inventory, its objects should be sectoral and territorial proportions of the distribution of productive forces, along with the resulting parameters of the rate of development of socioeconomic processes in Russia.

Many independent experts try to compare the state of the economy of Russia and Western countries. However, they do not take into account that the Russian Empire in 1917 and the USSR in 1991 lost 5.3 mln square km or almost 1/4 of its territories, involving more than 140 mln people or half of the total population, along with two thirds of the production potential and accumulated national wealth. Such huge losses have not known any state for the whole millennial history. If these losses are included in the calculations and ratings, the conclusions will be quite the opposite.

The years of the country's economic development following the destructive years of privatization have demonstrated that the liberal-capitalist model of society lacks unity of views on the integral system of socioeconomic relations. Accordingly, it is unable to realize the effect of synergetic multiplication of productive forces and production relations. Liberal globalization leads only to the loss of sovereignty and prohibitive dependence of the country on the world's transnational corporations. The President of the Russian Federation Vladimir Putin has formulated in the most general form the thesis that dying liberalism[24] and private property[25] [11] do not unite, but rather divide people according to their selfish ends, which will inevitably lead to the failure of the country's economic policy. Liberals throughout the modern historical period have tried to dictate their will to the world. However, since their will proceeded from the interests and values of the rulers of the artificial human habitat represented by the capitalist economy, it constantly conflicts with the natural interests of the majority of people.

In order to follow the course outlined by the President of the Russian Federation Vladimir Putin, the private property that appeared in the course of ill-considered and hasty privatization should be systematically replaced by property that is understood as part of the state, thus functioning as a single integral ensemble. This is the root and quintessence of the country's economic sovereignty.

It is not necessary to prove that, despite the current contradictory Russian reality and series of sanctions against Russia and its citizens, future changes can only be constitutional. Such reforms that take into account real inertia processes and national traditions can be optimal in speed and depth.

[21] https://ratings.moodys.com. Accessed May 07, 2025.

[22] https://fitchratings.com/. Accessed May 07, 2025.

[23] Order of the Government of the Russian Federation No. 4153-r dated December 30, 2024 "On Approval of the General Scheme of Electric Power Industry Facilities Location until 2042." http://government.ru/docs/53923/ (in Russ.). Accessed May 07, 2025.

[24] Interview with the President of the Russian Federation V.V. Putin on the eve of the G-20 summit. http://www.kremlin.ru/events/president/news/60836 (in Russ.). Accessed May 07, 2025.

[25] Private property is a part of national property that has become dependent on capitalists (e.g., the closure of enterprises in Russia). Partial property is the national property that is transferred to private managers who can ensure its most efficient use.

The President of the Russian Federation Vladimir Putin pursues the following line[26]: all processes in Russian society and economy should follow from the consensus of the social contract to become a program of general civil accord, thus uniting the healthy forces of Russian society and its allies on the principles of common sense. Along with the general progress of friendly countries, the success of the electronics industry as the most technologically advanced branch of the country will be characterized by the speed and scope of the universal transition from the present private economy to an economy of pragmatic altruism. The production of various goods with the condition of obligatory reproduction of resources in the natural environment in order to guarantee the basis for sustainable development of future generations should be considered as the norm of future social relations. It is this world outlook criterion that should form the basis for the inventory of the country's productive forces and the elaboration of the general scheme for the development of the economy in general and electronics in particular. We can and should use the systemic global economic crisis as a chance for harmonious development of economy and society in Russia, as well as in countries that share Russia's system of values.

Thus, the object of inventory consists in the entire system of socioeconomic relations in Russia, in which electronics plays an increasing and indispensable role. It is now clear that by grasping this crucial link, it is possible to pull the whole chain to a new phase of progress: the first step should be a nationwide inventory.

The inventory should metrically accurately reflect the real advantages of Russian economy, including the vast natural and skilled human resources used by private owners to barely one-third of their useful capacity. The backbone of the country's former intellectual and military potential has been preserved and recently even multiplied. However, this advantage has not yet been statistically measured, which means that it is difficult to use it effectively as a basis. Progressive improvement of legislative, informational and administrative-technical support of the Russian economy is already yielding tangible results, especially under the conditions of unprecedented sanctions pressure on the country and the economy. Thanks to the persistent implementation of scientific programs, new "windows of opportunity" have been opened for the transition of Russian economy to the sixth mode [12, 13] of future development of Russia and the world. As part of this process, the electronics industry will be assume one of the most prominent positions.

Methods and tools for managing the country's economy and any industrial sector should be chosen depending on the reliability, completeness, and integrity of knowledge about the socioeconomic situation and the objective needs of economic and social development. Currently, no manager starting from the micro-level of enterprises and ending with meso- and macro-levels can be confident in assessing the current state of the managed object and the formation of a winning strategy for further development due to the lack of a holistic picture and the inability to assess the risks beyond the extremely narrow boundary of the sphere of opportunities. Winston Churchill humorously observed that he trusted only those statistics that he himself falsified. Without an inventory, there is no understanding of the extent to which information about the state of affairs in the economy is falsified, or who exactly falsified it and how. Today, there are no longer any proponents of investing the country's reserves in Western financial jurisdictions rather than in the country's productive potential. It is easy to imagine what NATO and the European Union would say now if the frozen USD 300 bn[27] had been invested in the production potential of Russian electronics and related industries.

In his recent articles and speeches, V.M. Simchera authoritatively argued that none of the socioeconomic programs in Russia in the 21st century was ever implemented [14]. Of course, some officials can be accused of incompetence, but the majority of Russian managers and scientists sincerely wished for the fulfillment of the plans. This is the best proof that the specialists who adopted the planned guidelines simply did not realize where they were located.

I would like to emphasize that specialists of economic management bodies present detailed accounts of the true state of affairs in the sphere of their competence, but life goes on in its own way. People move to other jobs, retire, etc. Along with the individual specialists, the knowledge they were carrying also disappears from their offices. New appointees need time to form a holistic idea of the assigned work, which hinders development. For this reason, the inventory, organizational management structure, and general development scheme of productive forces of industries and the economy should

[26] Putin V.V. ASI Forum "Strong Ideas for New Times," 2022. http://www.kremlin.ru/events/president/transcripts/69039 (in Russ.). Accessed May 07, 2025.

[27] https://www.rbc.ru/economics/13/03/2022/622dd6ee9a7947081b63341c?ysclid=m3ujyuye2217113543 (in Russ.) Accessed May 07, 2025.

be formalized in the form of integral, but constantly updated data, which is approved at a high state level. In this case, people may change, but newcomers will have a formalized initial base and material traces of its development by the previous manager. This will significantly increase the efficiency of management, especially at the sectoral meso-level, along with the responsibility of officials for their decisions, which will be reflected as author's innovations in the organizational structure and the General Scheme of Industry Development.

5. MEASURES TO IMPLEMENT THE INVENTORY PROGRAM

The program of inventory of productive forces of the country developed by the group of specialists under the leadership of V.M. Simchera included 77 measures, which should provide the management bodies with reliable information in the context of 280 indicators. Here it is advisable to consider the most significant for electronics provisions.

The electronics industry was seriously underfunded in the period up to 2020, while the demand for its products was growing at a faster rate. As noted above, the right decisions have by now been made to significantly increase capital investments in the industry. Under these conditions, it is especially important to balance them in terms of time, territorial location, and technological level with parallel training of specialists for future new production facilities. Fortunately, sanctions have forced Russian consumers, who previously ordered foreign-made electronics, to turn their attention to Russian manufacturers. The inventory should provide a clear picture of the current and future ratio between the primary factors of production consisting of fixed assets and highly qualified personnel, both temporally and territorially.

One of the bottlenecks in the electronics industry is the rapid obsolescence of the production and technological potential of enterprises, which sometimes significantly outpaces the rate of physical wear and tear of equipment. A complete census and cost estimation of electronic industry equipment will permit an optimization of depreciation charge norms, as well as forming an approach to determining the types of equipment subject to accelerated depreciation. This "accounting" issue is so significant for the electronic industry enterprises that its solution cannot be postponed under any circumstances. Otherwise, the technological lag of the industry will grow and may become catastrophic.

One of the most significant factors of efficiency of electronics and entire economy include specialization, cooperation, and the optimal size of enterprises. Our global competitors are represented by giant transnational corporations that deploy thousands of small and medium satellites around the main economic entity. Privatization, which destroyed sectoral, inter-sectoral cooperation links and clusters of co-operators along the entire chain from research and development (R&D) to the production of finished goods, has not yet been assessed from the position of optimality and efficiency of modern production. Without a comprehensive inventory, the current situation is difficult to assess and consequently almost impossible to improve. In this regard, all existing reports on R&D performed in ministries and departments should be subjected to inventory and deep scientific audit, with the obtained results be put up for auction for their commercialization on the basis of a public–private partnership.

In addition, the inventory will provide a metric for weighing all the factors that influence productivity and form a clear program for generating the required number of high productivity jobs.

A significant development problem consists in the gap between the performance of enterprises, industries, as well as the economy as a whole, as measured in physical and value terms. In addition to solving the problem of assessing the production and technological potential of industries, the proposed inventory will permit the establishment and accounting adjustment of manufactured products to be as close as possible to the final physical and natural results, thus reflecting the real shifts in the economy and the actual situation of people in society. This is not a private task, but a question of manageability, since artificial cost indicators under conditions of galloping inflation and the dominance of the shadow economy reflect little more than errors and mistakes. It will also make it possible to measure the welfare of the population in natural units.

There are already tools that can be used to carry out the first wave of industrial inventory, both in terms of the production capacities of enterprises and the products they produce. For example, a catalog of industrial products manufactured in Russia has been formed on the platform of the State Information System of Industry (SISI)[28]. The catalog contains information on more than 1.6 mln units of products, including more than 360000 units of Russian industrial products with an indication of the manufacturer, the commodity nomenclature of the Eurasian Economic Union, and, with respect to certain Russian radioelectronic

[28] https://gisp.gov.ru/ (in Russ.). Accessed May 07, 2025.

products, the component parts of Russian origin. As for Russian radioelectronic products, the catalog is used as a basis for building the entire system of preferences and state support for the industry. The relevance and completeness of information on the confirmation of Russian origin is realized automatically within the framework of integration interaction with the service of implementation of the Decree of the Government of the Russian Federation dated July 17, 2015, No. 719[29].

SISI also contains tools for describing the production capacities of enterprises, entering information on the volume of production, shipment and sale of goods, including exports, both on the industrial enterprises themselves and the characteristics of their industrial products, taking into account their sectoral affiliation and the level of digital maturity of industrial enterprises. By carrying out verification and operational monitoring of the financial and economic status of systemically important producers of industrial products, it also becomes possible to assess the economic stability of producers in real time.

When supplemented with the necessary industry reliable statistics, including the results of "big data" analysis from open sources, an inventory knowledge base is created having possibilities of seamless integration of the SISI with the accounting systems of enterprises to simplify the mechanism of operational automated collection and processing of the necessary data. The current level of SISI development is already sufficient to start the inventory of industrial products and enterprises producing them in Russia. This will form the basis for territorial and production planning at a strategic depth.

In addition, the basic architecture of the industry decision support system has been designed to date. The complex of "Multi-agent network-centric model of electronics resource management" [15], "Organizational structure of industry business process management," and "General scheme of development and location of productive forces of electronics for the period up to 2050" will form the basis for strategic planning of development of the electronics industry, starting from the detailed goals and objectives facing the national economy (industries, territories), which are formulated by the country's leadership, and ending with the optimization of industry cooperation and logistic interconnection of co-executors of both state tasks and enterprises working in the unregulated market.

In order to obtain the necessary qualitative data, separate systematic analytical studies in the field of development of electronic engineering (including materials, chemistry), photonics technologies, human resources have been carried out in recent years. This formed the basis to approve comprehensive programs for the development of electronic engineering and photonics. However, it is necessary to complete such work in the field of microelectronics technologies, along with power and microwave electronics, passive electronics and electrical engineering, as well as to continue the expansion of comprehensive studies of the state and development prospects of all electronics technologies, the customization of systems of industry and state statistics, and determination of approaches to territorial and production planning and compilation of inter-sectoral balances [16].

The inventory should be the starting point for the fundamental implementation of digital technologies in the management of the electronics industry, the flowchart of which can be visualized as follows (Fig. 5).

CONCLUSIONS

The proposed inventory of the Russian electronics industry and the country's economy as a whole will make it possible to restore the reliability of statistical data, which is currently the subject of considerable doubts. By systematizing and evaluating the obtained data, it also will be possible to more responsibly counteract the leakage of sensitive information from Russia.

In order to prepare, conduct and continue this crucial work it is necessary to restore in Russia the work on operational tracking of the dynamics of the pro-inventorized parameters of the Russian economy and their comparison with the world's best scientific, technical and technological achievements and standards. The necessary revival of methodological and factual work on the formation of the necessary balances should start from individual product graphs linking all co-executors and product-service platforms, which balance the reproduction process on the scale of sub-sectors of the electronics industry, and end with the sectoral balance of ordered results with available resources. This should be carried out in conjunction with the integral inter-sectoral balance of the country's economy. Synchronization of this work with the national inventory will ensure the reliability not only of sectoral management, but also the maintenance of the proportions of the Russian economy as a whole. This approach will make it possible to synergistically accelerate the pace of economic development of the community of friendly countries and introduce a qualitatively new meso-economic management platform in the format of an electronic industry digital twin.

[29] http://government.ru/docs/all/102816/ (in Russ.) Accessed May 07, 2025.

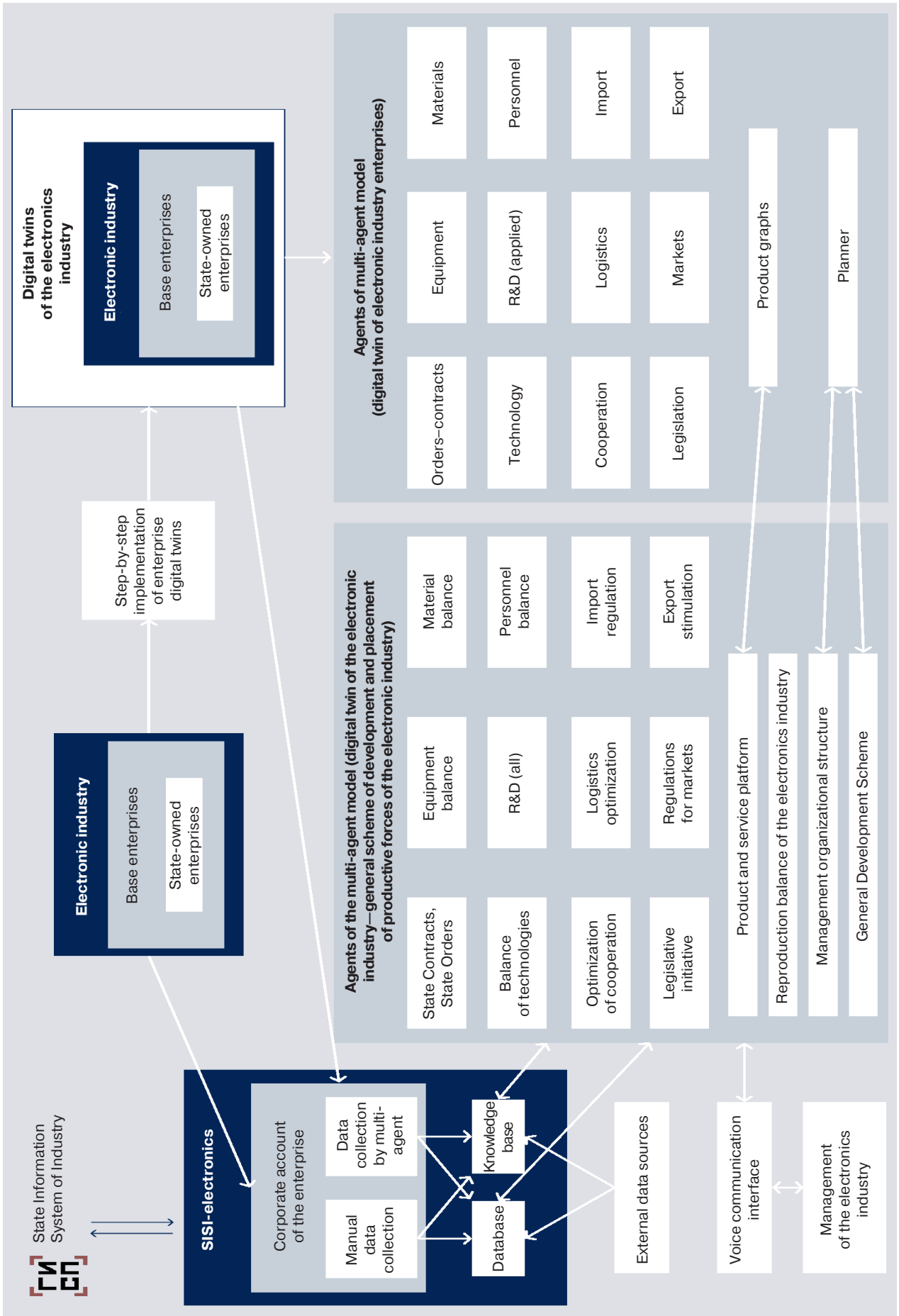

Fig. 5. Block diagram of electronic industry management based on modern digital technologies

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