The political economy of technological sovereignty: on the transformation of the concept into the scientific category

K.P. Stozhko[1], *S.N.* Nekrasov[1,2], *D.K.* Stozhko[3], *A.V.* Shilovtsev[1,2*], and *T.N.* Makarova[1]

[1]Ural State Agrarian University, Yekaterinburg, Russia
[2]Ural Federal University named after the first President of Russia B.N. Yeltsin, Yekaterinburg, Russia
[3]Ural State University of Economics, Yekaterinburg, Russia

Abstract. In the context of the current geopolitical crisis and a new reality formation, technological sovereignty is of particular importance for ensuring national security. This concept is relatively new in science and has not yet been developed. Its semantic content remains controversial and ambiguous, as well as ideas about the ways and methods of its formation and strengthening. In this regard, the article presents a comparative analysis of the "technological sovereignty" concept, based on its comparison with the similar concepts of "technosphere", "national interests", "national security", "economic activity". The lexical interpretation of "technological sovereignty" as a new concept and as a scientific category is given. Special attention is paid to endogenous and exogenous factors determining the formation of "technological sovereignty", the need for its more targeted complementation with development goals (totality, system, structure of interests), as well as the definition of its subject and object nature.

1 Introduction

Scientific categories, as you know, are formed not right away. First, concepts and science appear, as, indeed, the scientific community itself, "lives by concepts." But over time, it turns out that everyone has their own concepts, and it is necessary to negotiate. Moreover, it becomes necessary to match the concept of objective reality chosen as the "common denominator". This, in general, characterizes the concept transition into a scientific category. Considering the essence and evolution of concepts, D.P. Gorsky, for example, half a century ago rightly remarked that concepts are, in general, individualized forms of objective reality reflection and typical features of some social groups of the population can be embodied in them in an individualized form [1, p. 196]. In fact, the ideas of various social groups of the population about technological sovereignty may be different. For the creators of technologies, who have the necessary knowledge, such representations turn out to be more professional and reliable. Others have to be make with the text typed in small

* Corresponding author: a.shilovtsev@mail.ru

print on the wrapper (packaging), where information is given about product contents. For still others (officials) it is important that the goods comply with GOST standards, etc.

In modern conditions, such concepts are most actively formed by the ruling political and scientific establishment, but the garland of victory should be attributed specifically to the political community. When developing a particular law, its authors sometimes introduce into the text such concepts and requirements that are at least of a polemical character. This fully applies to biotechnologies, the use of genetically modified components, etc. Nevertheless, since the practice of law adoption indicates that its initiators are just manufacturers (large corporations and their lobby in the halls of power), science is sometimes simply forgotten or used "in the dark", which is proved by quite numerous confirmations.

This turns science into a servant of political and ideological predilections, which, of course, indicates a serious crisis not only in modern humanities, but also in the education system. Such a situation is not uncommon in history, nevertheless it needs to be corrected in the common interest. Interestingly, the results of scientific research implementation must be documented (by acts of implementation), and the level of scientific knowledge of the laws and regulations does not require such confirmation, an examination of their compliance with scientific requirements on certain issues is practically not carried out.

It is typical for science when new concepts are introduced in the process of its development and the old ones are removed. This is a natural process since new concepts are introduced on the basis of a deeper study of already known objects, their more detailed qualimetric or organoleptic research, etc. In this way, the concept development occurs as a result of the discovery of new properties and characteristics of the product [1, p. 142]. Therethrough, the concept transformation into a scientific category is the result of the effect of a fairly wide range of endogenous and exogenous factors on the labor process. From these positions, this article presents a comparative analysis of the "technological sovereignty" concept, which has yet to become scientific category.

2 Research methodology

In the study, based on comparative analysis and dialectical approach, methods of linguistic, expert-analytical, program-targeted, structural-functional, and system design of technological sovereignty as a political economic category are used. The subject of the study is various ideas about the essence of technological sovereignty of Russia. The object of the research is the ways, methods, and ways of forming the technological sovereignty of the country as an objective reality.

3 Research results

The concept of "technological sovereignty of Russia" has appeared recently. It was directly stated by the President of the Russian Federation V. V. Putin at a Meeting of the Council for Strategic Development and National Projects on 15.12.2022. In his speech, he paid special attention to the investment aspect of technologies and new organizational and legal forms (clusters), the most promising in the light of ensuring the technological sovereignty of the country [2].

Following the speech of the President of the Russian Federation, an explanation was also given about the *situation* of "technological sovereignty": "Today there is not a single country in the world that has achieved a level of technological sovereignty" [3]. Thereby, the task was set.

At the same time, the formulation of the problem of the technological sovereignty formation was not without organizational fetishism. For example, when technological sovereignty is reduced to a certain state program to replace the import of certain goods with the production of such goods within the country. If we talk about goods "that are intended for use in state orders and therefore should not be produced abroad," then there are no questions here. But growing all agricultural products (avocado or kiwi) clearly looks pointless [4]. Just as it is absurd to produce bamboo or cane as a building material in conditions of risky farming. Therefore, one of the factors of ensuring technological sovereignty is the production diversification, which, nevertheless, must correspond to the natural and climatic characteristics of the country and its regions.

Geographical conditionality of technological sovereignty as a scientific category and as a socio-economic reality is inextricably linked with the anthropological factor (cultural, psychological, mental characteristics of producers and consumers). It is clear that even the most "high" technologies for sewing "highly competitive" ladies' dresses or works of "haute cuisine" will not be in demand from a potential client if his anthropological features, his culture and mentality are not considered. Deeply decollete (open) women's outfits or prestigious food products (lobsters, crawfishes, crabs) will not be in demand in those regions of the country where people adherent of the Islamic faith live. The fastest Internet systems, modern tablets and smartphones will not find their consumers in regions where there is no coverage area.

The claim on the part of individual authors to determine the technological sovereignty meaning in the format of a state program is also illegal, because such a basis is legislation only, and not a subordinate document. Nevertheless, Lenin's well-known definition of politics as a concentrated expression of economics has received its modern confirmation in the current situation. Most government programs are approved by presidential decrees, which gives them the status of federal law.

It was clear that this politicized slogan about the identity of technological sovereignty and development strategy is clearly not enough for a serious conversation about "technological sovereignty", since they relate to each other as an end and a means, which is far from the same thing. In this connection, an addition appeared quite quickly, according to which "technological sovereignty is understood as the ability of a particular type of economic activity to provide the national economy with its products of appropriate quality, even partially due to its import supplies, but subject to the mandatory condition of reimbursement of import costs due to proceeds from the sale of its own exports" [5, p. 83]. Further: "to measure the scientific and technological sovereignty of an industry (type of economic activity), the following indicator can be used:

$$\alpha=100(E - I) / (E + I), \text{ where:}$$

E – export of products as a sign of leadership,

I – import of products as a form of borrowing foreign achievements" [5, pp.83-84].

But there again, the essence of technological sovereignty slipped from researchers. It was proposed to measure something else: economic security, macroeconomic equilibrium, fiscal balance, innovation activity, etc. There has not been a word about technological sovereignty yet. Only about how to achieve it: "The future inevitable increase in T-sovereignty should be based not on the manifestations of a crisis shock, but on a proactive increase in the competitiveness of domestic products, import substitution, and non-primary exports" [5, p. 85].

Before that, a more detailed definition appeared, which further confused the situation: "Technological sovereignty is considered as part of economic sovereignty that provides the basic needs of the Russian world-system" [6]. In other words, the concept of "technological sovereignty" has not turned into a scientific category, but has simply been

associatively blurred in a number of other concepts ("world-system", "economic sovereignty", "basic needs"). In addition, this concept turned out to be subjectless, since it correlated not with its specific carriers, but with a specific (economic) form of activity. In reality, the concept of sovereignty "presupposes the existence of a subject – the carrier of sovereignty, which, as a rule, is the people living in a particular territory" [7, p. 2380]

The approach to "technological sovereignty" definition through understanding the needs of its subject (in this case, the state) is more or less productive. But needs are just a subjective representation of objective interests. They may be different for different social groups, they may differ significantly. As early as K. Marx repeated: "Don't talk to me about your needs, talk about your objective interests." But in modern economics, few people see the difference between needs and interests at all. That is why the approach according to which "technological sovereignty" is associated with such needs is very subjective, although it is not devoid of a certain meaning.

The needs of the state and society that are associated with objective interests and provide "technological sovereignty" include: "ensuring the safety of citizens on their territory; obtaining energy on their territory; providing citizens with food independence and medical care; supplying citizens with essential goods; guaranteeing transport links and accessibility throughout the territory; maintaining a modern level of production information, its storage and exchange on the basis of software and hardware independent of external factors, including an electronic component base" [8].

A detailed examination of these needs reveals quite blurred belief about them, which leaves room for various, sometimes just opposite definitions, assessments, and judgments. Thus, it turns out that the security of Russian citizens is offered only on "their own territory". But if we assume that the security for our citizens – carriers of technological secrets and trade secrets who find themselves abroad (vacations, business trips, etc.) is not provided, then what kind of technological sovereignty can we talk about at all? Or, when they talk about providing medical care without a clear designation of its quantitative and qualitative characteristics, then you can simply forget about "technological sovereignty". The same is true about the transport accessibility of our citizens on "their own territory". The same is true about maintaining a modern level of information production" when databases end up on the black market or in open networks…

The directions of ensuring "technological sovereignty" look rather vague at the moment, which are reduced to stating the need for the formation of an integral system of planning and management of scientific and technological development in the country, the maximum concentration of personnel, financial, infrastructure resources in priority areas of scientific and technological development" [9]. It is not clear, for example, what kind of planning we are talking about, will it be indicative or directive? Which production model is this control system aimed at: the model of "fast-reacting production" (R. Suri) or the model of "lean production", or the model of "active production"? The question seems to be extremely important, especially since at the moment researchers identify from 12 to 17 different business models.

From the above directions of technological sovereignty formation, it can be seen that everything seems to look quite logical, but in fact we have an example of taboo – the substitution of one (first) concept by another (second concept), which only partially reflects the essence of the first concept. The use of abstract concepts (formation, maximum concentration, harmonization) without their clear quantitative and qualitative codification does not give the very possibility of a strictly scientific definition of technological sovereignty, which does not allow it to be considered as a scientific category.

As a concept, technological sovereignty is still blurred at the moment, because a simple summation of one or another of its features by simply listing and generalizing them is a reductive and disjunctive, but far from a dialectical approach. Such an approach does not

allow dialectically to comprehend the place and role of each of the listed features in the structure of the innovative concept, which is "technological sovereignty", and to identify its synergetic component. This circumstance turns out to be all the more important, the greater the role of self-organization and self-government, the participatory management model, which is an alternative to the administrative bureaucratic management model, begins to play role in technological sovereignty formation. Currently, "the synergetic approach has taken shape in a separate direction of the modern theory of automatic control, which has received recognition in Russia and abroad" [10, p. 13], but is extremely poorly applied in practice, although it is clear that "any theory acquires its significance only when it is used in solving practical problems" [10, p. 13].

On the other hand, the mentioned methodology of the interpretation of the "technological sovereignty" concept leads to a multiplicity of its definitions and does not in any way bring us closer to the search for a universal, universally recognized idea of it. The very concept of "technological sovereignty" begins to be used in the plural – "technological sovereignty" in relation to one specific carrier (subject) and is presented in different forms, sometimes completely abstract from the technological background: as the ratio of exports and imports of products, through the ratio of domestic and world oil prices, etc. [5].

In this regard, we can agree with the opinion that "technological sovereignty is absent as a concept — no country in the world has it. The concept of technological sovereignty remains vague and in its scope (...) Therefore, to put into effect the term "technological sovereignty", it is necessary first to indicate which technological blocks and applications are of the greatest importance and for what purposes. For this purpose, it is needed to put the technology in context and link it to the goal it is intended to achieve. This goal is determined by technical, operational, and regulatory requirements, which are based on strategic objectives, legal requirements, and policy directives. Then this context can be translated into a top-down planning and decision-making process that includes several levels" [11].

Sovereignty is most often associated with independence. But the question arises about the subjectivity of sovereignty. After all, sovereignty as such is a certain relationship that develops between certain subjects. Whose technological sovereignty are we talking about? State technological sovereignty is one thing, corporate or personal (private) sovereignty is quite another. In the first case, independence means complete freedom, in the second case – conditional.

A sovereign state, for example, does not pay taxes to another state, and a sovereign person (individual) is obliged to do this. The sovereign state is not obliged to provide military support to other states, and its citizens are obliged in many countries to perform military duties (conscription). The situation is the same with technological sovereignty: some states comply with international obligations in the field of patenting, licensing, while others do not. The practice of borrowing (copying), so widespread in the PRC, for example, has led to the fact that they do not know about any counterfeiting at all. The economic breakthrough provided by such "piracy" is quite obvious.

There is no reason to condemn such a practice, which, among other things, allowed one and a half billion Chinese citizens to overcome the level of poverty: the country's sovereignty begins with the right to life of its citizens.

This phenomenon, in our opinion, illustrates the technological sovereignty of the people, and only then of the state. In fact, it is the people who adopt the available technologies, and the state mediates this in its law enforcement practice. The situation is different in some countries of Europe and the United States, where, contrary to the declared democracy, the authorities do not even hear their people, which is fraught with revolutionary upheavals. The seizure of the Capitol by protesters in the United States or the

thousands of people protesting against pension reform in Paris (March 2023) is a small illustration of current and future upheavals.

It is known that the so-called social division of labor plays a decisive role in world history. No one has canceled it, but less and less people talk and write about it. Politicians in many countries have simply "forgotten" about it. But it is the objective nature of such a social division of labor that determines the specialization, integration and cooperation of production, and, consequently, the technological sovereignty of a country. No matter how much you develop modern "high technologies", the mass production of kiwi or mango in the Russian Federation will not be provided by even the most senior official. Therefore, not political ideas, but only scientific ones should determine the very concept of "technological sovereignty". Therefore, the concept of technological autonomy acquires a certain interest in the context of the technological sovereignty definition.

Technological autonomy is a soberly calculated optimal division of labor and production to ensure technological safety. It should correspond to the objective interests of Russia. Therefore, sovereignty can be full (independence) or partial (autonomy). The question of the role of local self-government in the formation of technological sovereignty of the country remains open. The effectiveness of the functioning of these bodies in the field of technological sovereignty formation in their territories, as it seems to us, comes precisely from the ideas of technological autonomy.

Of course, local self-government bodies should take their part in the formation of technological sovereignty (locally), also insofar as they are subjects of the social partnership system. Although, their competence does not include the development of an appropriate legislative framework, but at the regulatory level they have certain opportunities to contribute to solving this problem. It is possible, by the way, that in the current conditions it makes sense to return to the previous discussion about the endowment of local self-government bodies with certain (separate) power competencies and raise their rank to the level of public service. Moreover, there are priority development areas (PDA) in the country in which the activity of local self-government could play a role [12].

The question of the relationship between technological sovereignty and specialization within the framework of the international social division of labor remains unresolved. The point here is not the value in dispute (for example, the production of semiconductors or microchips), but a more rational approach, since economic integration contributes to the growth and strengthening of technological sovereignty no less than specialization.

An important aspect of technological sovereignty issue is the state of the internal and external environment, for example, the technogenic or ecological situation. Since "destructive external factors are transformed into internal threats through a number of mediating links, which seriously undermines the effective functioning of national economies" [7, p.2381], the key condition for the formation of technological sovereignty is the development of a risk-oriented mechanism for managing technical, technological, and socio-economic processes. We can talk all we want about protecting economic interests or technological security, but without such a mechanism, everything will remain in words or, at best, on paper.

No less important, along with the understanding of the subject – carrier of sovereignty, is the idea of the technological sovereignty object, which today is called "the totality of national interests in all spheres of the country's life" [7, p. 2383]. But the totality does not give any clear ideas about the consistency of such interests, their hierarchy, structure, ranking, and priority. In conditions of limited material and non-material resources, it is the idea of consistency that allows the most competent concentration of forces and resources on the most important and promising areas of the country's development and, accordingly, its technological sovereignty.

Today, several spheres of national security are distinguished by the criterion of the main spheres of society's life: social, political, economic, environmental, informational, spiritual, etc. Nevertheless, the technosphere concept is not yet in this structure. But the state of the modern technosphere is directly related to technological safety. Unfortunately, this condition leaves much to be desired. "Constant transformation, flexibility, high adaptability to external demand, subordination to the laws of capital, as well as the lack of effective technologies turn technospheres into a self-developing system producing a global risk field, unpredictable in its configurations due to the effects of convergence with the risks of other spheres of the media" [13, p. 114]. One of these risks is the problem of biosafety, or rather, biological threats not only natural, but also man-made. Since the consequences of their influence on human life are global in nature, and the threat of the use of biological weapons in modern conflicts remains extremely acute [14, p. 94], technological sovereignty should also be aimed at ensuring such security.

4 Conclusions

Technological sovereignty as a scientific concept (category) involves clarifying its own meaning in a rapidly changing new reality. Since it is inextricably linked with the economy and business, it is necessary to consider their high and constantly growing dynamics. Especially the constant change of their borders, their informational basis and constant reengineering [15, pp. 143-144]. In each strategic sector today it is proposed to implement the concept of technological sovereignty through the so-called five-stage approach [11; 17]. Since the increase of technological sovereignty is inextricably linked with the increase of intellectual capital (IC), it is still necessary to bring such five-stage models into line with the already existing four-phase models of the IC formation [18, p.230].

Perhaps, there are other algorithms, since the dynamics of development of different economy sectors may be different and, accordingly, the reaction to changes should also be different (appropriate).

The rapidly changing reality also presupposes the ability for rapid technological change, the so-called "frontier modernization" [16]. This means that "efforts to form and strengthen Russian sovereignty should be focused not only on digital technologies, but also on quantum technologies, new materials, and biotechnologies. Therefore, to put into effect the term "technological sovereignty", it is necessary first to indicate which technological blocks and applications are of the greatest importance and for what purposes. For this purpose, it is needed to put the technology in context and link it to the goal it is intended to achieve" [17, p. 56]. The traditional three-sector model of the economy ("Model of K. Clark – A. Fischer", 1935) seems somewhat outdated due to the profound structural shifts that have occurred since the beginning of the XXI century in the world and in the national economy. The role of the information sector, as well as the education sector, which were recklessly "recorded" in the service sector at the end of the twentieth century, became obvious – they turned out to be completely independent sectors of the national economy with all the consequences that follow from this fact. The definition of education or informatization as educational or information services is most obviously refuted by the creation of artificial intelligence, which is quite a high-tech and innovative product that has quite a material, not just an intellectual basis. The materialization of innovative thought as an independent technology is present both in software and in other practical formats. The fact that modern society has long since turned from a post-industrial into a "risk society" should not be overlooked (U. Beck), so that the role of endogenous factors in technological development is verified. This, in turn, calls into question another traditional model of economic development – the model of R. Solow (1956), which proceeded solely from the possibilities of the exogenous nature of economic growth and did not consider its

endogenous (internal) factors. For developed globalism, such a model had its arguments, but with the onset of its global crisis, when countries rely on ensuring their economic and technological sovereignty, it is no longer applicable.

Finally, the key issue of the formation of technological sovereignty is personnel (researchers, scientists, laboratory assistants, designers, etc.). Over the past decades, the number of such personnel in the Russian Federation has significantly decreased. The optimization of the education system carried out over the past decades under the banner of the Bologna Convention has contributed to the fact that today the number of scientific and technical workers has significantly decreased. Per million residents of the country, the number of scientific and technical workers in us is 6 times lower than in China. The assurances that Russia's technological sovereignty will be ensured by the new education system remains only a phrase and nothing more. How many similar promises have already been made! Having lost access to a wide range of modern technologies due to certain circumstances, the Russian Federation found itself in an extremely difficult situation: if earlier imperious experiments on the education system and the sphere of science were somehow compensated by such access, now times have changed.

These considerations make it possible to comprehend the necessity and possibility of ensuring technological sovereignty in the context of a broader concept transformation – economic sovereignty, and the latter involves finding alternative models of economic development adequate for fundamentally different conditions than before, emerging within the new reality: high macroeconomic and geopolitical instability and uncertainty, constantly growing risks and general social turbulence.

References

1. D.P. Gorsky, Generalization and cognition, 208 (Moscow: Thought, 1985).
2. V.V. Putin, Speech at the Meeting of the Council for Strategic Development and National Projects (15.12.2022) Access mode: http://kremlin.ru/events/president/news/70086
3. D. Peskov, Why technological sovereignty is important for Russia. Access mode: https://www.rbc.ru/newspaper/2022/06/10/62a0e95b9a79472d8b713207
4. Ensuring technological sovereignty of Russia. Access mode: https://npf-specmash.ru/stati/tekhnologicheskiy-suverenitet
5. V.K. Faltsman, Modern Europe **3,** 83-91 (2018).
6. I.B. Konstantinov, E.P. Konstantinova, Bulletin of the Volga Institute of Management **22(5),** 12-22 (2022).
7. A.A. Afanasyev, Economics, Entrepreneurship, Law **12(9)** 2377- 2393 (2022).
8. I.G. Dezhina, A.K. Ponomarev, Management of science: theory and practice **4(3)** (2022).
9. On ensuring the scientific and technological development of the Russian Federation to achieve technological sovereignty. Access mode: http://council.gov.ru/activity/legislation/decisions/143029/
10. G.E. Veselov, A.N. Popov, A.A. Kuzmenko, *Problems of self-organization and management in complex technical systems*, System synthesis and applied power engineering. Materials of the X All-Russian Scientific Conference. Rostov-on-Don, 2021 12-18 (2021).
11. O.A. Yakimenko, Technological Sovereignty as the key to Russia's Sustainable Development in the XXI century. Access mode:

https://roscongress.org/materials/tekhnologicheskiy-suverenitet-kak-klyuch-k-ustoychivomu-razvitiyu-rossii-v-xxi-veke/

12. D.M. Khudolei, Bulletin of the Perm University. Legal sciences **2,** 48-57 (2011).
13. I.S. Shapovalova, Bulletin of the Institute of Sociology **3,** 113-137 (2016).
14. S.K. Zavriev, World Economy and International Relations, **66(4),** 94 -100 (2022).
15. B. Gates, Business with the speed of thought, 480 (Moscow: Eksmo, 2006).
16. I.V. Berezhnikov, Russia is reforming **12,** 246-275 (2013).
17. B.D. Matrizaev, Theoretical economics **8(92),** 49-59 (2022).
18. E. Brooking, *Intellectual capital. The key to success in the new millennium,* 288 (St. Petersburg: Piter, 2001).