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Ecosystem Approach to the Management of Economic Agents' Interaction in the Industry

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ABSTRACT

The article is devoted to the theoretical and methodological substantiation of the ecosystem theory application to manage the interaction of digital economy actors in the context of industry's development, including its high-tech sector. **The subject** of the study was the assessment of objective and subjective components of the process of forming a united digital space necessary to ensure interaction in the enterprise management in the new digital economy, and **the goal** was to solve the question of choosing a theoretical basis in favor of ecosystem theory. **The results** of the article carried out using the methods of description, scientific analysis and synthesis consist in identifying the completion of digital transformation when the ecosystem level is reached, substantiating the necessary conditions for this; systematizing the objective need to update classical approaches, proving the need to adapt life cycle models for ecosystems taking into account the uncertainty of technological development and proposing an original cyclic model that takes into account transformation of enterprises and the formats of their interactions in the digital economy. As **conclusions**, the basic provisions on the elements of a united digital space (platform, network effects and market expectations) and a dynamic model of its formation based on an ecosystem approach are presented. The authors have formed **recommendations** for the creation of a management system for the interaction of economic agents, taking into account the rules of communication of ecosystem partners, competition between them and the possibilities of coordination. **The relevance** of the work done is determined by the proposal of a unified interpretation of the process of forming a united digital space as one of the most important consequences of the digital breakthrough of the economy.

Keywords: digital economy; ecosystem; business model; management; interaction; unified digital space; digital solution; industry; industrial production; life cycle

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INTRODUCTION

The emergence of the digital world has led to a number of irreversible changes in the economy and society. The new technological cycle, with a significantly higher propagation rate than previous ones, continues to widen the gap between countries, which change existing economic, technological and social models of decision-making and behavior. The technology update caused by these factors is transforming relationships, according to researchers, both economic and social, and political [1, 2]. Digital economy in many ways became the integrator of changes. Russia, according to estimates[1] [3], despite a significant lag from the leaders, was in promising segment of the digital economy (*Fig. 1*), (*Table 1*).

Identified trends need to be more thoroughly developed and studied at all levels, ensuring balance in national development strategies and the organization of business–government interaction.

At present, two major megatrends have been established that reflect most of the digital changes in the modern economy [4]:

- shift from trade in goods to trade in activities arising in value chains, resulting in intermediate products rather than complete goods or services);
- growth of high–tech intangible assets and the transfer of values therein (from patents to service models), which significantly increases the importance of innovation, and to reduce the life cycle of technologies; provide the growth of emerging markets to realize both megatrends more efficiently than old industrial areas.

[1] Digital Intelligence Index. The Fletcher School. Tufts University. URL: https://digitalintelligence.fletcher.tufts.edu/trajectory (accessed on 01.05.2022).

The prospect of digital growth for Russia is also confirmed by the increasing costs of its implementation, which contributes to the accumulation of the potential for a new breakthrough (*Fig. 2*).

In many cases, digitalization is defined as a social process [5] reflecting the rate of change by new technologies. At the same time, market power in the digital environment shifts from manufacturers to end users, who are forced to expect increasingly complex digital services [6]. Relations (as a common generic concept of current processes) are realized in two processes: digitization (i.e. presentation of pre-existing and new data in digital format) and digital transformation, while the second, based on the first, forms new organizational and technical cooperation. It should be noted that the digitization itself is considered by individual researchers, for example [7], as "creative destruction" (by J. Schumpeter), justifying the processes of creation more accessible to consumers while reducing transaction costs.

The concept of a unified digital space (further — UnDS) gives the most real opportunity for Russia's economic growth, due to the digital breakthrough that has become a promising segment of digitalization (with these mega–trends and increasing the communication potential) [8–11], increasingly popular in both scientific research and practical solutions.

But the category, as were the related theoretical and methodological approaches, was not given a unified interpretation, which leads to the need for its substantiation within the framework of the macroeconomic understanding of new economic relations and the organization of industry markets.

It should be noted that the processes of digitization and digital transformation

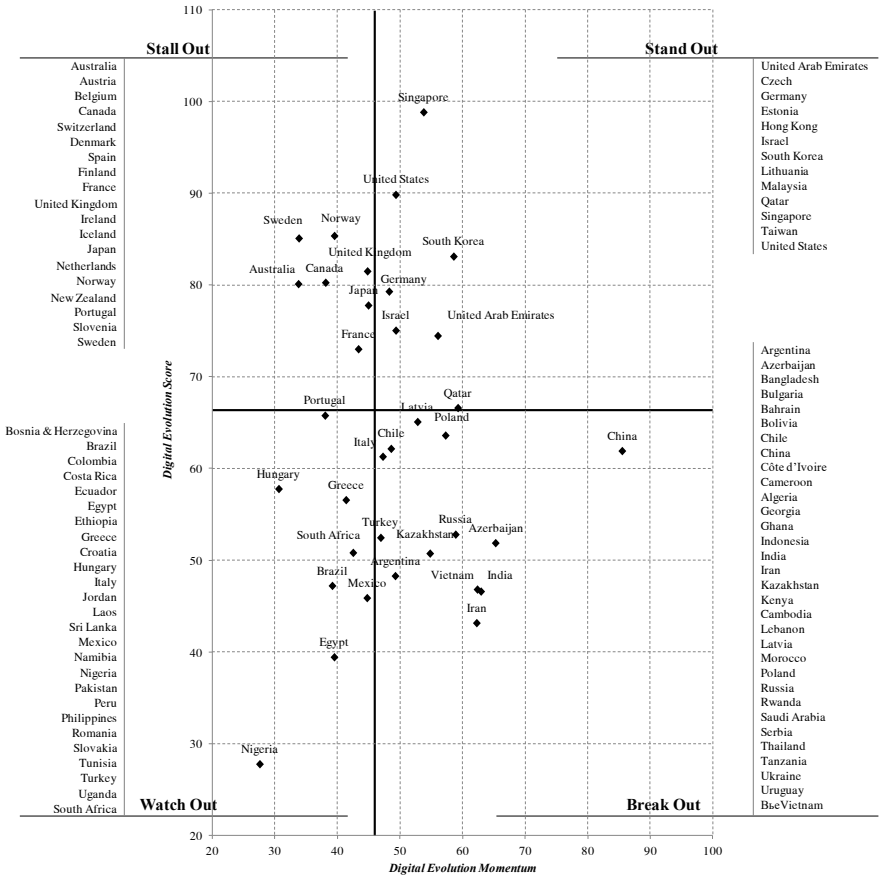

Fig. 1. **Positioning countries by speed and level of digital development, 2020**

Source: compiled by the authors based on Digital Intelligence Index. The Fletcher School. Tufts University. URL: https://digitalintelligence.fletcher.tufts.edu/trajectory (accessed on 01.05.2022), [3].

Table 1

Comparative characteristics of high-tech sectors of the economy of various countries, 2019

Country	Russia	Germany	Norway	US
The country's position on the digital development rating (according to Fig. 1)	Break Out	Stand Out	Stall Out	Stand Out
The share of value added of the medium and high–tech, % of GDP	30	62	43	47
Number of medium– and high-tech, units	40 274	39 437	2097	171 147
Employment in high–tech, million people	24.3	41.7	2.6	59.6
Value added per employee per year, dollars	20 456.8	58 743.9	71 776.9	162 291.9

Source: compiled by the authors on the basis: Problems of regulation and law enforcement practice hindering the development of high-tech companies in the Russian Federation. The Expert Center under the Commissioner and the office of the Public Ombudsman in the field of protection of the rights of high-tech leading companies Special Report, 2020. URL: http://doklad.ombudsmanbiz.ru/2020/6.pdf (accessed on 01.05.2022).

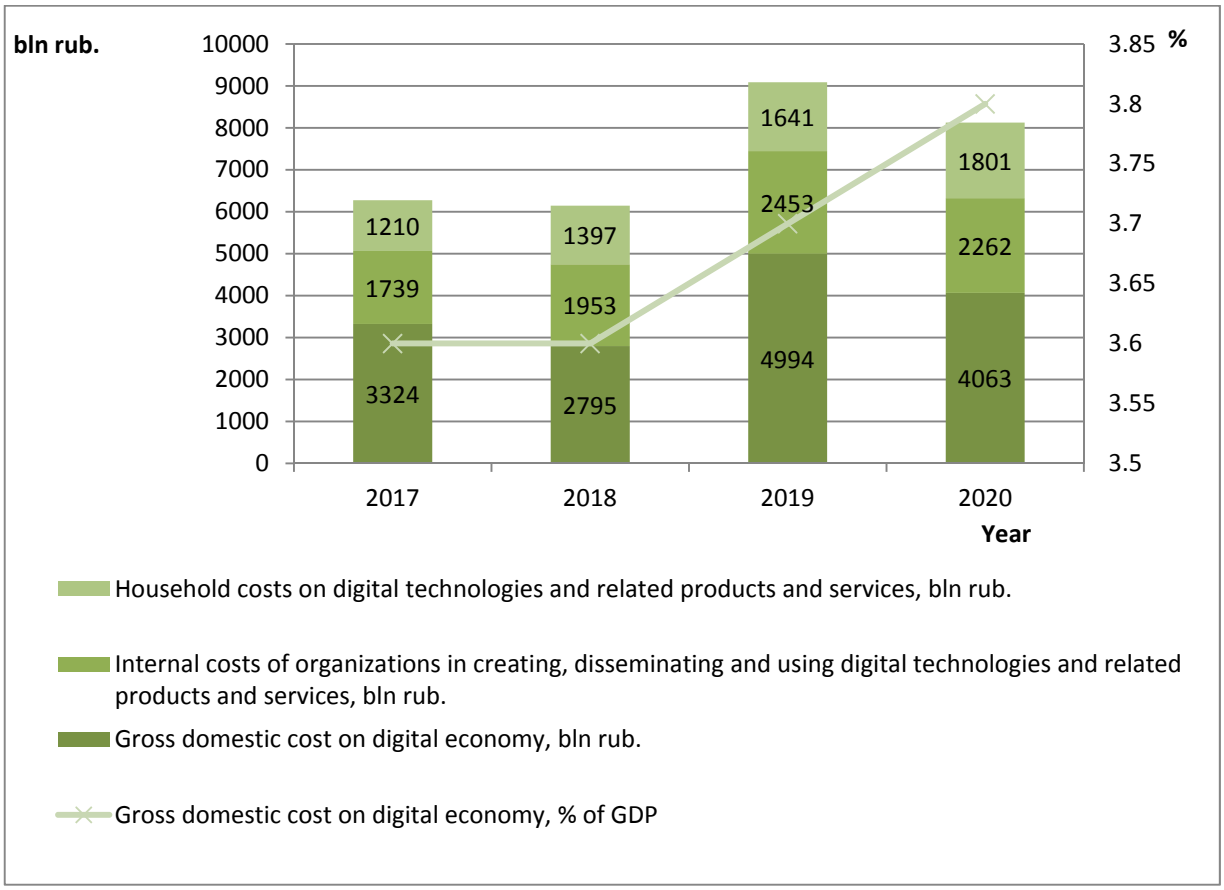

Fig. 2. **Increasing costs of digitalization in Russia**

Source: compiled by the authors on the basis: 2022. Digital Economy. A brief statistical collection. Gokhberg L.M., Kuzminov Ya.I., Parshin M.V. and others., eds. Moscow; HSE; 2022:12–13.

are instruments of transformation of the economy, and not system factors, and therefore it is impossible to form the theoretical basis of the UnDS concept. The research question is whether to consider it as: 1) new theory of ecosystems or 2) as the development theoretical views on the formation of value chains in the digital environment regardless of the level of subjectivity of such a space.

The first direction is now becoming the most accepted and developed: It is based on the organization of production, industry market theory, conformity market design, firm theory and strategic management theory, whose scientific experience has required revision based on digital relationships and the predominance of digital solutions. Such updates are usually systematized by researchers precisely within the framework of the emerging theory of ecosystems.

The author of the concept of ecosystems in business, J. Moore, published his first work in 1996, and since then the topic has been continuously explored to identify trends and provide practical recommendations [12]. Several researchers are connect the dominance of large companies (for example, *Walmart* and *Microsoft*), hat form a unified digital environment as a business ecosystem to the success of their new architectures, defining the latter as "free networks

of suppliers, distributors, outsourcing companies, manufacturers of related goods and services, technology suppliers and many other organizations that influence the creation and provision of own company offers" [13]. Other researchers define digital ecosystems as "interacting organizations that are related to digital connectivity and support modularity and are not controlled by hierarchical authority" [14]. In addition, the ecosystem means, "a set of interdependent subjects and factors coordinated in such a way that they ensure productive entrepreneurship in a particular territory" [15].

The following three — platform, network effects and market expectations — are the main elements for building a successful ecosystem [16]. In the formation of UnDS, we proceed from the need to provide parameters such as interdependence, consideration of factors, coordination, productive entrepreneurship and limited territory (national or subnational level) and compare its framework with the above-mentioned elements of ecosystem architecture strengthened by government regulation and support. All this in the framework of creating a theoretical landscape for managing the interaction of economic agents in industry in the modern digital economy.

METHODOLOGY OF RESEARCH

The author's idea of the composition of the concept of "unified digital space" is based on the clear identification of four major approaches to its definition:

1) limited notion "Internet" to a specialized digital environment, within which both interaction and its management is carried out, that only by technical parameters, without establishing rules for the formation and implementation of managerial and economic relations in such an environment; such an approach is inherent in understanding the "common" space rather than the "unified"; it is thus obvious that there may be several segments of such a space, both connected and independent, but this connectivity (independence) is determined not by organizational and managerial relations, but by the rules (and procedures) of access to such environment;

2) narrowing the digital space to an industry digital environment that ensures the unity of data within the framework of implemented relationships (unity of information base). This understanding allows for more trusting relationships within the new space, avoiding duplication of data and ensuring its validity; but in such an environment no interaction or control algorithms are yet to be implemented except for regulated procedures, competitions or procedures that require standardization;

3) use of the concept of "ecosystem" in the notations of J. Moore and his followers, including both universal ecosystems and more specialized, for example, entrepreneurship, knowledge, human capital, open innovation, etc.

4) value chain approaches for specific projects at different levels and scales.

It is important to note that from the first approach to the fourth there is a *reduction* in the level of complexity in terms of the scale and technical design of the system itself, and the degree of algorithmization of managerial decisions, on the contrary, is *increasing*.

Certainly, the broadest definition of UnDS is contained in the first vision, which implies two options for accessing such an environment: either fully open or limited to registration (openly

conditional). Subsequent options, however, are characterized by the introduction of additional restrictions, both functional and managerial, which also allow the concepts of protectionism and economic sovereignty to be realized (including at the national level), ensuring the competitiveness of countries in the world space with selected domestic economic policies (while more open spaces are characterized by global trends).

The basic premise for this research is the initial focus of digital transformation on three objectives: cost reduction, networking and cost targeting [17], and, therefore, its completion at the ecosystem level is fair (i.e. after digitally transform operations and organizational processes, as noted in a research by specialists from the International Business School at Massachusetts Institute of Technology [USA]) [18]. This, in turn, suggests that for the industry, the digital transformation will be considered complete after the creation of a unified digital space. This conclusion correlates with the logic of the four levels of ecosystem definition we have identified above.

The authors take the following position regarding the identification of an objective need to update the classical approaches (including characteristics of digital relations, within UnDS):

- change of the classical concept of "external environment", which under conditions of digital economy undergoes significant transformations;
- rejection of resource approaches to the formation of strategies, including the replacement of the basic postulate that "strategy is the result of assessing the compliance of the external environment and the ability of the company", statement that "strategy in the digital environment as a business model is a reflection of the potential of customer-centric cooperation";
- transformation of the content of the concept of "technology", which becomes double in content, i.e. includes transforming and controlling parts, in doing so, the latter part becomes exclusively digital, including access to such technology.

In addition, the transition to the concept of "everything as a service"[2] also has its imprint on the mentioned problems, which defines many new properties of digital economic relations, but does not create fundamentally different solutions (in terms of final consumption), only greatly reducing transaction costs.

The initial selection of the ecosystem theory as the theoretical basis for UnDS requires the identification and assessment of the main problems faced by the new concept.

Justifying its potential, we note that the first and main problem and the related discussion are based on the fact that the ecosystem (as the business model considered the main strategic decision in ecosystems) is not a mainstream as such, but a set of contradictions (of opposites) — "fragile balance" [19] between integration and disintegration. This allows speaking about the possibility of dialectical vision of digital space: two key vectors — "centripetal forces and centrifugal forces" [19] are diametrically opposed, and their compromise largely determines the forms of the existence of digital solutions.

The second problem, which is reflected in the work of many researchers, is a passion for the functional approach (which is particularly relevant in the context of the

[2] Tech Trends 2017: The kinetic enterprise. Deloitte University Press. URL: https://www.deloittedigital.com/us/en/blog-list/2017/the-kinetic-enterprise-announcing-deloittes-2017-tech-trends-report.html (accessed on 01.05.2022).

prevalence concepts of sharing economy, the economy of services, etc.), which objectively describes various processes and in the digital economy has an advantage over the product and process. Too much protrusion of certain functions leads to negative outcomes rather than an informed understanding of many digital solutions.

The third problem — is the constant dynamics of the external environment, in which the idea of including resources in the business model begins to prevail, i.e. there is a radical need to move away from resource strategies: effective use of resources becomes a pressing issue instead of attracting resources.

The authors also identify the issue of the preferential choice of the management system as discussion — for many researchers the ecosystem (and potentially UnDS) turns out to be independent of the dichotomy "market — plan" quite unexpectedly and can be realized in the framework of both platform capitalism, and regulation of the economy with significant state participation. At the same time, it is obvious that it is impossible to theoretical justification the effectiveness (advantage) of ecosystems in various management systems — it will be proved in a practical way.

RESULTS OF THE STUDY

Ecosystems in the cyclical development model

By now, there are quite a number of ecosystem types and the typology itself is not sufficiently developed. Most commonly identified: business ecosystem, entrepreneurial ecosystem, innovative ecosystem, knowledge ecosystem [20]. It is also important for researchers to divide them into levels — global, national and subnational [21]; it does not consider the production and creative ecosystems but global and regional also. At the same time, the attention remains and network potential with a qualitative highlighting of such properties as "good" or "bad" functioning network [22]. Most scientists consider quality assessments of ecosystems development to be dominant, so attempts to conceptualize their types more specifically are only just beginning [23]. Obviously, for the purposes of UnDS design, the classification associated with the level (national or subnational) or with the sectoral division (e.g., industrial, creative or scientific) is most applicable.

However, it should be concluded that ecosystem typologies will be difficult to understand without understanding their life cycle, so one model of cyclicality should consider, inter alia, the life cycle itself [24] or the survival indicator (with funding and influence of the time factor) [25].

In many ways, the need to define a life cycle is linked to some of the technological uncertainties inherent in modern digital solutions; of course, in order to reduce it in decision-making it is not necessary to evaluate the development of technology itself (which is essential and important for R&D). Their implementation in society and economy (which is of great importance for UnDS as an ecosystem), which is most fully expressed by such categories as "strategies" and "business — models". Therefore, these are the concepts used further as the basic.

Cyclical models that take into account the feasibility of technologies (in terms of consumer value) and the diffusion of innovations (i.e. their development and commercialization potential for the producer) are preferable to assess the life cycle. The practical value of diffusion and competition models is not high enough given the insufficiently of experience with digital technologies and the lack of a direct

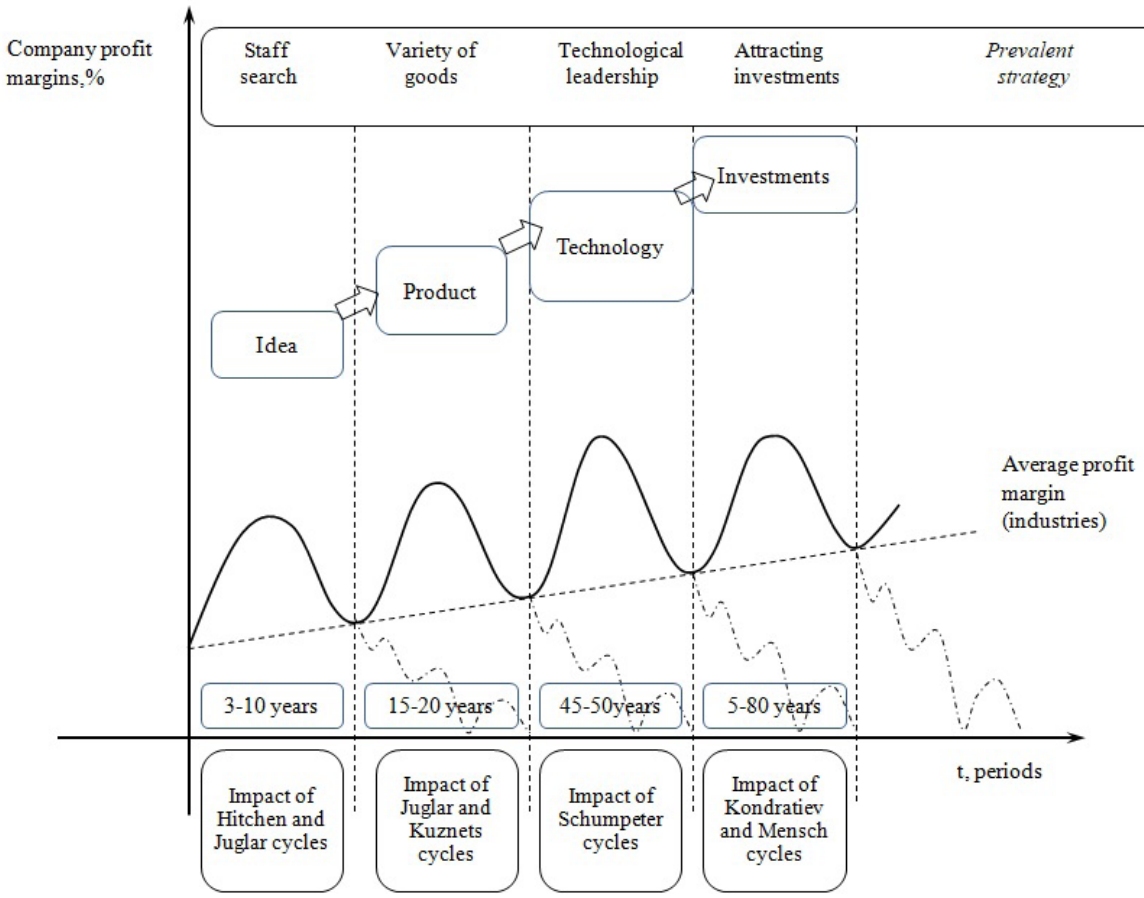

Fig. 3. **The basic model of the company's cyclical development**

Source: [29].

link to the business model; it is important to note that at the same time as developing the most promising business concepts, the right combination of technological priorities cannot be determined for sure [26].

The potential of technologies should be the basis of the proposed model — it can be estimated with the following 8 metrics [27]: technical system objectives and business objectives; product life cycle phases; its preferred behavior in these phases; product life cycle; technological properties; links between product properties and desired consumption choices; potential effects of investments and assessment of financial performance. This list shows that, for example, for a service whose market exit is long, a limited number of metrics can be used, with the popular cost measurement completely dependent on expert assumptions, when evaluating technical parameters [28]. However, the increasing complexity of the cyclical model should be selected as the vector to demonstrate the change in business — decisions in the medium and long term. Such periodization can be derived from the previously developed original author's base model presented on *Fig. 3*.

In order to justify the use of a particular version, it is necessary to clarify the constants that ensure continuity of industrial and digital periods, and for

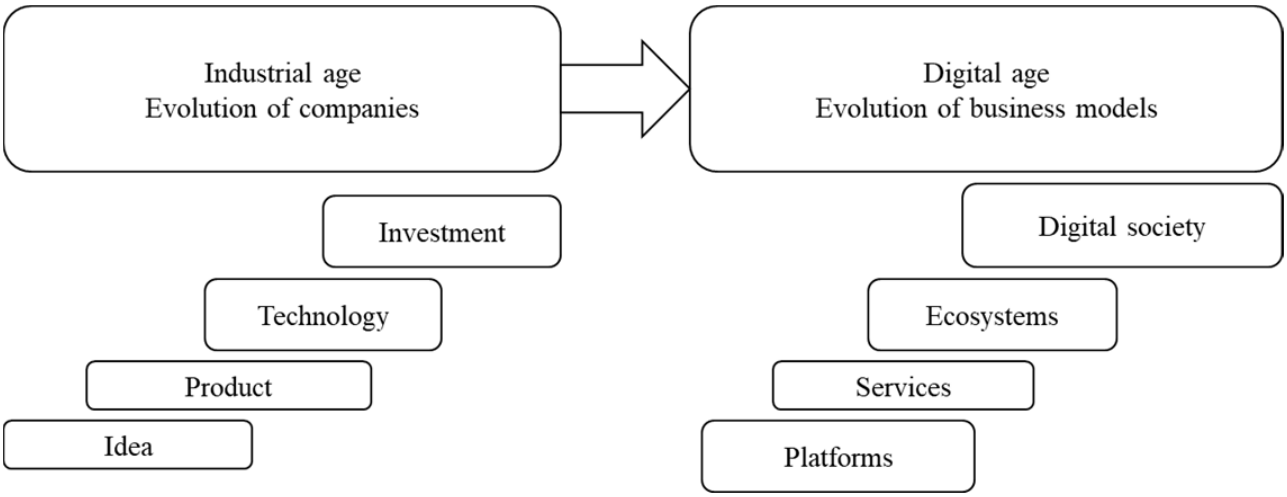

Fig. 4. **Transformation of the prevailing strategy**

Source: [31].

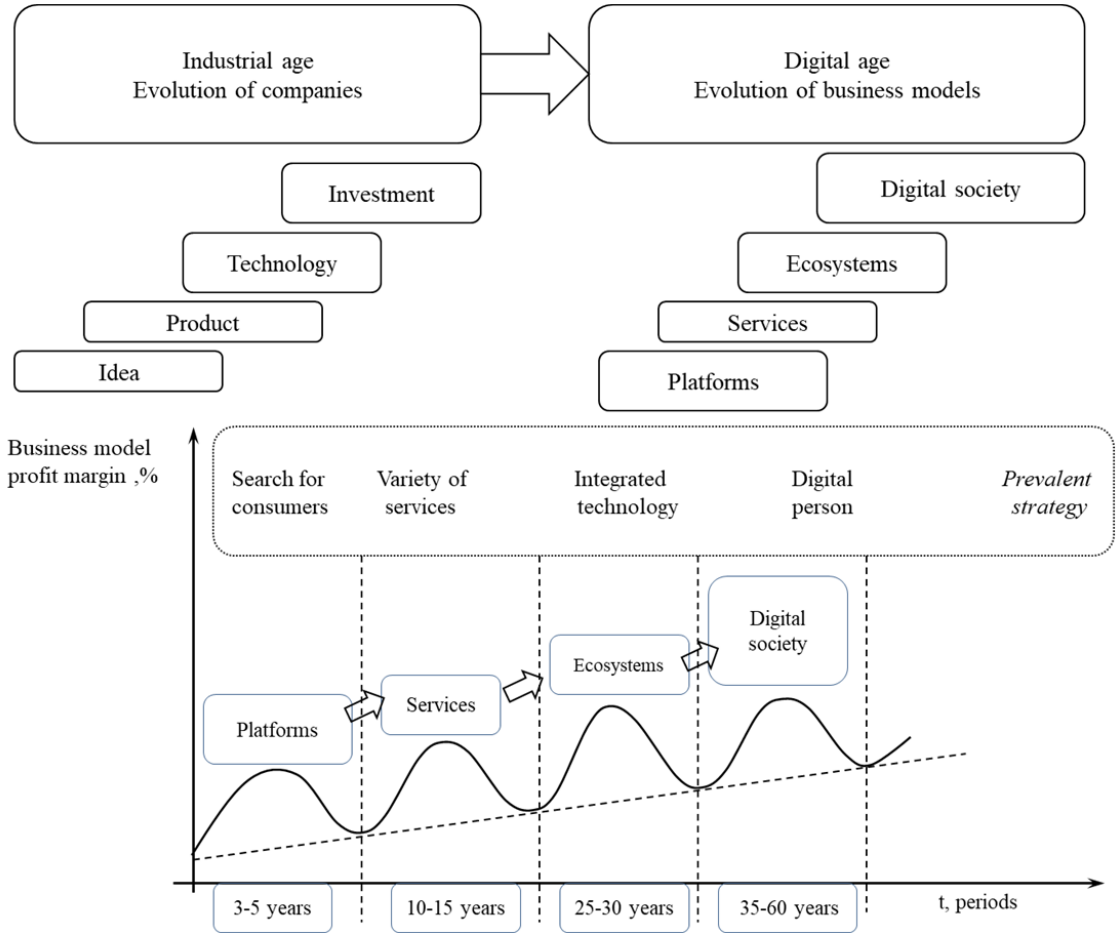

Fig. 5. **Cyclical model of the "digital economy" stage**

Source: [31].

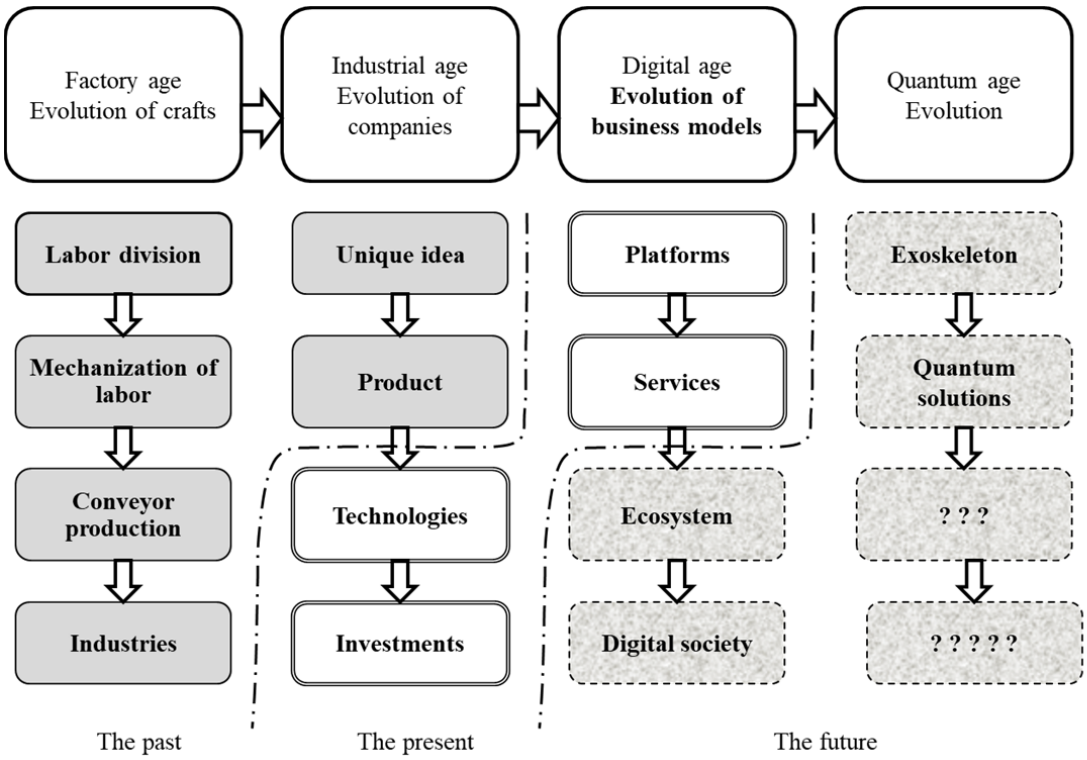

Fig. 6. **Matrix representation of the cyclicity model**

Source: supplemented by the authors based on [31].

adaptation — the differences between industrialization and digitalization:

• technologies have the property of growing in complexity in a number of stages of their development, before completely changing the solutions used;

• development of economic relations is cyclical, characterized not by one but by several manifestations of different periodicity.

The unity of understanding and presentation of modern technology is ensured by the single separation of two components. The first is material (instrumental or transformative) and the second — consists of management decisions, i.e. the flow of technology data transferred to management [30]. The delivery process (logistics) in this case should become open and external — then there will be a unity of presentation of both the technology and the business models generated by it, which will reduce the uncertainty in the future.

As a result, models were obtained: transformations of the predominant strategy (*Fig. 4*), cyclical, adapted to the digital economy (*Fig. 5*) and their totality, taking into account historical data (*Fig. 6*).

First, note that on *Fig. 5* it is not a company but a business model that is being considered, as different organizational forms begin to lose their purpose in the digital economy: many of their internal costs are becoming comparable to those of others, and the role of formal integration is therefore somewhat reduced. In other words, the new stage of business development, namely — digital, is not connected with organizational forms of entrepreneurship and their strategies (including efforts to reduce the cost of support), and it's business models that, with their physical

structure, are getting closer and closer to the digital reality of the future; replacement of their generalized type has and will continue to do so in a sequential (cyclical) manner, supported by various technologies (as has already happened in the industrial economy).

Accordingly, the "platform" (*Fig. 3*) reflects the stage of a huge number of different startups, the so-called "idea", which was realized, practically without affecting the production, leaving it with the prospect of digitization. During this period, it was the technologies–integrators, implemented primarily through communications. Such platforms, while rarely producing goods, had a significant impact on income distribution in the value chain.

It is important to note that it is within the framework of value creation that common application technologies have achieved "easy" digital victories, reducing transaction costs for a number of companies, thanks to which they have gained leadership. However, should be considered, such results will become less frequent and less profitable in the development and dissemination of a holistic digital environment. Estimate of the duration of the second stage of the evolution of the digital economy — 10–15 years, and therefore it will be estimated to end in 2025–2030. Note that the features of this period should be the active replacement of the product by the service and the development of the sharing economy. Accordingly, the key technologies will be those that can provide.

The third stage will be entirely devoted to the creation of digital ecosystems — it is there that our idea of technology as a multi–component model will be demanded. Today's leaders are undoubtedly already forming the first ecosystem approaches, which will receive full development only after the implementation of the stage "service". It should also be noted that the maximum possible digitalization by this time will be completed, the digital advantages will be converted into a digital necessity. The fourth stage can be considered only in terms of its duration and the new society now, based on digital relations, whose contours can only be traced in philosophical notions. Taking into account the presented cyclical model (*Fig. 5*), note that the creation of value chains remains the content of the first stage ("Platforms"), which does not mean the rejection of such decisions. However, taking the established trends as a basis, it is necessary to focus the business on the formation of the transition to services in the maximum number of segments.

This model, applied to UnDS, allows you to draw the following conclusions:

- the final structure of UnDS is not defined, as the main period of creation of such solutions is expected in the range 2025–2040;
- in connection with the beginning of the creation of similar UnDS, it is important to explore the role of leaders, adjust their future image;
- the development of UnDS as an ecosystem does not mean the abandonment of platform solutions and networks (including value chains), but rather the transfer of UnDS from targets to mandatory tools;
- the formation of UnDS it is required to focus on its main elements within a unified structure to ensure sustainability in future periods: otherwise, the lack of solutions will not allow in the future to form an independent UnDS and will have to turn to import institutions again (as it did in the 1990s).

Table 2

Changing the paradigm of society (2010s vs. 2020s)

The paradigm of the 2010s.	The paradigm of the 2020s.
Globalization	Protectionism
Monetarism	Keynesianism
Financial losses	Threat to life
People	Robots
Deflation	Inflation
Reduction of borrowed funds in banks	Reduction of borrowed funds of companies
Low taxes	High taxes
Minerals	Clean energy
Economic recovery after the crisis	Anti-crisis support programs
Shareholders	Stakeholders
Profit Maximization	Moral Capitalism
Growth	Value

Source: adapted and supplemented by the authors based on: Bank of America Merrill Lynch 2020 Market Outlook: Profits Rise, Economy Slows, Globalization Peaks, and Business-as-Usual Investing Comes to an End. 2019, 03 Desember. URL: https://newsroom.bankofamerica.com/press-releases/global-markets/bank-america-merrill-lynch-2020-market-outlook-profits-rise-economy (accessed on 01.05.2022).

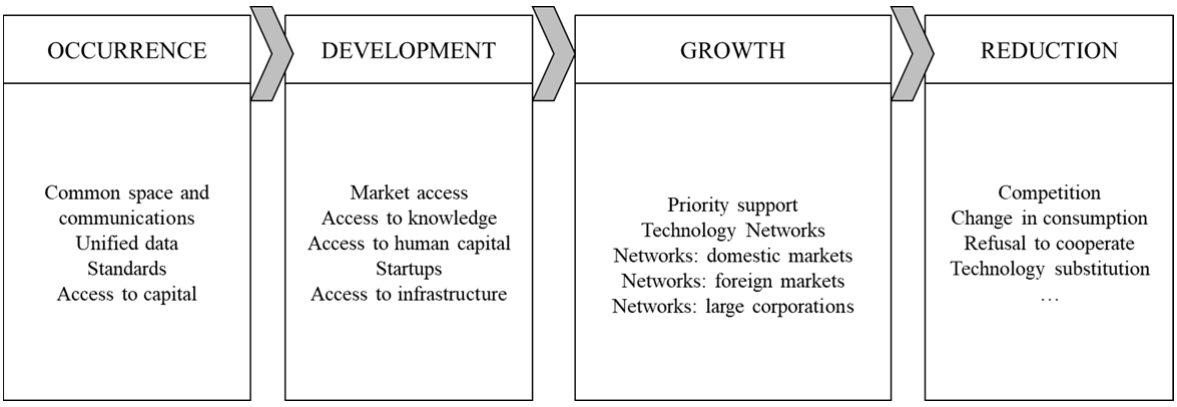

Fig. 7. **Stages of formation of a single digital space**

Source: developed by the authors.

Ecosystem structure and the new digital environment

The structure of the ecosystem is understood by some authors as a set of presented elements (supporting entrepreneurial culture, access to finance, access to human capital, innovative capacity, and formal business support organizations [32]), a set of which is considered by many researchers to be an essential and determining factor for its effectiveness [22].

However, the list above does not include the important component of institutional infrastructure which is understood as the combination of "cognitive, normative and regulatory elements and activities that provide stability and meaning to social behavior" [33].

In our opinion, in general, the components of the UnDS ecosystem base can be divided into several groups: state economic policy; leadership; financing; human capital; research (in some cases — research results defined as knowledge); physical infrastructure (most logistics and rental); markets; entrepreneurial culture; communications.

Each of them, when implemented, can be expanded in more detail depending on the purpose of the created spaces, but is required to have ecosystem element properties: avoid duality and duplication, be scalable, interact with digital solutions, and operate in a digital environment.

In this regard, it is also important to approach the formation of this new environment as the basis of "activity" UnDS. The external environment, whose importance dates back to the 1950s, remained the basis for the development of strategies and a key part in most of the related processes prior to digitalization (and in a number of sectoral segments still remains). The most important logical design for more than half a century is the prerequisite to assess the relevance of available resources to the potential of the external environment by considering the organization as a system. Various aspects, including institutional, have since supplemented this theory. As a result, the concept of the target environment was proposed, including suppliers, customers and competitors, which can be defined as "adaptive" [34]. However, a paradigm shift is taking place even from the 2010s (*Table 2*).

The transformation of the external environment (when designing industrial interactions under digital transformation) should be understood as the integration into UnDS and itself, and the resources available, which will facilitate their use for participants; therefore, when establishing UnDS, it is necessary to consider the possibilities of conformity market design. The choice of such an approach as the base instead of the "adaptable" is the main principle difference of ecosystems, for ensuring the requirements of the correspondence between the internal and the external environment [35, 36]. It is important to note, however, that the creation of conformity markets does not mean a market economy retreat — on the contrary, it increases its efficiency.

In addition, it is possible to distinguish a few less radical but essential in the design of interactions within ecosystems and UnDS changes, namely:

- preconditions for designing — business model performance analysis instead of environmental compliance analysis;
- accounting and assess the availability of new types of reality — augmented, virtual and hybrid — to different processes instead of resource availability;
- analysis of ecosystem borders (beyond traditional industries) instead of the previously key sector analysis;

• analysis of value chain participants as basic elements instead of analysis of micro– and macro–level and dynamics of indicators of industrial development;

• using decentralized financial services for calculate instead classic bank transactions;

• attracting finance through digital approaches instead of classical debt financing;

• using internal ecosystem performance criteria rather than traditional environmental utility assessments.

CONCLUSION

There is a definite dynamic model of UnDS formation based on the ecosystem approach, which is consistent with the previous cyclical model of the last, 4th stage of development (*Fig. 7*). Each one on *Fig. 7* is presents a generalized, because in the design of UnDS, the choice of initiative advantages that develop and ensure the growth of factors, should be carried out individually with reference to a specific task.

Given the sustainability of the largely equitable argument that technology transforms economic linkages, coordination and competition play an equally important role in industrial transformation. In this case, the main vector should be directed towards their synthesis, or, in other words, cooperation. There is no doubt that the classic model whereby a company with access to scarce resources gains a competitive advantage remains fair; however, another thesis is also logical: if opposing parties agree to cooperate, the economic result becomes more significant. As a result, while other processes remain competitive, increased competition leads to increased cooperation rather than the reverse, which is what high– and medium–tech industries linked to the same suppliers are seeking [37, 38].

Therefore, as recommendations for creating a structure of industrial interactions under UnDS within the framework of the ecosystem approach is necessary:

establish clear rules for communication between ecosystem partners, setting them at the level of model development;

Justify the use of other control techniques in ecosystems, and thus compromise decentralization and centralization through the necessary variety of platforms, taking into account that traditionally value chains have been created as linear, final consumption chains and that vertically integrated organizations have been created to address emerging issues (which, in turn, require typology and appropriate measurement);

• to decide on vertical or horizontal integration, based on the conditions of control of profit in the value chain created;

• to develop a system of criteria for choosing between coordination and cooperation in terms of technological independence from competitors, which is generally provided by the alternative of not engaging with competitors. With public participation, such an alternative should be controlled at the highest level, allowing only value chains with technological sovereignty;

• the choice of cooperation should be evidenced by the specific market situation and therefore be short– and medium–term rather than long–term obligations;

• to assess the functioning of ecosystems to manage them. Since there is no consensus on the methods to be used, different approaches [39] may be used to group the way ecosystems are measured on the basis of multiple elements: worldwide

governance indicators (formal institutions); entrepreneurship index (entrepreneurship culture); networks; physical infrastructure; finance; leadership; human capital quality; market demand; services; exit opportunities provide the basis for the formation of basic parameters of ecosystem design to ensure modern digital interactions in industry for the benefit of economic and social development.

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REFERENCES

1. Nelson R.R., Winter S.G. An evolutionary theory of economic change. Cambridge, MA: Belknap Press of Harvard University Press; 1982. 454 p.
2. Berg S., Wustmans M., Bröring S. Identifying first signals of emerging dominance in a technological innovation system: A novel approach based on patents. *Technological Forecasting and Social Change*. 2019;146:706–722. DOI: 10.1016/j.techfore.2018.07.046
3. Bhalla A., Chakravarti B., Chaturvedi R.V. The most digital countries in the world: 2020 rating. Harvard Business Review Russia. URL: https://hbr-russia.ru/innovatsii/trendy/853688/ (In Russ.).
4. Cano-Kollmanna M., Hanniganb T.J., Mudambi R. Global innovation networks — organizations and people. *Journal of International Management*. 2018;24(2):87–92. DOI: 10.1016/j.intman.2017.09.008
5. McAfee A. Enterprise 2.0: New collaborative tools for your organization's toughest challenges. Boston, MA: Harvard Business Press; 2009. 256 p.
6. Legner C., Eymann T., Hess T., Matt C., Böhmann T., Drews P., Mädche A., Urbach N., Ahlemann F. Digitalization: Opportunity and challenge for the business and information systems engineering community. *Business & Information Systems Engineering*. 2017;59(4):301–308. DOI: 10.1007/s12599–017–0484–2
7. Valenduc G., Vendramin P. Digitalisation, between disruption and evolution. *Transfer: European Review of Labour and Research*. 2017;23(2):121–134. DOI: 10.1177/1024258917701379
8. Krasil'nikova M.A., Maksimov M.I. On the prospects of creating a single digital space of the CIS countries. In: Development of integration processes in the Russian economy. Moscow: KnoRus; 2018:161–165. (In Russ.).
9. Efremov A.A. Unified digital spaces: Finding the balance between integration and sovereignty. *Informatsionnoe pravo = Informational Law*. 2016;(3):36–39. (In Russ.).
10. Vasilenko N.V., Lapinskas A.A., Khaykin M.M. The role of state policy in the formation of a single digital space. In: Innovative clusters of the digital economy: Theory and practice. St. Petersburg: Polytech; 2018:51–76. (In Russ.). DOI: 10.18720/IEP/2018.4/3
11. Lopatina N.V. Theoretical and methodological bases for designing a unified digital space of scientific knowledge. *Informatsiya i innovatsii = Information and Innovations*. 2020;15(3):45–49. (In Russ.). DOI: 10.31432/1994–2443–2020–15–3–45–49
12. Moore J.F. The death of competition: Leadership and strategy in the age of business ecosystems. New York: Harper Business; 1996. 320 p.
13. Iansiti M., Levien R. Strategy as ecology. *Harvard Business Review*. 2004;82(3):68–78.
14. Jacobides M., Cennamo C., Gawer A. Towards a theory of ecosystems. *Strategic Management Journal*. 2018;39(8):2255–2276. DOI: 10.1002/smj.2904

15. Spigel B., Stam E. Entrepreneurial ecosystems. In: Blackburn R. A., De Clercq D., Heinonen J., eds. The SAGE handbook of entrepreneurship and small business. London, Thousand Oaks, CA: SAGE Publications; 2018. DOI: 10.4135/9781473984080.n21
16. Valdez-de-Leon O. How to develop a digital ecosystem: A practical framework. *Technology Innovation Management Review*. 2019;9(8):43–54. DOI: 10.22215/timreview/1260
17. Kotarba M. Digital transformation of business models. *Foundations of Management*. 2018;10(1):123–142. DOI: 10.2478/fman-2018–0011
18. Kane G. C., Palmer D., Phillips A. N., Kiron D., Buckley N. Strategy, not technology, drives digital transformation. Cambridge, MA: MIT; 2015. 29 p. URL: https://www2.deloitte.com/content/dam/Deloitte/fr/Documents/strategy/dup_strategy-not-technology-drives-digital-transformation.pdf
19. Holgersson M., Baldwin C. Y., Chesbrough H., Bogers M. L.A.M. The forces of ecosystem evolution. *California Management Review*. 2022;64(3):5–23. DOI: 10.1177/00081256221086038
20. Cobben D., Ooms W., Roijakkers N., Radziwon A., Ecosystem types: A systematic review on boundaries and goals. *Journal of Business Research*. 2022;142:138–164. DOI: 10.1016/j.jbusres.2021.12.046
21. Audretsch D. B., Belitski M. Towards an entrepreneurial ecosystem typology for regional economic development: The role of creative class and entrepreneurship. *Regional Studies*. 2021;55(4):735–756. DOI: 10.1080/00343404.2020.1854711
22. Spigel B., Harrison R. Toward a process theory of entrepreneurial ecosystems. *Strategic Entrepreneurship Journal*. 2018;12(1):151–168. DOI: 10.1002/sej.1268
23. Kapturkiewicz A. Varieties of entrepreneurial ecosystems: A comparative study of Tokyo and Bangalore. *Research Policy*. 2021:104377. DOI: 10.1016/j.respol.2021.104377
24. Clayton P., Feldman M., Montmartin B. et al. Funding emerging ecosystems. GREDEG Working Papers. 2019;(25). URL: http://www.gredeg.cnrs.fr/working-papers/GREDEG-WP-2019–25.pdf
25. Auerswald P. E., Dani L. The adaptive life cycle of entrepreneurial ecosystems: The biotechnology cluster. *Small Business Economics*. 2017;49(1):97–117. DOI: 10.1007/s11187–017–9869–3
26. Tomičić M., Tomičić-Pupek K., Pihir I. Understanding digital transformation initiatives: Case studies analysis. *Business Systems Research Journal*. 2020;11(1):125–141. DOI: 10.2478/bsrj-2020–0009
27. Mämmelä J., Juuti T., Korhonen T., Julkunen P., Lehtonen T., Pakkanen J., Vanhatalo M. Evaluating the value and costs of technology in the manufacturing industry. In: Proceedings of NordDesign 2018 (Linköping, August 14–17, 2018). Tampere: Tampere University of Technology; 2018. URL: https://www.designsociety.org/publication/40936/Evaluating+the+value+and+costs+of+technology+in+the+manufacturing+industry
28. Chiesa V., Gilardoni E., Manzini R. The valuation of technology in buy-cooperate-sell decisions. *European Journal of Innovation Management*. 2005;8(1):5–30. DOI: 10.1108/14601060510578556
29. Stepnov I. M. Innovation management: The use of innovative potential in industry. Moscow: Fizmatlit; 2001. 234 p. (In Russ.).
30. Stepnov I. M., Kovalchuk J. A. Digital business model: Technology management and profit control. *Innovatsii v menedzhmente = Innovations in Management*. 2020;(3):68–79. (In Russ.).
31. Stepnov I. The uncertainty of the technological future. In: Stepnov I., ed. Technology and business strategy: Digital uncertainty and digital solutions. Cham: Palgrave Macmillan; 2021:19–37. DOI: 10.1007/978–3–030–63974–7_2
32. Vedula S., Kim P. H. Gimme shelter or fade away: The impact of regional entrepreneurial ecosystem quality on venture survival. *Industrial and Corporate Change*. 2019;28(4):827–854. DOI: 10.1093/icc/dtz032

33. Hinings C.R., Logue D.M., Zietsma C. Fields, institutional infrastructure and governance. In: Greenwood R., Oliver C., Lawrence T.B., Meyer R.B., eds. The SAGE handbook of organizational institutionalism. London, Thousand Oaks, CA: SAGE Publications; 2017:170–197. DOI: 10.4135/9781446280669.n7
34. Demil B., Lecocq X., Warnier V. "Business model thinking", business ecosystems and platforms: The new perspective on the environment of the organization. *M@n@gement*. 2018;21(4):1213–1228. DOI: 10.3917/mana.214.1213
35. Vulkan N., Roth A.E., Neeman Z., eds. The handbook of market design. Oxford, New York: Oxford University Press; 2013. 681 p.
36. Callon M., Roth A.E. The design and performation of markets: A discussion. *AMS Review*. 2021;11(2):219–239. DOI: 10.1007/s13162–021–00216-w
37. Miotti L., Sachwald F. Co-operative R&D: Why and with whom? An integrated framework of analysis. *Research Policy*. 2003;32(8):1481–1499. DOI: 10.1016/S 0048–7333(02)00159–2
38. Monteiro A.P., Soares A.M., Rua O.L. Linking intangible resources and export performance: The role of entrepreneurial orientation and dynamic capabilities. *Baltic Journal of Management*. 2017;12(3):329–347. DOI: 10.1108/BJM-05–2016–0097
39. Leendertse J., Schrijvers M., Stam E. Measure twice, cut once: Entrepreneurial ecosystem metrics. *Research Policy*. 2021:104336. DOI: 10.1016/j.respol.2021.104336

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Management Accounting: What is Subject to Digital Transformation?

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ABSTRACT

The subject of the article are the problems of transformation on the basis of breakthrough digital technologies of activity on information support of management and use of accounting information in managerial decision-making. The authors in the course of the research analyze the current state of management accounting and prove that only a factor information model is able to ensure the implementation of the functions of the actual management of the object, allowing observation based on operational, technical, accounting, statistical and data integration requirements. On the example of the system of productivity indicators (qualitatively defined quantity), it is demonstrated that it is possible to implement such requirements for this factor as the object, accuracy and specificity of the work; and an example of a system of indicators for fixed assets — harmonies the functions performed for the object. The article also substantiates the conclusion that the solution of the problems of digital transformation of speech can be provided by an information system functioning based on the platform using ***Big Data*** and cloud technologies — ***DaaS*** interacting with active elements of the Internet community. In the course of the study, in generalization of modern concepts of management of economic systems, directions of development of digital technologies and their implementation in the processes of information management, **methods** of system and comparative analysis were used.
Keywords: information support of management; management accounting; accounting systems; digitalization; digital transformation; information model; Big data; DaaS

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INTRODUCTION

Today's challenge is considered the requirement of high efficiency of the enterprise as a business unit, but the strengthening of its position in the market of goods and services largely depends on the adoption and implementation of high-quality management decisions. Therefore, any management system is often challenged to organize its activities using modern tools at present, among which digital technologies are most in demand in the implementation of national programmes in this area. To this end, decisions are being taken to develop the technical and technological base for the collection, generation, storage and data processing in various areas of public life. Digital technologies become the basis of digital transformations that provide profound transformations, including new quality [1].

Immediately emphasize, that the effectiveness of any transformation is determined by the degree to which it corresponds to the theoretical and methodological foundations of the activity being transformed. This assertion is due to digital transformations can answer the question: "how can this be done"? and only in general terms — to question "what to do"? In other words, they hardly affect the primary problems.

However, many factors have made it necessary to find a solution, however, the first priority is to establish the location of the information activities to be digitally transformed in the management; other circumstances, concerning the ecological environment, are play no less significant role, from information technology to management of complex economic systems. It is also

important to take into account that finding answers will pose two problems: effective management decision-making and information management of the process [2], which are related to the monitoring of the whole variety of manifestations of the essence of functioning; and development of the business unit, influencing its behavior and changing under the influence of the environment.

The importance of information for objective reasons should not be underestimated; Moreover, the efficiency of its transformation will determine the possibilities of changes not only in the management sphere, but also in the behavior of the business unit itself. Since the digital transformation is likely to affect this activity in the first place, the degree of its effectiveness will depend on the depth of knowledge of the theoretical and methodological foundations of the last.

STATEMENT OF THE PROBLEM

When digitally transformation of management activities based on breakthrough digital technologies, it is important to take into account that all of the modern management structures are based on the fundamental principle of pairing of the categories "management" and "information" [3]. It is not surprising, therefore, that any responsible administration pays great attention to an information system that is able to provide information, when making a specific management decision, on:

- what's going on with management object activity — business unit;
- why this is so, and not another;
- how laws and regularities, in all their diversity, are influence the behavior and development of the object of management;
- what will happen to them in the future (including as a result of activities).

As a result, the task of transforming information processes is actualized in part:

- monitoring the activities of the business unit in all its aspects;
- analysis of this activity based on monitoring information;
- knowledge of the role of laws and regularities in the functioning and development of activities in specific conditions;
- forecasting the behavior of the business unit in the direction of increasing efficiency based on the knowledge gained.

In doing so, it is important to consider the objective reality that each management decision is aimed at *changing the behavior of the object of management*, but it can only be accepted if there is a full understanding of *what changes are object of management*. Business unit will maintain its integrity when managing changes, when an activity is a set of interrelated and interdependent processes, the quality of which remains unchanged (at least for the moment). In case of strategic development, changes in the way of its activity lead to the formation of an integrated system of qualitatively new phenomena and processes.

It should be understood that in these conditions, change management becomes possible because the phenomena in the behavior of the business unit as the object of management are considered both *qualitatively* and *quantitatively*, which as an objective reality is presented in the form of their dimensions, the relationship of dimensions in time and space, the relationship of dimensions of the opposite phenomena. Among the variety of parameters to be measured, the quantitative side is so dynamic that it responds to even the most insignificant impacts, so the goal of management becomes a change specific in its manifestation of the quantitative side of any phenomena, which, in its current version, "preserve its essence", and in strategic — present a new essentially. As a result:

- an objective reality is formed, which implies the perception of the quantitative as an

object of control (for it is impossible to control what cannot be measured);

• the business unit of management information system is generates data that reflect the quantitative side of the whole variety of phenomena and processes, and implements procedures for its use in the course of managerial decision-making;

• the activities were organized on monitoring the size of specific phenomena, their behavior characteristics, interrelationships and interrelationships;

• knowledge and description of the mechanism of action of laws and regularities, phenomena of different degrees of generality (sizes and varieties) is carried out on the basis of changes in the relationship between their sizes in their interrelationship;

• the organization of such activities is based on the understanding that the nature of observed phenomena determines the methodology for tracking and exploring them.

The last conclusion shows that the business unit of management information system is based on variety types of observations — accounts whose consistency is only possible in a system that unites them. This was most clearly reflected in the Soviet Union in the concept of economic accounting as the unity of its types: operational, accounting, statistical, which ensured not only the observation of the same objective reality in the form of a system of interrelated phenomena and processes, but also their statistical organization. The recent was manifested in the fact that the central category of the *indicator* was considered as a quantitative characteristic of qualitatively defined properties of phenomena [4]. Its compliance with the requirements of focus, accuracy and specificity was based on the understanding that:

• it is necessary to respect particular limits of the set of facts, which represents a qualitatively defined phenomenon;

• the quantification of laws and regularities is determined by the specific context of the activity;

• only a system of indicators (as a strictly organized set) can be an image of real activity at the level of both the elementary and the integrated system of interrelated phenomena;

• management apparatus directly operates such values in decision-making processes, taking into account their inherent nature of compliance with the original — the object of management.

Currently, the business unit management information system represents the unity of the following types of accounting:

• *operational and technical* — it is least developed in theoretical and methodological terms;

• *statistical*, the purpose of which is to make mandatory reporting on federal or corporate statistical programs for phenomena and processes in their particular set [5];

• *accounting–financial*, the development of which is linked to the adoption of national and international financial reporting standards [6];

• *accounting–tax*, focused on ensuring the completeness of accounting for financial and economic activities, based on the requirements of tax reporting [6, 7];

• *management accounting*, formed as the implementation of accounting of a particular direction, demanded in the management system [6–9].

When assessing the available diversity of accounting types, to keep in mind that it was formed as a result of the implementation of the concept, where a business unit manifests itself as part of a more general management structure in an environment, and its production and economic activities are displayed through two information systems, (statistical form, in the case of research conducted since 1969): *external,* aimed at reflect the object as part

of a higher degree of community (includes financial, tax and statistical accounting); and *internal*, intended for ensure the processes of managerial decision-making carried out by its own management apparatus (management accounting and operational and technical).

In considering approaches to the development of each type of accounting, including through digital transformation, it is important to note location the general theory of systems, according to linkages and functions of each element are determined by the objectives of the system as a whole. So the answer to the question: "What to do"? in the form of a set of indicators and the methodology for obtaining them are defined for:

- objectives of accounting financial— financial reporting standards as part of a common national and/or international financial information system;
- accounting–tax — tax reporting standards as part of the National Tax Service information system;
- statistical — requirements of the programme and the way in which statistical monitoring of specific phenomena in their diversity is carried out within the framework of the national and/or global information monitoring system, particularly in the economic sphere.

And it is only in the case of management accounting and operational technical accounting (where there is a continuing need for such accounting), that the answers to the questions that have been asked indicate that:

- information system can provide data to the management apparatus if it is adequate to the relevant functions and methods of management tasks;
- effective mechanism of managerial decision-making can correspond to production and financial activity as object of management;
- information system should be relevant to the reality that it reflects.

The implementation of these provisions does not always give the expected results when making management decisions aimed at improving the functioning of the business unit. It can hardly be considered correct that from the definition of activity "management accounting" (having its own subject and method), without changing its essence, the word "management" was changed and declared about the new "managerial accounting", which can provide information on multiple management functions for a variety of phenomena and processes as objects of management.

This follows from the understanding that management accounting is focused primarily on solving the problems of business efficiency management in terms of production costs, and reserves and cash flows related to income and budget and payments [8, 9]. How do this management — everyone understands in their own way, and as a result we have a large variety of known and not so much cost accounting systems, cost calculation of works and goods, budgeting and treasury systems, etc. However much one may speculate on what the management accounting system should address, answer may be based on the fundamental methods with double entry, asset flow and settlement of liabilities, on a set of synthetic and analytical accounts that reflecting specific groups of assets and business transactions, although with a *high valuation of assets as assets with particular liquidity and liabilities of varying maturity*.

And then the question arises: is this accounting able to manage the activities of the business unit?

METHODS OF RESEARCH AND RESULTS

To find the answer to the above question we will use the category "information model" [10, 11]. The model is given into an equation or system of equations of interrelation of a

specific indicator and its determining factors, constructed on information of observation and accounting, taking the form of a numerical. It reflects the operation of the laws and patterns of conduct of the original — object of management in the specific conditions of the place and time, and is an adequate way of acting.

Importance of information models for managerial decision-making is determined by the fact that the management apparatus operates the images of the original, implementing the principle of pairing categories "management decision" and "information model", which acts in such a process as the main carrier of knowledge about a controlled phenomenon regardless of its degree of complexity. According to it, the quality of the management decision and, consequently, management itself, will be determined, on the one hand, by the quality of the model, which is built on the basis of a specific system of indicators and with informative, explanatory, empirical, predictive functions in necessary volumes, on the other hand, by the ability of the management apparatus to maximize these functions. It should be taken into account that the application of this type of model provides knowledge of what happened in the past and may happen in the future. Therefore, any observation and accounting system is organized on the basis of the need to build information models of specific phenomena. Taking into account the subject and method of management and production accounting, which, according to the concept presented by C. Drury [12], there are constituent parts of accounting, we will evaluate information models of cost of production.

Regardless of the calculation methodology, it is important to understand that, ultimately, the costs of diversity are managed. Use the following information model:

$$e = e_t + e_{sz} + e_m + e_a + e_{pr}, \quad (1)$$

where: e — unit cost, including the types of costs;

e_t — labour compensation;

e_{sz} — social protection spending;

e_m — material costs;

e_a — depreciation of non-financial assets;

e_{pr} — others.

Detailing in this model takes the form of cost distribution, as is the case with material: $e_m = \sum_j e_{m-j}$, when allocating specific j — types of material resources.

Implementing the comparison methodology as mandatory element of the process of knowledge based on the information model (1), we will have:

- in the case of absolute increases, when $\Delta e_{e_{vz}} = \Delta e_{vz}$, cost due to a specific vz — type of costs varies in the size of the increase in the type of costs;
- in the case of a growth rate, when $m_e = \sum_{vz} m_{e_{vz}} de_{vz}$, there is an increase due to:
- increase in a particular type of cost (in many), when $m_{e.e_{vz}} = m_{e_{vz}} \cdot de_{vz.1}$;

structural shifts

$$m_{e.de} = \sum_{vz} e_{vz.0} \cdot de_{vz.1} - \sum_{vz} e_{vz.0} de_{vz.0}.$$

The model is able to explain the changes in cost by type, which is already an achievement. But the model does not answer the questions: *Why did it change? What must be done to achieve these goals?*

In managerial accounting, the cost monitoring system makes it possible to build an information model of another kind:

$$e_{vd} = e_{prm} + e_{pst}, \quad (2)$$

where e_{vd} — unit cost including in terms of costs:

e_{prm} — variable (volume — dependent);

e_{pst} — fixed (volume — independent).

Assessing its importance for managerial decision-making, we use such a category of financial management as "production leverage" [13], considering the ratio of fixed and variable costs, and considering its determining role in the formation of profit according to the model (3):

$$\sum M_{vd} = \sum Q_{vd} \times [p_{vd} - e_{prm}\left(1 + \frac{e_{pst}}{e_{prm}}\right)], \quad (3)$$

where $\sum M_{vd}$ — amount of profit;

$\sum Q_{vd}$ — production volume / sales of products;

p_{vd} — unit price.

Preserve or increase the volume of profit by increasing the volume of production / sales of products, in case of violation of the ratio towards increase in the relative size of fixed costs. Again, the cost model provides information on what is happening in terms of cost ratios, but nothing about the reason for the change in the ratio or about measures to prevent future negative events.

Such a conclusion follows from the objective reality that a phenomenon of any degree of complexity is managed through change through carrying out particular actions — activities related to its determinants: in the case of cost, these are those that affect unit costs for specific types. Therefore, in order to make a management decision, the information model (as the basis for its development) should present their factors and describe the mechanism of their influence, however, in the options (1) and (2) described above, this is not the case and, therefore, they cannot be used to know the cost as the object of management

The unit cost model (4) of the functional factor class is suitable for this purpose:

$$e_Q = \left[\begin{array}{c} \frac{1}{B} \cdot \overline{o} \cdot \left(1 + \overline{s}_{sc}\right) + \\ + \sum_j y_{m-j} \cdot p_{m-j} + \frac{1}{Fo}\overline{\alpha} \end{array}\right] \left(1 + \sum_i y_{Z_{pr-i}}\right), \quad (4)$$

where: B — labor productivity;

$\overline{o}$ — average wage of employees;

$\overline{s}_{sc}$ — average contribution rate to the social fund;

y_{m-j} — specific consumption per unit of output j — type of material, fuel, energy;

p_{m-j} — average price of the j — type of material, fuel, energy;

Fo — capital productivity;

$\overline{\alpha}$ — average depreciation rate;

$y_{Z_{pr-i}}$ — percentage of other costs i — type, per unit of used on their own.

In this model, factors represent phenomena with a high degree of generalization, if each can be described as more complex using an appropriate information model. Statistical indicators [4] are the basis of its construction (as an image of the real object of management existing in specific conditions of place and time), the values of which are determined by observing the phenomena and processes.

It is known from the theory and practice of economic statistics that calculating the indicators of the model *only in terms of labour costs* requires at least:

- *accounting on the basis of quantities* of output as consumer values of specific types of products, the number of employees: in general, specific categories of personnel, hours worked and unprocessed working hours, volumes of work performed in all their diversity;
- *cost — accounting* for gross wages in all forms of payments (time worked and unprocessed, compensation and incentive payments, other) and social contributions.

Based on primary data, absolute totals of accounting quantities, nominal and cost can be calculated, as well as their average and relative values in their diversity. In order to obtain this information, it is necessary to organize monitoring with operational accounting elements in the part, for example: determination of output volumes and performance of a specific job; accounting (the

size of the payment for labor fund[1]; payments to social protection funds; statistics on the number of employees; amounts of hours worked and hours not worked, and the integration of operational; accounting and statistical data to calculate the average and relative values of the indicators: labour productivity, average wages and average social contributions). In addition, in order to characterize the manifestation of laws and regularities as such in specific conditions of place and time, it is mandatory to apply the method of grouping a wide range of characteristics.

Highlight three main types of actions of the control apparatus in relation to specific objects, projecting information cost models on management processes: monitoring, controlling and managing.

Based on the essence of the last, we are led to the following conclusions.

The unit cost information model (1) provides *monitoring* functions when levels, ratios and dynamics are tracked, but not all the categories listed here are intended to change. However, the acquired knowledge is taken into consideration in decision — making regarding other phenomena.

The Information Model (2) provides a *controlling* function when decisions to change the volume of activities are made in case of unfavorable conditions in the field of variable versus fixed costs. In this case, the factors that determine the fixed costs and the cost of the variable costs are not affected.

Only the information model (4) **is able** to guarantee the function of *direct management*, as it represents the factors that determine the level of costs by types, influencing and managing production costs and sales of specific production volumes and unit cost.

To do this, considering the absolute growth and growth rate as a result of the influence of many factors in the form of: $\Delta e = \sum_j \Delta e_{f_j}$ and $m_e = \sum_j m_{e/f_j}$:

- measures of cost change Δe_{f_j} and m_{e/f_j} are calculated under the influence of a specific factor f_j;
- measures of factors and groups of factors are assessed against each other using formal $\sum_{j \in G_F} \Delta e_{f_j}$, $\sum_{j \in G_F} m_{e/f_j}$ and meaningful synthesis $\sum_{j \in G_R} \Delta e_{f_j}$, $\sum_{j \in G_R} m_{e/f_j}$;
- measures depending on the factor cost are identified: $b_{e/f_j} = \frac{\Delta e_{f_j}}{\Delta f_j}$ and $\beta_{e/f_j} = \frac{m_{e/f_j}}{m_{f_j}}$;
- Projected change in cost per factor: $\Delta e^{prg}_{f_j} = b_{e/f_j} \times \Delta f^{prg}_j$ and $m^{prg}_{e/f_j} = \beta_{e/f_j} \times m^{prg}_{f_j}$.

Consideration of problems of information support of management decision-making processes leads to the conclusion that it should not be about "managerial and production accounting as elements of accounting" or else, where an integrated system for monitoring mass manifestations is possible, and it should be defined as managerial accounting.

The effectiveness of information management is enhanced if the system becomes integrated with synergies when:

in the observation displayed the quantitative side of mass phenomena and processes in all forms of its manifestation, based on the system of indicators as the basis of building its (phenomenon) adequate image;

in the case of a business unit activity, a high degree of adequacy of management processes ensures a monitoring system based on a multitude of consistent and complementary indicator systems, each of which is formed according to the information model of the

[1] [1] First, payroll and payment in accounting is perform the function of determining the portion of monetary assets to be distributed in favour of employees and the subsequent repayment of the resulting liabilities.

phenomenon and process, purposefully modified because of the management decision. This is — the consequence of the representation of real reality as a set of qualitatively defined actions, consisting of elements of a holistic system of interrelated and interdependent phenomena, reflecting the activity of the business unit in a particular aspect;

observational data are aggregated using logical and mathematical tools to map the phenomenon of a particular degree of commonality in the form of a system of indicators. In this case, the implemented logic and mathematical procedures do not lead to loss of qualitative certainty of phenomena and processes (regardless of the degree of their generality).

In such a situation, the central category of the management accounting system becomes the indicator as a "qualitatively defined quantity" representing the real reality. It must meet the requirements of subject matter, accuracy and concreteness [4] from the perspective of the phenomenon as an object of control. To illustrate the above, there is much talk about "labor productivity", putting in this term a particular content. However, all conversations stop when a given indicator is constructed according to a particular methodology (starting with the recording of specific facts of specific phenomena). As a measure of the *efficiency of the labour* used in production, it is calculated as a unit of output per unit of total labour of the population. With regard to the measure of *efficiency of a particular work*, this is output as a unit of work per unit of work, measured by time worked. The adequacy of these efficiency measures is disputed in the form of proposals to measure labour productivity based on gross value added or the volume of profits of production. However, the inaccuracy of the proposed measures is manifested in the fact that they do not take into account the objective reality: labour is engaged in the production of a specific volume of output to meet the needs of the recent [14]. Reference to the practice of calculating the productivity of social labor means misunderstanding, because it is engaged in multi-stage production of gross domestic product, as in the totality of all the goods and services for public final consumption and saving, and therefore is in demand when characterizing national economic production.

We would like to emphasize that only as a measure of the specific volume of production the indicator is in demand for the information model of cost as unit cost. As for its accuracy, it is a question of the correctness of the calculation of its value, be it total or relative, or the mean of the feature. In particular, in calculating this indicator, the amount of work used is represented by the average[2] number of employees, which is calculated according to the data of both adjusted schedules and unspecified composition.

It is important to take into account two circumstances:

- since the population of workers is directly engaged in mass production, it makes sense to calculate the value of the labour productivity indicator from the data of the average number of this population in primary and secondary production;
- taking into account the employment of managers, specialists and employees (other personnel) performing the functions of management, design and technology, economic and other support of production, the measure of their efficiency of work can be indicators relative (unit) number of employees in the respective population.

As a result, the following information model can be used to manage productivity:

$$B = \frac{B_{rb} \times \overline{t}_d \times \overline{T}_g}{1 + \sum_f K_{P_f}}, \quad (5)$$

[2] The authors consider it necessary to abandon the definition of "average number of population", which follows from the methodology of calculating the indicator.

where: B_{rb} — hourly productivity of the worker, the level of which is determined according to the model:

$$B_{rb} = Fo / te_N ,$$

where: Fo — capital productivity complex of fixed assets, representing their productive use in the implementation of a variety of technological processes;

te_N — labor intensity of operation and maintenance of the general complex of fixed assets as a generalized characteristic of the use of labour in the performance of a system of interrelated labor operations;

$\overline{t}_d$ — average daily working hours of a worker as a characteristic of the organization of his employment during this period;

$\overline{T}_g$ — average duration of the working year as a characteristic of the organization of his employment within the calendar year;

K_{P_f} — relative number of managers, specialists and employees characterizing the organization of workers performing the functions of management and preparation of production, information and other support.

Within the framework of the unified monitoring system of management accounting "contradictions" in "fixed assets" will be resolved. In addition, it is important to take into account, that, for a specific facility, decision — making is based on a set of functions. When the recent are many, it is important to distribute them in a hierarchical order, for in such a set there is no objectively equal. Ignoring this provision leads to dominance of functions rather than harmonization.

Definition of fixed assets of production as "fixed capital" requires consideration of them as elements of the turnover of the latter, the essence of which is most susceptible to knowledge, if by it means cash, which has passed the accumulation stage. In this turnover, capital changes, taking the following successive forms:

→ ***cash income*** → ***current savings*** → ***savings (financial capital)*** → ***fixed capital (productive capital)*** → ***commodity — capital*** → ***cash income*** →

Traditionally, the main element is productive capital (which is why it is called the main). As an object of management, it exists in the form of a complex of diverse items (capital goods), providing the production of a particular product — good or service. It is as such that fixed assets determine the productive capacity of the business unit of any degree of community; and their role increases as science and technology are introduced. Product sale in the markets generates cash earnings, forming income, and subsequently current savings as a source of savings, from which the process of simple or expanded reproduction of capital goods is carried out.

Considering the fixed assets (fixed capital) as a management object, we consider it necessary to distinguish such functions as "investment", "production", "liquidation", "financial". The first relates to the process of the acquisition of fixed assets and their commissioning; second — using them in the production of the product for the purpose and content of the proper technical condition; third — with the implementation of the subject as a commodity after a limited period of service; fourth — with capital accumulation assured.

In the form of a management object, first of all, are the main means of production in the part of the processes of acquisition and commissioning with a variety of species of capital; use in production and maintenance in proper technical condition through refurbishment; disposal due to various reasons, but above all for dilapidation and depreciation, including moral. Participating in technological processes as active or passive production tools, they realize consumer properties that laid down of their design: capacity (productivity), resource exploitation/resource usage, reliability, repair intensity, energy intensity, labor

intensity and material intensity, and content and like them. Knowledge of them underpins management decisions, for example:

• quantity of items for the simple or expanded reproduction of productive capacity, including through upgrading and reconstruction of facilities;

• use of items for specific quantities of specific work in specific conditions of place and time, develop technical maintenance and repair.

The first group requires data on the total cost of production, delivery, installation and commissioning of items for solving managerial problems. Therefore, accounting based on quantities is used *their evaluation at full cost*, updated information on *replacement cost* when tracking the amount of required income savings in cash.

In solving problems of an industrial nature, it is necessary to have actual information on the number and total capacity of items of all fixed assets, since the interoperability in modern technological development is almost zero. Based on systems of indicators to measure the availability, condition, operation and use of specific capital goods. Nevertheless, when estimating a business unit, the characteristic of all items of fixed assets (as integral complex involved in the production of products) is demanded. When looking at ways to measure it, the use of cost accounting using prices is considered acceptable as *calculators of different consumer values* on condition to requirement of comparability, and under certain conditions and permanence, as they are determined *cost of fixed assets at comparable prices*.

When solving the problems of the participation of fixed assets in the production processes, account is taken of the fact that the items, preserving their natural shape, are worn out, while losing part of their resource, and at a certain point and all fully. Therefore, their depreciation is being monitored on accounting on the basis of quantities, with a full range of indicators of their condition. Moreover, since the cost of depreciation is transferred to the value of the output in the amount of the so–called "consumption of fixed capital" (and in some accounting practices — "reserves for depreciation") for characterization of the groups and the totality of the items of production equipment requires data on the *cost of their depreciation*, and their subsequent *cost based on depreciation*.

These indicators are in demand when property, plant and equipment are treated as having a specific role in economic activity, when the economic entity (owning assets and conducting economic activities and transactions with other entities) makes decisions and assumes financial obligations, for which he is responsible his property, i.e. fixed assets. The latter are assets whose value is changed by the arrival of new and used items of appropriate value; movement of value in operation/use due to depreciation (physical and moral); disposal of items of liquidation or exchange value in the event of sale. Therefore, for the characterization of a complex of fixed assets, as property of a business unit, are in demand of *cost of depreciation of fixed assets*.

The situation is different when fixed assets are part of such management, and that is capital turnover. Reproduction of fixed capital requires savings from current savings — cash not used in actual activities. The most important resource of such savings is depreciation, now regarded as a method of recovery of savings spent on the acquisition, modernization and reconstruction of fixed assets. This is reflected in our capital turnover scheme, where the latter are recorded as a liquid asset, for which purpose it is proposed to estimate them by the *residual*, i.e. the value to be depreciated.

It is necessary to recognize that now at the highest level of the hierarchy turned out to be a "financial" function, while its purpose is

to ensure the process of money accumulation, due to which the items of fixed assets are put into operation and put into operation. That is the orientation of many of the so–called "economic mechanisms", including "accelerated depreciation" in its various manifestations.

In this case, due to the development of productive capacity and its effective use, the value of management functions, determined by the essence of the phenomena and processes occurring. As an example, we apply the practice of estimating national wealth by residual value of fixed capital, which is appropriate for characterizing assets as liquid assets. Or calculation of the indicator of capital productivity, as a measure of efficiency of use in the production of its complex of fixed assets based on data on residual value of "fixed capital".

Other solutions should be presented in a management accounting organization to improve information management. In particular, the efficiency of the business unit can be significantly improved if the latter is organized and managed as a coherent business process system. In addition, being the real object of management, each of them acts as a similar system of interconnected phenomena, functioning as objects of control at a certain level. Implementation of the process approach in management involves resolving a broad range of problems: from identifying business processes as part of the system to evaluating solutions for improving the performance of the entire business unit in specific aspects. As a result, the scope of the tasks and their relevance are determined by the principle: management accounting functions as an integrated system, the elements of which are statistically organized [15].

The above illustrates the problems that must be solved in the area of management accounting in the search for the answer to the question *"what to do?"* Having this result can move on to the second question *"how to do"?* and above all to the problems of digital transformation of management accounting.

The fact that, as an information system, it is an object of effective digital transformation is no doubt. But we need to understand whether such a transformation is possible within the concept of digital economy, implemented on the structures of the Internet community, given that modern platforms are able to provide cloud services *"Data-as-a-Service (DaaS)"*? in search of an answer, it is important to consider that the structures of the Internet community in the evolving digital space define their core function as *"providing information services and processing procedures for an unlimited number of users"*. And in order to implement it, the principle that all activities of the structures of the Internet community are based on approaches, de jure and de facto standards of the Internet, which means the use of standardized data processing procedures and analytical tools, especially the mathematical apparatus of data analysis.

Regarding management accounting as an information system with its main function — information support for managerial decision-making, it is important to understand that:

- *business unit in all respects has a unique management object,* operating in the context of many competitive markets;
- *management adopts and implements unique solutions,* the essence of which is determined by the content of unique managerial situations;
- *decision-making is based on a unique knowledge system* that is driven by an original system of observing specific phenomena and processes;
- *object of the monitoring is unique phenomena*, that appear production and financial activity in specific conditions determined by factors of the respective external and internal business environment.

As a result, the operation and development of management accounting can be carried

out based on a *unique* information platform, which, because of its nature, cannot be an active element of the structures of the online community. However, this does not exclude, that in the information process of such a system cannot be implemented standard solutions, including those based on the use of breakthrough digital technologies, especially *Big Data*.

Big Data performs in several guises, such as:

- huge data set in a variety of (structured and unstructured) formats from various sources at high speed;
- set of technologies for scaled databases and computer networks;
- organization of data analysis on the basis of a set of digital technologies providing solutions to the problem of obtaining knowledge about the reality. We are talking about the most popular techniques and methods of analysis, such as *Data mining*, data blending and integration, machine learning, pattern recognition, artificial neural networks, predictive analytics, simulation modeling, statistical analysis, analytical data virtualization [16–19].

With regard to *Big Data–analytics*, it should be kept in mind that the management accounting system may be embedded as a tool to support management decision-making (in a particular cycle) [20, 21], that including:

a) assessment of the current beyond past and future;

b) obtaining, as a result of standard procedures of data processing, knowledge about non-obvious, insignificant patterns of behavior, even in the case of their insufficient adequacy that are useful for the implementation of the functions of "proper management" (can reduce the risks of poor management decisions).

First, *Big Data–analytics* objects should include phenomena — factors of the *internal environment*, which are objects of monitoring, and for the next, management function does not aim to change the behavior of the object, enough knowledge. It is based on the consideration of individual "most significant" connections (relationships) and obtained based on an efficient sample and presented as mathematical construction quantitative criteria, including supporting statistical hypotheses.

Second, the objects of *Big Data–analytics* should include environmental factors implemented through the relationship B 2C (Business–to–Consumer), whose special significance is determined by the current focus on the consumer of created values, that objectively leads to building relationships between business and population in the form of partnership, where business — the object of management, population — the object of monitoring. This should be based on the characteristics of relationships, in particular: 1) remoteness of participants; 2) many of them, representing a large number of specific citizens; 3) high number of single acts; 4) implementation in an information environment. Such a relationship becomes effective if it is formed because of knowledge about the consumer whose uncertain behavior is that he can become your partner. Or maybe not, and that its relationship to a particular value is shaped by the influence of uncertain individual business interests. Formation of knowledge about the patterns of behavior of the monitoring object is connected with the analytical development of mass data on the facts of the business-population relationship, which in today's conditions cannot be imagined without the use of *Big Data* technologies.

Given that the value of analytics increases with the growth of the volume of attracted data, it is expected that the source of such knowledge will be the structures of the online community providing services of cloud technologies "*Data-as-a-Service*" (*DaaS*) in the part of services *"Big Data"* from the cloud. But this requires that these structures define *DaaS*

services as their main function for an unlimited number of users, which objectively determines the maximum implementation of the approach that de jure and de facto becomes the standard of the Internet.

CONCLUSION

The problems of economic management reform cannot be solved without taking into account the provisions on which the tasks of digital transformation of management accounting as a defining element of the information system of business units are based.

The most significant of them:

- the effectiveness of digital transformation is determined by the extent to which it corresponds to the theoretical and methodological foundations of information management support activities and the use of the data obtained in managerial decision-making (in accordance with the requirements of effective management);
- in modern conditions, the tasks of transformation are updated: the processes of monitoring the activity of the business unit (in all aspects of its manifestation) and its analysis on the basis of this information; knowledge of laws and regularities of operation of the object of management in specific conditions, forecasting on the basis of knowledge of its behavior in the direction of increasing efficiency;
- the purpose of management is quantitative changes in the behavior of the business unit in the conditions of preservation of its qualitative essence, as a result of which data are required that reflect the quantitative side of the whole variety of phenomena and processes, and implementation of its use in management decision-making;
- the management information system is based on a number of types of accounting, the consistency of which is possible in their unified system;
- the diversity of accounting has resulted from the concept of two information systems: *external,* designed to reflect a business unit as part of a higher degree of community structure and *internal,* designed to inform its management as a separate entity;
- the ultimate goal of any monitoring system is to build an information model of the managed phenomenon — its image, representing the factors and the mechanism of their influence on the effectiveness of the operation of the object of management;
- construction of the information model is based on the data of observation, which is organized on the basis of operational and technical, accounting and statistical types themselves and integration of their data for calculation of indicators in their system. Based on purpose, this monitoring system is defined as *managerial accounting*;
- effective management accounting ensures the highest level of compliance with the requirements of subject matter, accuracy and specificity of indicators as the basis for building highly relevant information models required in management;
- management accounting harmonizes all functions performed by the decision-making system in relation to a particular monitoring object;
- managerial accounting is an effective digital transformation. However, as an information system with the function of providing unique management decisions in the case of unique management situations in the behavior of a unique business unit should function and develop on the basis of its own unique information platform;
- the unique management accounting system can use breakthrough digital technologies, and especially *Big Data* technologies (in the part of *Big Data — analytics*);
- interaction of the unique management accounting system with the Internet

community is based on the services of the cloud services *"Big Data"* from the cloud.

The significance of the provisions considered is determined by the fact that the digital transformation of management accounting, on the one hand, is prone to errors in setting and solving tasks to improve the methodology of the latter, which could nullify the gains full benefits of modern digital technology. On the other hand, in case of wrong choice of information methods, in particular due to following "trends", it will not allow to realize expectations from improvement of information support of management and use of data in managerial decision-making.

The results of the research are intended for services engaged in the digital transformation of management of economic entities at all levels.

REFERENCES

1. Prokhorov A., Konik L. Digital transformation. Analysis, trends, world experience. Moscow: Alliance-Print; 2019. 368 p. (In Russ.).
2. Mikhnenko O.E. Management of economic phenomena in railway transport: Information aspect. Moscow: MIIT; 2001. 200 p. (In Russ.).
3. Wiener N. Cybernetics or control and communication in the animal and the machine. New York: John Wiley & Sons, Inc.; 1948. 194 p. (Russ. ed.: Wiener N. Kibernetika, ili upravlenie i svyaz' v zhivotnom i mashine. 2nd ed. Moscow: Sovetskoe radio; 1968. 326 p.).
4. Mikhnenko O.E. Digital technologies and efficiency of statistical indicators. In: Proc. 2nd Int. sci.-pract. conf. "Digital transformation in the economy of the transport complex" (Moscow, October 11, 2019). Moscow: RUT (MIIT); 2019:207–216. (In Russ.).
5. Zinchenko A.P. et al. Statistics and accounting. Moscow: Kolos; 2018. 436 p. (In Russ.).
6. Glushkov I.E., Kiseleva T.V. Accounting (tax, financial, management) accounting at a modern enterprise. An effective handbook for an accountant (in 2 vols.). 11th ed. Moscow: KnoRus; Novosibirsk: EKOR-kniga; 2004. (In Russ.).
7. Kas'yanova G. Yu. Accounting-2016: Bookkeeping and tax. Moscow: Abak; 2016. 960 p. (In Russ.).
8. Black J. Introduction to accounting and finance. Harlow, New York: FT/Prentice-Hall; 2009. 406 p. (Russ. ed.: Black J. Vvedenie v bukhgalterskii upravlencheskii uchet. Moscow: Ves' mir; Infra-M; 2018. 424 p.).
9. Horngren Ch.T., Foster G. Cost accounting: A managerial emphasis. Englewood Cliffs, NJ: Prentice-Hall; 1991. 964 p. (Russ. ed.: Horngren Ch.T., Foster G. Bukhgalterskii uchet: upravlencheskii aspekt. Moscow: Finansy i statistika; 1995. 415 p.).
10. Mikhnenko O.E. Information models in the management of economic phenomena. Moscow: MIIT; 2009. 48 p. (In Russ.).
11. Mikhnenko O.E., Salin V.N. From the analysis of statistical data to the analysis of real phenomena based on statistical information. In: Proc. Int. sci.-pract. conf. "Data science" (St. Petersburg, February 5–7, 2020). St. Petersburg: St. Petersburg State University of Economics; 2020:196–199. (In Russ.).
12. Drury C. Cost and management accounting: An introduction. Andover: South-Western Cengage Learning; 2011. 476 p. (Russ. ed.: Drury C. Upravlencheskii i proizvodstvennyi uchet. Vvodnyi kurs. Moscow: Unity; 2019. 320 p.).
13. Atrill P., McLaney E. Accounting and finance for non-specialists. Englewood Cliffs, NJ: Pearson; 2012. 592 p. (Russ. ed.: Atrill P., McLaney E. Finansovyi menedzhment i upravlencheskii uchet dlya rukovoditelei i biznesmenov. Moscow: Alpina Publisher; 2018. 648 p.).
14. Mikhnenko O.E. On measures of labor productivity. In: "Statistical studies of the socio-economic development of Russia and prospects for sustainable growth: Materials and reports". Moscow: Plekhanov Russian University of Economics; 2019:108–114.

15. Mikhnenko O.E., Salin V.N. Problems of modern transformation of statistics. *Uchet. Analiz. Audit = Accounting. Analysis. Auditing*. 2021;8(4):18–33. (In Russ.). DOI: 10.26794/2408–9303–2021–8–4–18–33
16. Mayer-Schönberger V., Cukier K. Big Data: A revolution that will transform how we live, work, and think. Boston, MA: Eamon Dolan Books/Mariner Books; 2014. 272 p. (Russ. ed.: Mayer-Schönberger V., Cukier K. Bol'shie dannye. Revolyutsiya, kotoraya izmenit to, kak my zhivem, rabotaem i myslim. Moscow: Mann, Ivanov and Ferber; 2014. 240 p.).
17. Maryika J., Chui M., Brown B. et al. Big data: The next frontier for innovation, competition and productivity. McKinsey Digital. May 01, 2011. URL: https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/big-data-the-next-frontier-for-innovation (accessed on 17.12.2021).
18. Franks B. The analytics revolution: How to improve your business by making analytics operational in the Big Data era. Hoboken, NJ: John Wiley & Sons, Inc.; 2014. 304 p. (Russ. ed.: Franks B. Revolyutsiya v analitike. Kak v epokhu Big Data uluchshit' vash biznes s pomoshch'yu operatsionnoi analitiki. Moscow: Intellektual'naya literature; 2016. 367 p.).
19. Franks B. Taming the Big Data tidal wave: Finding opportunities in huge data streams with advanced analytics. Hoboken, NJ: John Wiley & Sons, Inc.; 2012. 336 p. (Russ. ed.: Franks B. Ukroshchenie bol'shikh dannykh. Kak izvlekat' znaniya iz massivov informatsii s pomoshch'yu glubokoi analitiki. Moscow: Mann, Ivanov and Ferber; 2014. 343 p.).
20. Hassani H., Saporta G., Silva E.S. Data mining and official statistics: The past, the present and the future. *Big Data.* 2014;2(1):34–43. DOI: 10.1089/big.2013.0038
21. Hostie T., Nibshirani R., Friedman J. The elements of statistical learning: Data mining, inference, and prediction. 2nd ed. New York: Springer-Verlag; 2009. 763 p.

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Digitalization of the Banking System: Risks and Opportunities for Managing Financial Assets

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ABSTRACT

All sectors of economic activity have changed significantly in globalization, and the banking sector is no exception. Commercial banks around the globe are experiencing digitalization in different ways. However, in the near future, most of these organizations will most likely have to face this process. Otherwise, they simply cannot compete, as the needs of the client base are changing along with continuous technological progress. People are interested in being able to receive services and feedback from the bank quickly and remotely. In order to remain competitive, financial institutions create a new corporate culture, developing and implementing innovative models of interaction with clients. The purpose of the research is to determine the principles of economic security in digitalization of the banking sector and ensure the stability of its functioning, considering possible risks. This study can be useful both for employees of commercial banks for building the processes of digitization of the services provided, and for IT specialists responsible for the development and implementation of certain digital products.

Keywords: digital transformation; credit institutions; bank; banking system; digital economy; artificial intelligence

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INTRODUCTION

Banks — are an integral part of the economic and financial system to which the majority of the population refers every day: so, almost every person makes at least one transaction per day — for example, a transfer or payment. Therefore, with the growth of consumer demand and criteria important for the customer base in terms of choosing a service provider, banks need to continuously monitor new technological solutions, timely implementation of which will contribute to improving the level of service. The digitization process is therefore likely to be a natural rather than a necessary stage of growth for banks. It is also important to note that the rate of development of mobile banking at the moment significantly ahead of similar indicators for online banking. As there is a high demand for new information technologies from consumers of this type of service, digitalization is actively implemented in the banking sector and various financial institutions. This process was particularly relevant at a time when the adverse epidemiological situation caused by the COVID-19 pandemic was difficult, and already had an impact on financial stability, which refers to the uninterrupted operation of the relevant agencies of the system and their high degree of reliability against possible threats. Central banks provide financial stability. The systems they build have a direct impact on both economic and political sustainability (i.e. to ensure that the State's economy is functions correctly). This is particularly important given that the banking sector is much more likely to be exposed to risks than other industries.

To be effective, companies should have economic security services based on the following principles:

- Legality.

All work processes (including those that ensure economic security) should be carried out exclusively on legitimate grounds enshrined in Russian and international legislation.

- Economic feasibility.

It is important to protect the facility only if the cost does not exceed the potential loss in the event of a threat.

Range of reactive and preventive measures.

Reactive measures are taken when there are real security threats — their key objective is to quickly and effectively minimize adverse effects that may result in economic or reputational losses. Preventive measures include measures to prevent and block possible threats.

- Continuity.

The company's economic security service must work continuously.

- Differentiation.

The nature and degree of the threat directly affects the company's efforts to stabilize the situation and combat potential negative effects.

- Coordinated action.

In order for the department of economic security to perform its functions correctly, it is important to establish close cooperation between all entities within the company.

- Complete control.

The economic security service must fully comply with the decisions of the company's management.

THE DIFFERENCE BETWEEN ONLINE AND DIGITAL BANKING

Online banking primarily focuses on money transfers, payment of bills, remote deposits and basic online account management. Synonyms to this concept are "virtual banking", "internet banking" and "e–banking".

Digital banking is the digitization of each program and activity carried out by financial institutions and their clients.

Advantages of digitization include:

• Increase number of non–cash transactions and conditions for their execution (for example, a large number of ATMs) contributes to significant savings for both the customer base and the banking organizations themselves.

• Digital analytics available to banks allows more effective decision– making.

• Growth of the customer base due to the fact that interaction with the bank becomes more convenient.

• Reduced number of operational errors because of the human factor.

• Reduced need for large amounts of cash.

• Reduction urban and rural customer service differences.

• Reduced the threat of counterfeit currency creation and distribution (through increased non–cash transactions).

ADVANTAGES AND DISADVANTAGES OF DIGITIZATION IN THE BANKING SECTOR

Digitalization can help banks reduce costs and optimize customer service. Although the introduction of IT solutions is usually expensive, and new digital banking tools are not always well received by customers, then development a clear vision of digitalization will allow banks to overcome emerging challenges. Smooth implementation, integration and adoption of new digital tools within the company and convince employees of the importance of transition to digital services and online banking tools (they will be more receptive to digitalization, strategically reducing internal conflicts, and will be able to better explain the use of such new tools to clients). Aligning the internal organizational culture with the type of products and services it offers is crucial to maximizing its marketing efforts and ultimately the performance of firms.

The disadvantages of digitization in the banking sector can be attributed:

• Significant reduction in human resource requirements due to wide application of various automation programs.

• Reduction of the number of bank branches, which entails reduction of jobs and complicates interaction with the Bank of consumers of services from the category "50+" do not feel comfort when working with digital channels.

• Vulnerability of most banking institutions to cyber attacks.

In the future, banking systems with their own form of artificial intelligence are probably waiting for us, and some tools for interaction with clients with its use (for example, ChatBots) are already implemented. This is just the beginning. Artificial intelligence has the potential to change organizations on a huge scale — from virtual financial assistants to computerized credit scoring and predictive analysis.

From the point of view of customers, machine learning contributes to the effective improvement of experience in the application of banking products, and helps to solve emerging issues quickly and efficiently. Artificial intelligence, in the near future, will allow banks to identify the range of problems of service consumers and deal with them very quickly and at no significant financial cost. This will lead to the transformation of the banking industry, and with it the client experience of interaction with a particular development. Banking organizations should regularly monitor the emergence of new

technological opportunities and quickly implement them for continuous business development.

Based on the above, it can be concluded that for mass attraction of clients it is necessary not only to develop an interesting and quality product, but also to provide a comfortable and continuous process of its use. It is especially difficult to reaching the consumer in a highly competitive environment, as the banking sector is very wide and the service of various agencies in the industry in terms of providing their products becomes identical [1]. In addition, there is the possibility of simultaneous registration of several products without the physical presence of the client (including online lending). The need to create individual, bank-specific technologies and methodologies developed using high-performance digital resources becomes relevant [2].

The introduction of banking digital platforms is aimed at creating both new benefits for customers and creating their own ecosystem. The emergence of services focused on small business (for example, online accounting, operational accounting, automatic forecasting of profits) that will be able to enter it, will allow much better and more accurate consideration of the needs of consumers.

DIVERSIFICATION OF BANK RISK

It is important to note that digitization creates about 70% of digital risks for banks. According to the analysis, 22% of banks worldwide allocated more than 1/4 of the annual budget for digitalization of risk management [3].

Diversification of bank risks is a key method for ensuring the stable development of financial institutions in the global economy, and its effective management requires a new strategy within the framework of digitalization. This is particularly important as diversification of credit portfolio has a significant impact on profit growth and overall risk reduction.

In developing countries (such as Malaysia, Thailand, the Philippines, Indonesia and Vietnam), the impact of several strategies to diversify operational risks was analyzed and it was concluded that they had a positive impact on the competitiveness of banking institutions, and to improve the stability of financial institutions [4]. For example, Thailand and Indonesia noted significant impacts on their overall performance and risk management in particular. And in the Philippines, diversification does not affect profits, but generally has a positive impact on bank performance. In Malaysia, however, after asset diversification, profits declined and risk management was characterized as more effective [5]. In Vietnam, this process practically does not affect banks, as the market in the country is poorly developed [6]. Asian banks diversify interest–free assets and services that are not credit–related rather than credit activities in order to increase returns under liberalization [7]. This experience is very useful for developing countries, as it can help to gain additional knowledge on diversification, if the financial sectors are liberalized [8]. The diversification of investment portfolios could have a positive impact on increasing returns, reducing risk of sharp decline in stock prices and improving performance. As a result, banking organizations attract additional investment [9–14] and have less impact on the markets that are associated with them [15]. Research conducted in China has shown that bank diversification increases market share, net margin and non–interest income, and operating costs [16].

NECESSITY AN ADAPTED REGULATORY FRAMEWORKS

In order to digitize banking services as quickly as possible, it is essential that the country has a properly adapted regulatory framework.

It is important to understand that mobile banking has a high risk of online fraud, which casts doubt the reliability of smartphones in the near future [17]. The key goal of all work is to create a special protection mechanism for a huge stratum of data to enhance the cyber security of banks [18, 19] — many small industry organizations lack the necessary financial resources to do this [20].

In addition, one of the key problems is to create a set of regulatory and supervisory requirements, i.e. to amend the existing regulatory framework, to regulate existing threats [21] and effectively develop the banking sector [22].

E-SERVICES AND MOBILE PAYMENTS

There is relatively little of analytical data on mobile payment ecosystems, which is an important tool for enabling clients to track information independently (without having to go through a bank) [23]. To ensure continuous online access to an impressive amount of information, it is important to conduct research to determine appropriate pricing policies and make logical decisions for banks to provide electronic services [24]. Digitalization plays an important role in continuous customer service in European countries [25].

Introduction of the Payment Service Directive PSD 2,[1] entry of Google and Apple into the payment services market and the continuous growth of the financial technology (fintech) industry, these forces banks and other financial institutions to innovate and strive for such a method of work, which will not be contrary to constantly updated customer requests. This is the reason for the emergence of "electronic banking" — a special system that allows them to receive information and manage accounts remotely [26].

Electronic services provided by banks include:

1) client account statements;
2) information about bank products (deposits, credits, securities);
3) applications for deposits and loans and bank cards;
4) domestic transfers to bank accounts;
5) transfers to accounts in other banks;
6) currency conversion.

While the first two services require only mobile communications, the rest generally require Internet connectivity.

FEATURES OF IMPLEMENTATION OF ONLINE BANKING

In parallel, the use of blockchain technologies, the building of a hybrid process of interaction with the client base, as well as the presence of network competition can be considered as new points of growth, identified because of research of information systems. For example, the popularity of cryptocurrency and crowdfunding in recent years pushes banks with the traditional system to change business models.

Scandinavian countries have a high level of digitalization, which is essential to overcome temporary and space constraints

[1] PSD 2 (Payment Service Directive 2) — the amended Payment Services Directive, which aims to develop the market for electronic payments and to create an enabling environment for secure payments, thereby increasing the ability to make payments.

(which become critical for customers). The percentage of implementation of online banking is from 89 to 93% (according to Statista, 2019) in Denmark, Norway and Finland now, while the same rate does not exceed 7% in Romania and Bulgaria and it reaches 59% in Austria and Germany. It can thus be concluded that the perception of digitalization by financial institutions varies from country to country. However, the inherent ability of banks to consider it as a motive for further adaptation and for finding ways to generate new income in times of technological change has not been previously explored.

Every year, more and more banks close their branches, leaving only the head offices, or completely move into the field of online services [27, 28]; but with such significant changes in the work of the Russian problem, which prevents banks from transferring their activities to the digital environment (which is a more profitable niche for business), the older generation becomes unprepared to transition to the digital format of service.

UX– and UI–design, application and perceived utility of digital products (such as online banking instrumentation) cannot be equally targeted to all audiences, in particular older customers. That is, a conservative approach can be considered more profitable for banking organizations. In addition, Banker, Chen, Liu and Ou companies [29] have determined in 2009 that online services have a positive impact on economic efficiency, but are not very effective in terms of sales growth. In the past, conventional channels guaranteed this, although they were expensive, which means that they can still have an overall positive effect. That is, banks that decide to postpone digitalization for a while may remain equally successful in terms of profitability. This is particularly true for countries that are still in the process in the transition to new technologies.

Presumably not only the degree of digitalization, but also the extent to which financial organizations "accept" it strategically and use its opportunities in the market, is crucial for achieving a competitive advantage. Banks can develop a vision and implement coherent packages or new online services as part of their business strategy, or will operate without such a clear development program. They also have the potential to adopt different approaches to digitization, with different levels of entrepreneurial intensity. The non–entrepreneurial approach could be described as a "wait and see" approach where banks introduce services and online features that have been successful. Business approach (entrepreneurial) to digitalization, by contrast, is to introduce innovative online services before competitors, taking into account that these services may not lead to additional sales, profitability and/or customer satisfaction.

By focusing on innovation and initiative, banks will be more active in seeking new market opportunities and exploiting them more quickly. In this way, some financial companies will be able to better develop new market segments and attract new customers, as well as provide innovative solutions and products to existing ones. In addition, the focus on innovation makes banks more flexible to the changing requirements of customers, the emerging resources allow their top managers to be more aware and effectively explore new digital market opportunities and assess the risks associated with them. However, the latter may lead to more diverse results in terms of profitability. Nevertheless, it is generally expected that such work will be positive.

For large banks, they continue to focus on effective transfer systems and strategies. The conclusions of 2012 by Nüesch, Puschmann and Alt [30] confirm that such financial institutions are just beginning to explore digital services, and most of them provide only basic — such as instant messaging, wiki–cite, blogs and rating applications. This minimizes costs but threatens the business potential to attract new customers, strengthen relationships with existing ones and win their loyalty, as well as cross sales.

INTEGRAL, MULTIFUNCTIONAL AND MOBILE BANKING

Additional opportunities for intensifying customer relations with digital technologies — integrated, multifunctional and mobile banking. The first provides the client with greater transparency — he can get the same information that is available to the banking consultant. A key advantage of multifunctional banking is the ability to use various tools — such as computers, telephones and local banks for banking operations. Similarly, mobile banking is mainly linked to the ability to obtain banking services through mobile devices without time and location restrictions.

However, if necessary, customers still hope on personal contact with bank employees to obtain information and meet their needs; and human factor is not always positive. From this perspective, digital technology can be a useful tool for improving service quality.

Changes in business relationships can also be observed on stock exchanges. Digital trading platforms change the relevance of established exchanges, and suppliers, in order to survive in a highly competitive environment, have to be radically rebuild permanently of business models or adapt new ones, including allowing credit transactions through online platforms, thereby changing the algorithm of banks and credit institutions. The initial competence of the latter was to act as intermediaries. Now non–bank organizations are beginning to compete with traditional participants in the financial services industry — even a new term "open point banking" has appeared. A 2012 research by Sachse et al [31] showed that half of the respondents were already interested in using the services of these non–bank institutions. This indicates a market trend towards heterogeneity, with an increasing number of bank's rejection of intermediation.

Information is increasingly digitized, customers no longer rely on bank branches for their services; experts compete not only with each other, but also with complex technological innovations.

FEATURES OF ONLINE BANKING

Banks that have already digitized their services and passed to online banking have additional opportunities: for example, actively adapting their business models for dynamic currency conversion, which often requires the use of IT applications.

In doing so, it is important to understand that smaller financial organizations have fewer opportunities — they may have difficulties due to limited budgets. This is especially relevant when it comes to developing new tools for online banking. However, their current digital systems may be less complex, allowing for more innovative digital solutions.

To date, there are banks whose business model is based on the complete abandonment of offices and the use of only online platforms. An example in Russia is "Tinkoff Bank", which has no branches and carries out all interaction with the client through the mobile application. This

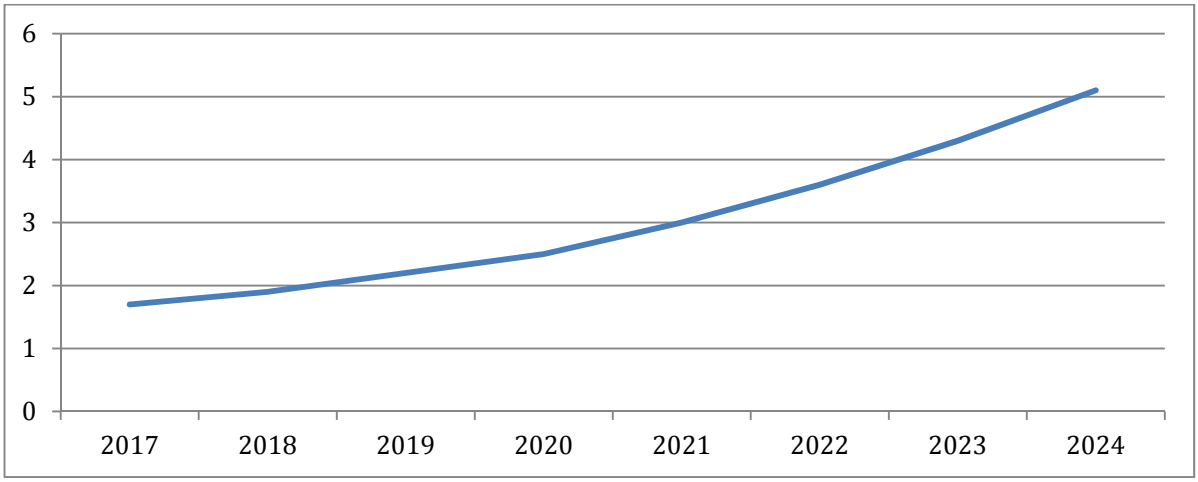

Fig. **Domestic costs for the development of the digital economy as a percentage of GDP**

Source: compiled by the author based on data from the Higher School of Economics. URL: https://www.tadviser.ru/index.php/Статья: Цифровая_экономика_России

service has become very popular because it allows you to receive services 24 hours a day, without leaving home. However, this model has its drawbacks: the amount of work assigned to the bank is becoming many times larger and requires staff with skills to work in the digital economy. Therefore, the most important task of such institutions is the appropriate training of personnel in technology and the implementation of their activities online.

KEY TECHNOLOGIES OF DIGITAL TRANSFORMATION OF BANKS IN RUSSIA

Progress in digital technology allow banks to operate more efficiently [32]. According to the information received from financial institutions in 2022, it is possible to distinguish 5 key technologies of digital transformation of banks in Russia, which they plan to develop:

- Cyber security. In 2022 and in the following years this topic will be relevant due to the fact that the further the process of digitalization of banking services, the more often there is a question of preservation of information and its processing [33–35]. Protecting customers' personal data will require substantial investment to maintain competitiveness in this market segment.
- Payment. Due to the epidemiological situation in the world, the share of non-cash payments has increased significantly, so banks are interested in making payments "through themselves" and receiving commissions [36–38].
- Artificial intelligence. The development of technologies associated with it will not lose relevance because, allowing to work with databases, it plays a huge role in terms of targeting banking products in the context of intense competition.
- Improving customer experience. Significant increase in customer base due to new users is unlikely; therefore, there is a need to improve the existing experience to work with current clients (in certain target audiences) and, in parallel, to attract new ones. Conservative banks are oriented to consumers of their services from the category of "50+", do not feel comfortable when working with digital channels and do not trust virtual funds, therefore,

it is necessary to focus on software simplification for this target audience.

• Digital mortgage. Currently, mortgage lending shows stable and high growth — therefore, a more rapid document management would help to provide the time required for more data processing that is detailed.

DISADVANTAGES TO IMPLEMENT THE NEW TECHNOLOGIES

Investment in digitalizing the economy continues to increase, as shown in the *figure*.

Digital transformation is now a key factor in the competitiveness of banks. The introduction of new technologies is in great demand by the society, which has fully appreciated the advantages of online banking services, especially since, according to the company's research, McKinsey Global Inc. "Digital Russia: new reality",[2] by 2017 about 60% of Russian population used smartphones. Market share of contactless rapidly increasing, as well as mobile payments and services operating on the P2P system. The concept of modern digital banks implies, among other things, the rapid implementation of customer–oriented innovative solutions.[3]

The following are some of the highlights that, despite the obvious advantages, the use of the latest digital technologies also entails a range of problems that require rapid analytical work.

• Shortage of personnel with appropriate qualifications. For information, systems to work correctly and efficiently, competent professionals must maintain them, and such staff should be knowledgeable both as administrators and as users. The constant updating of digital technologies significantly complicates the process of finding suitable staff, which entails the need for continuous staff development. The solution for banks is to use the experience of foreign financial institutions, to improve the organization of training of their employees, to train young specialists in this field, as well as to change the working hours of personnel to a more flexible and hybrid [39].

• Information security. Transfer most of the information base to the digital environment entails the risk of data loss, as a result of hacker attacks or errors in their use, which threatens banks with loss of customer loyalty and their leaving, and to customers — by access to their personal data by third parties [40, 41]. To avoid this, cooperation with highly qualified specialists in the field, continuous training of staff in accordance with modern criteria and, of course, operational work on the updating of banking systems is required.

• Errors in the operation of digital systems. As digitalization develops very quickly, there are great risks of program errors associated with automation of various processes within banks. Digital systems need to be monitored regularly in order to address possible problems quickly. It is also important to correctly assess potential threats — for all this organizations should allocate considerable amounts.

RISK MANAGEMENT STRATEGY AND DIVERSIFICATION PERFORMANCE INDICATORS

It can be assumed that an analysis of the diversification of banks worldwide will reveal that the stable development of

[2] Digital Russia: new reality. Company's research McKinsey Global Inc.: URL: https://www.mckinsey.com/~/media/mckinsey/locations/europe%20and%20middle%20east/russia/our%20insights/digital%20russia/digital-russia-report.ashx

[3] Ministry of Digital Development, Connection and Mass Communications of the Russian Federation. Digital Economy of the Russian Federation. URL: https://digital.gov.ru/activity/directions/858 (accessed on 08.03.2022).

the financial system is conditioned by a certain risk management strategy and methodology. In order to understand the needs of the customer base, it is important to establish permanent partnerships with foreign financial enterprises — this will help to create the conditions necessary for secure financial services and stable business growth.

To develop socio–economic activities should digitize banking processes, as well as work on the development of economic relations. It is important to pay attention to the fact that digitalization makes banking organizations vulnerable to cyberattacks, which can lead to certain reputational risks. That is, in the current circumstances, banks should work to attract additional investments aimed at prevention and operational prevention of risks of this type, as well as cooperate with interested organizations to exchange experience, including on this issue. All of the above are likely to have a positive impact on the profit growth of financial institutions. However, this is not the only objective indicator of the effectiveness of diversification. It is also necessary to monitor whether sales are increasing, whether client base and number of staff is growing. These factors will help track whether or not funds previously allocated for digitization are being repaid.

CONCLUSION

Mobile and wireless communication market is one of the fastest growing markets in the world. New technologies and increased use of mobile devices and smartphones around the world have led to a new platform in the banking industry. Connecting a customer anytime and anywhere to his money and a set of necessary tools to manage them — a mandatory service that has become necessary in recent years. This causes the emergence of a new generation of banking relations, which will be characterized by the most effective interaction with the customer base and, consequently, the operational satisfaction of all the needs of the latter. Financial organizations have a unique task to maintain and expand their customer base, as well as to quickly introduce new technologies and thus create additional competitive advantages. Convenience in online service combined with the presence of branches and ATMs have a significant impact on the prosperity of banks. New technologies should be used and adapted as necessary, so that they can develop continually and effectively.

Future research should focus on the processes of digitization of banking services and the identification of factors that determine the degree of their convenience for customers. This will allow not only to assess whether the products of banks meet the expectations of consumers, but also to propose ways of transforming banking operations in order to strengthen the financial stability of the latter. It is important to note that the most comprehensive and detailed analysis of digitizing business models with a high probability will require not one, but several scales to rank digital tools that reflect, for example, how much this process is used by different parts of the company: customer service departments, accounting departments. Ideally, subsequent research of such a plan should also assess which type of digitization tool is most suitable for wide application.

As rightly noted in a number of foreign materials and studies, digitization in commercial banks contributes to the optimization of a number of key processes and has a positive impact on the processes of interaction with customers in the

provision of banking services. The results of research study can be useful both to heads of departments and marketers of commercial banks for the subsequent development of the digitization of services. In addition, provisions and sections related to cybersecurity and potential threats to mobile banking can help in the formation of requests and technical assignments for IT–professionals responsible for the development and implementation of certain digital products.

REFERENCES

1. Kalenov O.E. Digital ecosystems of organizations. *Vestnik Rossiiskogo ekonomicheskogo universiteta imeni G.V. Plekhanova = Vestnik of the Plekhanov Russian University of Economics*. 2022;19(1):139–147. (In Russ.). DOI: 10.21686/2413–2829–2022–1–139–147
2. Anokhina A.A., Donskaia E.N. Digitalization of banking services. *Aktual'nye problemy sovremennosti: nauka i obshchestvo = Actual Issues of Modern Science and Society*. 2021;(2):30–33. (In Russ.).
3. Moudud-Ul-Huq S., Ashraf B.N., Das Gupta A., Zheng C. Does bank diversification heterogeneously affect performance and risk-taking in ASEAN emerging economies? *Research in International Business and Finance*. 2018;46:342–362. DOI: 10.1016/j.ribaf.2018.04.007
4. Mohd Khan S.J., Samsudin S., Islam R. Efficiency of banks in Southeast Asia: Indonesia, Malaysia, Philippines and Thailand. *International Journal of Social Economics*. 2017;44(12):2302–2312. DOI: 10.1108/IJSE-01–2016–0020
5. Do H.T.K., Chu L.K., Nguyen P.M. Vietnamese banking system in the context of ASEAN financial integration. *International Journal of Financial Research*. 2017;8(1):155–165. DOI: 10.5430/ijfr.v8n1p155
6. Taskinsoy J. Asian miracle, Asian tiger, or Asian myth? Financial sector and risk assessment through FSAP experience: Enhancing bank supervision in Thailand. *SSRN Electronic Journal*. 2019. DOI: 10.2139/ssrn.3385337
7. Syadullah M. ASEAN banking efficiency review facing financial services liberalization: The Indonesian perspective. *Asian Development Policy Review*. 2018;6(2):88–99. DOI: 10.18488/journal.107.2018.62.88.99
8. Cortés K.R., Strahan P.E. Tracing out capital flows: How financially integrated banks respond to natural disasters. *Journal of Financial Economics*. 2017;125(1):182–199. DOI: 10.1016/j.jfineco.2017.04.011
9. Gilje E.P., Loutskina E., Strahan P.E. Exporting liquidity: Branch banking and financial integration. *The Journal of Finance*. 2016;71(3):1159–1184. DOI: 10.1111/jofi.12387
10. Levine R., Lin C., Xie W. Geographic diversification and banks' funding costs. *Management Science*. 2021;67(5):2657–2678. DOI: 10.1287/mnsc.2020.3582
11. Dvorsky J., Popp J., Virglerova Z., Kovács S., Oláh J. Assessing the importance of market risk and its sources in the SME of the Visegrad Group and Serbia. *Advances in Decision Sciences*. 2018;22(A):1–22. URL: https://core.ac.uk/download/pdf/334753999.pdf
12. Oláh J., Kovács S., Virglerova Z., Lakner Z., Kovacova M., Popp J. Analysis and comparison of economic and financial risk sources in SMEs of the Visegrad group and Serbia. *Sustainability*. 2019;11(7):1853. DOI: 10.3390/su11071853
13. Doerr S., Schaz P. Bank loan supply during crises: The importance of geographic diversification. BIS Working Paper. 2019;(827). URL: https://www.bis.org/publ/work827.pdf
14. Cai W., Xu F., Zeng C. Geographical diversification and bank performance: Evidence from China. *Economics Letters*. 2016;147:96–98. DOI: 10.1016/j.econlet.2016.08.022
15. Bömer M., Maxin H. Why fintechs cooperate with banks — evidence from Germany. *Zeitschrift für die gesamte Versicherungswissenschaft*. 2018;107(3):359–386. DOI: 10.1007/s12297–018–0421–6

16. Hryshchuk R., Yevseiev S. The synergetic approach for providing bank information security: The problem formulation. *Ukrainian Scientific Journal of Information Security*. 2016;22(1):64–74. DOI: 10.18372/2225–5036.22.10456
17. Belás J., Korauš M., Kombo F., Korauš A. Electronic banking security and customer satisfaction in commercial banks. *Journal of Security and Sustainability Issues*. 2016;5(3):411–422. DOI: 10.9770/jssi.2016.5.3(9)
18. Servidio J. S., Taylor R. D. Safe and sound: Cybersecurity for community banks. *Journal of Taxation & Regulation of Financial Institutions*. 2015;28(4):5–14.
19. Crisanto J. C., Prenio J. Regulatory approaches to enhance banks' cybersecurity frameworks. Financial Stability Institute. FSI Insights on Policy Implementation. 2017;(2). URL: https://www.bis.org/fsi/publ/insights2.pdf
20. Camillo M. Cybersecurity: Risks and management of risks for global banks and financial institutions. *Journal of Risk Management in Financial Institutions*. 2017;10(2):196–200. URL: https://www.aig.co.uk/content/dam/aig/emea/united-kingdom/documents/Insights/jrmfi-mark-camillo-article-mar-2017.pdf
21. Gaur A., Ondrus J. The role of banks in the mobile payment ecosystem: A strategic asset perspective. In: Proc. 14th Annu. int. conf. on electronic commerce (Singapore, 7–8 August 2012). Singapore: Singapore Management University; 2012:171–177. DOI: 10.1145/2346536.2346570
22. Tinnilä M. Impact of future trends on banking services. *Journal of Internet Banking and Commerce*. 2012;17(2):1–15. URL: https://www.icommercecentral.com/open-access/impact-of-future-trends-on-banking-services.pdf
23. Maixé-Altés J. C. The digitalization of banking: A new perspective from the European savings banks industry before the Internet. *Enterprise & Society*. 2019;20(1):159–198. DOI: 10.1017/eso.2018.18
24. Samar S., Ghani M., Alnaser F. Predicting customer's intentions to use internet banking: The role of technology acceptance model (TAM) in e-banking. *Management Science Letters*. 2017;7(11):513–524. DOI: 10.5267/j.msl.2017.8.004
25. Digital transformation — a step into the future. Proc. 1st Int. sci.-pract. conf. of young scientists (Minsk, February 22, 2021). Minsk: Belarusian State University; 2021:68–73. (In Russ.).
26. Shakirov A. R., Shakirova G. I. Imperative of the digital economy. *Vestnik sovremennykh issledovanii*. 2018;(10.2):297–301. (In Russ.).
27. Bubnova Yu. B. Transformation of bank's business model in terms of digital economy. *Izvestiya Baikal'skogo gosudarstvennogo universiteta = Bulletin of Baikal State University*. 2019;29(3):425–433. (In Russ.). DOI: 10.17150/2500–2759.2019.29(3).425–433.
28. Rawat D. B., Doku R., Garuba M. Cybersecurity in Big Data era: From securing Big Data to data-driven security. *IEEE Transactions on Services Computing*. 2021;14:2055–2072. DOI: 10.1109/TSC.2019.2907247
29. Banker R., Chen P.-Y., Liu F.-C., Ou C.-S. Business value of IT in commercial banks. In: ICIS 2009 Proceedings: 13th Int. conf. on information systems. 2009. URL: https://core.ac.uk/download/pdf/301347393.pdf
30. Nüesch R., Alt R., Puschmann T. Hybrid customer interaction. *Business & Information Systems Engineering*. 2015;57(1):73–78. DOI: 10.1007/s12599–014–0366–9
31. Sachse S., Puschmann T., Alt R. Towards customer-oriented electronic markets — A survey among digital natives in the financial industry. In: Bled eConference. eDependability: Reliable and trustworthy eStructures, eProcesses, eOperations and eServices for the future (Bled, June 17–20, 2012). 2012. URL: https://aisel.aisnet.org/cgi/viewcontent.cgi?article=1016&context=bled2012

32. Protopopov S.A., Dubov D.A. Cyber security of banking in the context of digitalization of the economy. In: National economy of the Republic of Belarus: problems and development prospects. Proc. 12th Int. sci.-pract. student conf. (Minsk, April 3–11, 2019). Minsk: Belarus State Economic University; 2019:84–85. URL: http://www.bseu.by:8080/bitstream/edoc/83494/1/Protopov_S.A..pdf (In Russ.).
33. Romanchenko D.V. Cybersecurity in the Russian banking sector and the experience of foreign countries. *Ekonomika i biznes: teoriya i praktika = Economy and Business: Theory and Practice*. 2019;(6–2):105–108. (In Russ.). DOI: 10.24411/2411–0450–2019–10872
34. Temirkhanova M.T., Rudskaya I.A. Innovative financial technologies: The Russian experience and prospects of development. *Fundamental'nye issledovaniya = Fundamental Research*. 2018;(8):110–115. (In Russ.).
35. Yuldybaev B.R., Valiullina V.A. The role of electronic money in the development of a modern market economy. In: Problems of the humanities and education in the modern world. Proc. 7th All-Russ. sci.-pract. conf. (Sibay, March 26–27, 2021). Sibay: Sibay Institute; 2021:98–101. (In Russ.).
36. Rahim F.K., Asdar M., Sobarsyah M., Nursyamsi I. The effect of non-cash payments on inflation rate with cash circulation as an intervening variable during the COVID-19 pandemic. *International Journal of Innovative Science and Research Technology*. 2021;6(7):765–768. URL: https://ijisrt.com/assets/upload/files/IJISRT21JUL527.pdf
37. Obukhov A.D., Krasnyanskiy M., Nikolyukin M. Algorithm of adaptation of electronic document management system based on machine learning technology. *Progress in Artificial Intelligence*. 2020;9(4):287–303. DOI: 10.1007/s13748–020–00214–2
38. Kurmanova L., Nurdavliatova E., Kurmanova D., Galimova G., Khabibullin R. Development of digital services and information security of banks. In: DEFIN-2021: IV Int. sci. and pract. conf. 2021. DOI: 10.1145/3487757.3490911
39. Bulatova E.I., Ipatova E. Financial features of systemically important banks operation in modern conditions. *International Journal of Financial Research*. 2020;12(1):23. DOI: 10.5430/ijfr.v12n1p23
40. Moody G., Siponen M.T., Pahnila S. Toward a unified model of information security policy compliance. *MIS Quarterly*. 2018;42(1):285–311. DOI: 10.25300/MISQ/2018/13853
41. May M., White O., Wilson G. A risk agenda for boards of directors at US banks. McKinsey & Company. Feb. 04, 2021. URL: https://www.mckinsey.com/industries/financial-services/our-insights/a-2021-risk-agenda-for-boards-of-directors-at-us-banks# (accessed on 02.01.2022

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Import Substitution in High-Tech Industries under External Sanctions

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ABSTRACT

In the context of restrictions on the import of technologies and equipment to the Russian Federation caused by external sanctions and the withdrawal of Western European, American and Japanese companies from our country, initially, high-tech branches of domestic industry found themselves in a difficult situation. There were problems related to the substitution of products that fell under the ban on import, and the development of localization of the main production segments. The **purpose** of the study is to review import substitution plans in the machine tool, aviation, electronic and machine-building industries in order to assess the effectiveness of their implementation; to identify the causes and factors of inhibition of the import substitution policy, as well as ways to improve its effectiveness. The author offers directions of improvement of the State support of high-tech branches of manufacturing industry to solve the problems facing it.

Keywords: import substitution; industry; high-tech industries; external sanctions; localization of production; machine tool; aviation, electronic industry; mechanical engineering

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INTRODUCTION

In connection with the imposition of sanctions unfriendly to Russia, restricting the import of technology and equipment into our country, the issue of substitution of products that have been banned from importation sharply there was a question. The need for an independent industrial and technological policy based on an import substitution strategy with a focus on the domestic producers and the search for their own modern solutions in various fields of science and technology came to the fore, maintain a high level of technological safety and to survive global crises with the lowest losses in the future.

A large number of publications are devoted to import substitution problems in the Russian industry [1–12]. Import substitution in high-tech industries is addressed by studies presented in [13–20].

According to experts, high-tech industries are lagging behind on import substitution[1] — the head of the Ministry of Industry and Trade of the Russian Federation D.V. Manturov named aviation, radio electronics, rehabilitation industry, pharmaceuticals and power engineering among the most important of them [21].

Consider the status and processes of import substitution in such high–tech sectors of the domestic industry as machine tool, aviation, electronic and mechanical engineering.

AVIATION INDUSTRY

Aviation industry is one of the economic drivers. Being high–tech, it creates a great synergy effect. The competence of the aviation industry can be used in many other sectors of the economy to create on their basis competitive products compared with foreign analogues.

Russia with a share of 1% of world exports of civilian aircraft and helicopters is poorly represented in this segment of the global market — Currently, the aviation industry supplies abroad 0.4% of engines, 1.5% of aggregates, 2.6% of devices, as well as 2.3% of aircraft (mainly military). As a result of implementation the federal targeted programme " Development of the aviation industry on 2013–2025 years ",[2] task of forming a stable position of the civil sector and positioning the Russian Federation, as a world center of aviation industry, it is should be solved, that capable of implementing by 2025 at least 5% of the world's aviation equipment, including: in the field of aircraft engineering — 4–5%; helicopter industry — 19,4%; engine building — at least 1% for civilian aircraft and 7% — for helicopters; in the field of aviation and instrument engineering — at least 2.9% of the world market of aggregates and systems and 11.2% of on-board aviation complex [22].

The main problems of the aviation industry at present are:

- moral depreciation of the equipment's;
- low level of managerial qualification and lack of experience in in preparation for series production;
- underdevelopment of cooperative interaction and inability to work with partners;
- high age of leading specialists;
- low level of manufacturing automation.

Based on the analysis of regulations and strategic documents, can be concluded, that development of the domestic aircraft industry in the period from 2011 to 2021 was carried out on the basis of the model of partial import substitution and the choice of the

[1] Company secret (online resource). URL: https://secretmag.ru/news/rossiyanam-nazvali-samye-otstayushie-po-importozamesheniyu-otrasli-19–05–2022.htm

[2] Resolution of the Government of the Russian Federation No. 303 from 15.04.2014 "On approval of the State programme of the Russian Federation "Development of the aviation industry on 2013–2025 years". URL: https://base.garant.ru/70644068/?ysclid=l60uxrb8ds585710311

Table

Key indicators of the implementation of the state program "Development of the aviation industry"

Name of indicator	Unit of measurement	2011	2015 plan/actual	2018 plan/actual	2019	2020
Quantities of newly established small aircraft (airplanes)	Units	–	–/9	6/10	7	7
Share of Russian civil aviation aircraft deliveries in the international civil aircraft markets	%	0.6	2/1	1/1	1	1
Share of Russian aircraft in the fleet of the largest Russian air carriers	%	–	–/–	14/9	10	11
Number of delivered the aircraft engines	Units	690	1835/1263	937/846	835	911
Share of Russian aircraft engines for civilian aircraft in the international market of aircraft engines for civilian aircraft	%	0	–/0	0/0	0	0
Share of Russian aircraft engines for helicopters in the international market of aircraft engines for helicopters	%	7	8/8	8/8	8	8
Share of Russian on-board aviation complexes for aircraft in the international market of on-board aviation complexes for aircraft	%	3	8/8	8/8	8	9

Source: compiled by the author based on the State Program of the Russian Federation "Development of the aviation industry for 2013–2025". URL: https://ach.gov.ru/upload/iblock/086/08613e7c838609058a081ea2663f3c11.pdf?ysclid=l60vjscvf2920750409

optimal cost of the product, i.e. responsible for the implementation of the state program of the Ministry of Industry and Trade of the Russian Federation and executives — leading corporations. Leading corporations were chosen as final product nodes imported components due to the price positioning of the product in international markets. Some aircraft were purchased from foreign suppliers (*Table. 1*).

In addition, as a result of this policy, the share of Russian–made aircraft in the fleet of the largest Russian air carriers (from 15 to 10%) and the number of aircraft engines supplied (from 1 263 to 850 un.) has decreased year on year. Despite the tense situation in the world and Russian economy, the focus was not on complete import substitution, but on partial.

When referring to current document — the order of the Ministry of Industry and Trade of Russia No. 2914 from 02.08.2021 "On approval of the Plan of measures for import substitution in the civil aviation industry of the Russian Federation for the period up to 2024",[3] which regulates the import substitution policy in the industry, then questions arise about the difficult value of its indicators: increase the share of domestic products from 0% in 2020 to 100% in 2024 for the next high–tech products and components:

1. Aircraft engine PD-14.

2. Aircraft "Sukhoi Superjet 100" and its components:

- Auxiliary power unit.
- On-board radio electronic equipment.
- Integrated aircraft management system.
- Integrated air conditioning system.
- Panels of cabin crew.
- Engine vibration control system.
- Hydrosystem computer.
- Fuel management and measurement system.
- Hydraulic system elements and components.
- Water supply and waste disposal system.
- Emergency flight information system.

Taking into account the R&D situation, the real time for the implementation of projects in the aviation industry for the creation of final products with a complete set of systems based on the share of import–substituted components and aggregates above 80%, taking into account foreign experience and complex characteristics of high–tech industries,— it is 2028–2030 years.

Proposals on improvement of the mechanism of implementation of tools of modernization of the production base for creation of competitive production in the aviation industry are the following:

1. From 2022 to 2025, it is necessary to systematize production and technical activities. For this you should:

- identify the main priorities of the Russian economy in civil aviation products;
- quantify the need and allocate work dynamics by years;
- form technological chains of production for each product;
- perform engineering the entire process chain;
- identify weaknesses in supply chain production and technology; develop programmes to accelerate the modernization of the relevant industries;
- develop a service plan for each type of aircraft.

2. Implement a new type of management of the production and technological chain based on cooperation of its members and form a management body of representatives of

[3] Order of the Ministry of Industry and Trade of Russia No. 2914 from 02.08.2021 "On approval of the Plan of measures for import substitution in the civil aviation industry of the Russian Federation for the period up to 2024". URL: http://www.consultant.ru/document/cons_doc_LAW_392319/?ysclid=l60vxd9gh7389524397

manufacturers of components and assemblers of the final product (aircraft, helicopter, engine and aggregate).

3. Identify the needs of technology chains for highly professional staff.

4. Develop a technical and economic substantiation for the development of the aviation industry and a project financing system.

In order to achieve the above objectives is required:

In the field of development:

• to ensure a high technical level of domestic aviation equipment, including aircraft construction, helicopter construction, aviation engine building and production of aviation aggregates, devices;

• to create and implement in the practice of aviation industry advanced achievements of science and technology and breakthrough technologies.

In the civil aviation industry:

• to promote differentiated approach of final integrators and manufacturers of aviation components;

• to organize serial production of helicopters and engines with optimal model range (including new generation engines);

• to promote the development of small and medium–sized business in the industry;

• to form and develop innovative territorial clusters;

• to organize development, production, after–sales service, logistics and marketing management throughout the product life cycle;

• to provide operational aircraft service.

There is also a need to support the civil aviation industry in its:

• modernization of aviation transport infrastructure and improvement of aviation safety of domestic aviation models;

• providing advanced development of scientific and technical basis for creation of fundamentally new models of aviation technology.

In order to achieve the above objectives, the management of priority projects should be improved, monitoring not only development and certification, but also the organization of serial production, promotion of products on the market, its after– sales service, modernization and recycling. It is important to develop aviation technology with the possibility of its maximum unification, both within each "family" and between them, which will increase the development productivity.

5. Implement network production structures, conducting complexes of measures, such as:

• to create systems for standardization of production quality, taking into account world experience;

• to form institutes of attestation of competence of enterprises of manufacturing industry with the purpose of selection of promising for creation of effective production chains;

• to determine the results of certification of competence of the production company and on their basis to form cluster structures for the development of modules of complex products (for example, in the aviation industry it is the fuselage, wing, engines, navigation and control equipment, engineering and ergonomic saturation of aircraft).

6. Create a system for transforming scientific knowledge into breakthrough technologies: it should consist of separate sections for the development of aircraft (aircraft and helicopters) as well as modules, nodes and components for them, which are under the competence, accordingly, aircraft integrator and first–level supplier according to their functional purpose [23].

7. Create sustainable demand for high-technology products in the domestic market

by developing an integrated development programme that includes:

• increase the share of domestic aircraft in the fleet of Russian air carriers;

• development of aviation transport infrastructure and aviation industry for 20–25 years;

• organization of a modern after–sales service system.

This will allow planning for increase in the scope of activities, which will contribute to increasing productivity and reducing risks of production development.

The proposed set of measures for the modernization of the production base of the aviation industry can be used for the solution of the corresponding task for high-tech manufacturing industries, within which complex equipment is produced, consisting of a set of modules, nodes, aggregates [23].

ELECTRONICS INDUSTRY

The program of import substitution in the electronics industry, effective since 2015[4,5] is aimed at the creation and development of domestic enterprises involved in the chain of creation of complex products of the industry. The programme's implementation plan includes the following results in reducing the proportion of imports:

• Semiconductor microwave electronics — from 70 to 10%.

• Telecommunications equipment — from 90 to 50%.

• Microprocessors — to 25% in public sector and to 90% in mass market.

• Automated control systems — from 90 to 45%.

• LED technology — from 90 to 50%.

• Medical equipment — from 90 to 30%.

• Semiconductor manufacturing equipment — from 90 to 30%.

• Computer engineering — to 25% in public sector and to 90% in mass market.

• Individual elements of computer technology — from 90 to 50%.

• Electronic measuring tools — from 90 to 30–50% (with different technologies).

The problems of import substitution in the electronics industry, computer and information technology industry are addressed by studies presented in the works [24–26].

One of the most complex and ambitious projects in electronics is the plan to replace software in the public sector, which in 2016 provided for restrictions on the purchase of imported software for government agencies and organizations of Russia.

In practice, this program is more aimed at the formation of import substitution of the part of the industry that relates to the defense and industrial complex. In the civilian sector, technologies and components are mostly copied from foreign. Also common insignificant (and more formal) development of foreign components at domestic enterprises in order to achieve the required level of localization. Not all these circumstances contribute to the goals of real import substitution in the Russian electronics industry.

The main support measures for organizations that participate in import substitution projects in this area of the economy are:

• granting of preferences for income tax and insurance premiums.

• expanding the list of electronic industries, which have tax exemptions (the project

[4] Order of the Ministry of Industry and Trade of Russia No. 662 from 31.03.2015 (amend. on 31.05.2018) "On approval of the sectoral plan of measures for import substitution in the radio–electronic industry of the Russian Federation". URL: https://minpromtorg.gov.ru/common/upload/files/docs/662.PDF

[5] Plan of measures for import substitution in the radio-electronics industry of the Russian Federation. URL: https://frprf.ru/download/plan-po-importozameshcheniyu-v-radioelektronnoy-promyshlennosti.pdf

provides the reduction of income tax to 3% and insurance premiums to 7.6%).

• obligation of purchase by the public sector of domestic electronics and software.

• incorporation of domestic electronics purchases into government programmes.

In practice, however, the measures taken did not achieve the desired result. Key barriers at this stage appear to be:

• requirements for localization of industry products and point estimation of the level of localization of production. Shortcomings of the existing system encourage entrepreneurs not to develop domestic analogues of electronic products, but to insignificant adaptation of foreign samples in circumvention of requirements for localization of production.

• cancellation of tenders for funding scientific research in the electronic industry.

• non–strict implementation of existing regulations and de–facto use of selected components of foreign equipment in sectors where it should not be used.

In the current situation revealed the extremely low level of localization of electronics.

Domestic industry faced an acute shortage of components for products previously supplied from abroad. All sectors of instrument engineering and electronics industry were de–facto incapable of import substitution — the question arose of the lack of domestic products similar to imported quality. The most critical moment of formation of the program of rapid import substitution is the acute shortage of modern technologies in the Russian industry. In the absence of such access, the domestic electronics industry will be able to provide only a certain part of the service of previously delivered equipment. Accordingly, the fundamental task of an effective plan for technological import substitution in the long term is the need to organize the transfer to Russia of electronic industrial technologies existing abroad (by method of "parallel import" and through the branched link of third countries) concurrently with the intensification of research, development and engineering to develop their analogues. In this context, measures such as reducing the tax burden on small and medium–sized businesses that specialize in the development of critical electronics products will be appropriate.

It is also advisable to stimulate the program of repurchase by the management of abandoned foreign companies on the Russian market, abandoned enterprises, provided the development strategy, technological focus and the staff of these organizations are maintained. Currently, there is an agreement between the Ministry of digital development, connection and mass communications of the Russian Federation and Ministry of industry and trade of the Russian Federation with electronics manufacturers and software developers to submit authorities their specific proposals for the further development of the domestic electronic industry, which be added to the new national radio electronics project. The main funds of multi–billion–dollar state support under this national project will be directed to the development and production of domestic computer equipment for corporate and home use, navigation devices, medical electronics, intelligent transport systems, artificial intelligence and big data software.[6]

In September 2020, the state corporation "Rosteh" developed a road map for the modernization of Russian microelectronics, which states that 798 bln. rub. should be invested in the industry until 2024, for the

[6] Ministry of Digital Development and Ministry of Industry and Trade plan to launch a new national project in the field of microelectronics to support the industry. Habr — Community of IT-specialists (online resource). 13.02.2022. URL: https://habr.com/ru/news/t/651195/

development of the production of chips with topological norms 65 (55), 28, 14 norms, as well as elements for solid state accumulators with topological norm 25–30 norms.[7]

Plans for further development of the electronic industry are reflected in the Strategy for the development of the electronic industry of the Russian Federation for the period up to 2030.[8] Based on macroeconomic and sectoral prerequisites, 3 scenarios of industry development — conservative, targeted and innovative. Conservatives expect moderate long–term economic growth of only 2.8–3% per year; targeted — stable situation on the domestic market and average annual economic growth of only 3.1–3.2%; innovative — economic growth only on 3.4–3.6% [27]. Based on the target scenario of development of electronics, providing active import substitution and stimulation of development of new products with priority of projects of great importance for infrastructure. However, such a growth rate of the industry will not ensure the transition of the Russian economy to the modern level of management using digital platforms.

MACHINE–TOOL INDUSTRY

Sectoral Plan of measures for import substitution in the machine–tool industry of the Russian Federation for the period up to 2024 (further — Plan)[9] prepared and approved by the Order of the Ministry of Industry and Trade of Russia No. 2332 from 28.06.2021.[10] The Department of Machine Tools and Heavy Machinery implements the Plan, while the Department of Strategic Development and Corporate Policy coordinates the monitoring, expert analysis and methodological support of its implementation. Characteristic feature of this document is its formation in the context of individual product groups ("product name") with appropriate ciphers and codes according to the Russian Classification Register of Goods According to the Type of Economic Activities: OK 034–2014 (CPA 2008) — OKPD-2. According to these groups, the indicators of the share of domestic products before the implementation of import substitution plans (%) and the corresponding share until 2024 (%), indicating the volume of annual demand for the products of these groups and the responsible department of the Ministry.

This format does not fully correspond to the purpose of the document (indicated in its title), as it does not disclose the content and scope of import substitution measures in the industry, the subjects responsible for their implementation, the types of actors involved in their actions and their effectiveness.

This approach is broadly similar to the earlier format of the plan of measures for import substitution in the machine–tool industry of the Russian Federation, prepared in accordance with Order of the Ministry of Industry and Trade of the Russian Federation No. 650 from 31.03.2015.[11]

However, discrepancy in the details of these submissions: codes and ciphers, that

[7] See ibid.

[8] Order of the Government of the Russian Federation No. 20 from 17.01.2020 "On approval of the Strategy for the development of the electronic industry of the Russian Federation for the period up to 2030". URL: https://bazanpa.ru/pravitelstvo-rf-rasporiazhenie-n20-r-ot17012020-h4636415/?ysclid=l63kyvee9e678298835

[9] Plan of measures for import substitution in the machine-tool industry of the Russian Federation for the period up to 2024. URL: https://frprf.ru/download/plan-po-importozameshcheniyu-v-stankoinstrumentalnoy-promyshlennosti.pdf

[10] Order of the Ministry of Industry and Trade of Russia No. 2332 from 28.06.2021 "On approval of the Plan of Measures for Import Substitution in the Machine-Tool Industry of the Russian Federation for the period up to 2024". URL: https://base.garant.ru/401404102/?ysclid=l63l8c4kl1140435881

[11] Order of the Ministry of Industry and Trade of Russia No. 650 from 31.03.2015 (amen. on 12.12.2017) "On approval of the plan of measures for import substitution in the machine-tool industry of the Russian Federation". URL: https://legalacts.ru/doc/prikaz-minpromtorga-rossii-ot-31032015-n-650-ob-utverzhdenii/?ysclid=l63lizl4k6975897252

are linking to them; content of the indicators used (share of imports in consumption on the eve of the target period 2015–2020 in the above-mentioned document 2015 and share of domestic products before the implementation of import substitution plans in document), and the period in which they are oriented, *do not allow to fully correlate them, to assess the implementation of the 2015 Plan and the effectiveness of the 2021 Plan.*

Further refinement and justification of the assessment of the Plan 2015 and the Plan 2021, is accounting the latest actions that outlined in "Strategy for the development of the machine–tool industry to 2035" (Decree of the Government of the Russian Federation No. 2869 from 5 November 2020 "On approval of the Strategy for the development of the machine–tool industry for the period up to 2035").[12] In this regard, the importance of import substitution and the implementation of special measures for this purpose has been identified in connection with the need to ensure the industry transition to a new level of development.[13] And to enhance national security in general and reduce threats to technological security that persist in the use of imported inputs and component basesы, and also protect the military–industrial complex as the main consumer of the machine–tool industry from possible external influence.[14]

In turn, solving the problems of reducing the level of sectoral import dependence presupposes creation of appropriate institutional conditions, growth and development of domestic demand, providing domestic producers with access to the necessary technologies, changes in the quality of machine–tools production.[15] Its characteristic features are:

- overcoming the low level of technological and economic efficiency of domestic enterprises;
- increasing the competitiveness of Russian production components by quality and price;
- preservation progressive trends in cutting and a number of other tools.

The Strategy aims to implement these facilities and reduce import dependence through the following actions[16]:

- implementation of modernization programmes and the creation of a competitive internal supply (price and technology);
- creation of scientific and technical groundwork (including through the implementation of large-scale cross-cutting integrated R&D on the development and mastery of serial tool production of a wide range of world–class);
- elimination the shortage of human resources and incompetence;
- creation of domestic innovative high–performance technologies and special equipment, attraction of foreign technologies (with transfer of technological solutions) and equipment, as well as new instrumental joint–type enterprises;
- development of exports of Russian instrument products;
- strengthening state support for the development of production (financial, regulatory, tax incentives, prioritization of promising technologies for the industry);
- regular introduction of innovation in the organization of production, product innovation and technology.

[12] Decree of the Government of the Russian Federation No. 2869 from 5 November 2020 "On approval of the Strategy for the Development of the Machine-Tool Industry for the period up to 2035". URL: https://www.garant.ru/products/ipo/prime/doc/74769183/

[13] See ibid, part III, p. 1.

[14] See ibid, part II, p. 1, part V., p. 1.

[15] See ibid. part. II, p. 2.

[16] See ibid. part II, p. 2, 3, part IV, p. 1, part V, p. 1.

The impact of such efforts is expected to be not only the successful implementation of the Strategy, but also a significant contribution to national development goals.[17]

Accounting and detail of the import substitution plan actions identified in the above-mentioned Strategy should also be complemented by an operational monitoring system. This will allow an effective assessment of the contribution of import substitution to the risk management for sector development from the perspective of its scenarios highlighted in The Strategy.[18]

Some developments for such actions have already been included in the plan of measures for the implementation of the "Strategy for the development of the machine-tool industry up to 2035", approved by the Decree of the Government of the Russian Federation No. 2869 from 05.11.2020 (Order of the Ministry of Industry and Trade of the Russian Federation No. 4526 from 17.11.2021).[19]

These include, for example, the adjustment of requirements for products of the machine–tool industry, necessary for their classification into industrial products produced in the territory of the Russian Federation within the Decree of the Government of the Russian Federation No.719 from 17.07.2015 "On confirm of production of industrial products in the territory of the Russian Federation"[20, 21]; carrying out activities aimed at discussing the key issues of the development of the tool industry[22]; development and (or) updating of professional standards[23]; preparation of proposals to increase labour productivity in the machine–tool industry[24]; monitoring the execution of the action plan for the implementation of the Strategy for the development of the machine–tool industry until 2035 year.[25]

In addition to the important import substitution activities contained in these documents, measures and steps for their implementation should be taken into account when working on Plan, that implemented under the Industrial Development Fund and major development institutions essential for strengthening import substitution (for example, Resolution of the Government of the Russian Federation No. 522 from 31.03.2022 "On the amendment of the Rules for subvention from the federal budget of an autonomous non–profit organization "Agency for Technological Development" to support projects involving the development of design documents for components required by industries"),[26] as well as relevant tasks of the Ministry.

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[17] See ibid. Part V, p. 4, part VII.

[18] See ibid. Part VIII.

[19] Order of the Ministry of Industry and Trade of the Russian Federation No. 4526 from 17.11.2021 "On approval of the Plan of Measures for the Implementation of the Strategy for the Development of the Machine-Tool Industry for the period up to 2035, approved by the Decree of the Government of the Russian Federation No. 2869 from 5 November 2020". URL: https://legalacts.ru/doc/prikaz-minpromtorga-rossii-ot-17112021-n-4526-ob-utverzhdenii/?ysclid=l63mv3cyg3326914630

[20] Decree of the Government of the Russian Federation No.719 from 17.07.2015 "On confirm of production of industrial products in the territory of the Russian Federation". URL: https://base.garant.ru/71139412/?ysclid=l63myd85cm444984641

[21] Order of the Ministry of Industry and Trade of the Russian Federation No. 4526 from 17.11.2021 "On approval of the Plan of Measures for the Implementation of the Strategy for the Development of the Machine-Tool Industry for the period up to 2035, approved by the Decree of the Government of the Russian Federation No. 2869 from 5 November 2020". Goal III, p. 8. URL: https://legalacts.ru/doc/prikaz-minpromtorga-rossii-ot-17112021-n-4526-ob-utverzhdenii/?ysclid=l63mv3cyg3326914630

[22] See ibid. Goal III, p. 11.

[23] See ibid. Goal V, p. 14.

[24] See ibid. Goal V, p. 15.

[25] See ibid. Goal VI, p. 16.

[26] Resolution of the Government of the Russian Federation No. 522 from 31.03.2022 "On the amendment of the Rules for subvention from the federal budget of an autonomous non–profit organization "Agency for Technological Development" to support projects involving the development of design documents for components required by industries. URL: http://publication.pravo.gov.ru/Document/View/0001202204040037?ysclid=l63ndhm3pl130394549

Taking into account the above circumstances allow to expect both improvement of validity and clarity of the Plan as the most important document of import substitution management in the machine–tool industry, and efficiency of tactical and strategic actions implemented with its help.

MECHANICAL ENGINEERING

The Consolidated Strategy for the Development of the Manufacturing Industry of the Russian Federation until 2024 and until 2035 are provided, inter alia, an integrated impact on the industry through technological, investment, financial, personnel and foreign trade policy, and demand stimulation as a separate segment of the Strategy.[27] This is a consequence of the assessment of the industry and recognition of the existence of problems such as technological backwardness, insufficient presence in foreign markets, etc. one of the causes of which is the low profitability of Russian engineering.

The analysis shows that the tools of implementation of state support for the development of the manufacturing industry are insufficient to solve the problems of stabilizing the domestic market of industrial goods.

The state program "Development of industry and its competitiveness" provides that for the period 2016–2024 the volume of production will grow by 28%.[28] However, 55% of manufactured goods consumed are imported. Therefore, a 28% increase volume of production (even with import substitution) is not enough to stabilize the market [28]. An important task — increasing export capacity — can be solved only by increasing productivity, which is more than 3.5 times lower than in the major economies.

Research in the development of import substitution in various segments of the mechanical engineering industry presented in the works [29–32].

Mechanical complex in the structure of production is 22%, and the segment of the internal market of mechanical products — 42%. The share of the chemical industry in the structure of production is — 9,8%, and in the structure of the domestic — 14%. This imbalance is the main reason for increasing dependence of the Russian economy on foreign supplies. It is noteworthy that in the mechanical engineering complex of all sectors of manufacturing industry the lowest labor productivity — 3 times less than the average in the industry. The industrial development program lacks relevant target indicators describing the degree of solving complex tasks to increase the efficiency of mechanical engineering. Thus, its backwardness is actually preserved. The proposed measures for import substitution in the mechanical engineering complex:

1) procurement of components for the production of final products in countries outside the sanctions list (China, India, South–East Asian countries), which will require the establishment of new supply logistics schemes from Asian countries;

2) cooperation with small and medium–sized enterprises to provide the components of the industrial corporations that previously purchased in Europe. In this case, information, institutional, infrastructure and financial support are needed;

3) concessional lending to small and medium–sized enterprises by industrial development institutes (VEB.RF and SME

[27] Order of the Government of the Russian Federation No. 1512 from 06.06.2020 "On approval of the Consolidated Strategy for the development of the manufacturing industry of the Russian Federation until 2024 and until 2035". http://static.government.ru/media/files/Qw77Aau6IOSEIuQqYnvR 4tGMCy6rv6Qm.pdf

[28] The state program "Development of industry and its competitiveness". URL: http://government.ru/rugovclassifier/862/events/

Corporation), tax breaks, moratoriums on inspection of production enterprises, etc.;

4) the need for federal and regional executive bodies responsible for the development of industry to create a unified information and industrial network system that will respond quickly to emerging supply problems in production, coordinate the construction of new production chains.[29] This structure should unite together the State and the business community to exchange information in order to achieve the following objectives:

- production cooperation (creation of new production sites);
- logistics cooperation (search of optimal ways of delivery of raw materials and products);
- cooperation to optimize the purchase of raw materials and the production of components and materials (previously imported and currently — unavailable due to sanctions). These issues are in the competence of regional engineering centers;

5) localization of the main production segments of the mechanical engineering industry;

6) stabilization of the domestic product market:

- ensuring the stabilization and subsequent development of the engineering, chemical and food industries by replacing imported products with domestic products that are not inferior in their functional characteristics; with price–quality ratio at the level of world standards;
- orientation of the chemical complex for the accelerated development of petrochemical production, deep processing processes so that most of the energy resources (oil, gas, coal) are used as raw materials for petrochemical production [33];
- ensuring the State food security through support for engineering for the agricultural and food processing industry.

DIRECTIONS OF IMPROVEMENT OF INDUSTRIAL POLICY IN RUSSIA

Analysis of state support tools, implemented in the state programs, shows the lack of a systemic approach to creating conditions for the breakthrough development of the manufacturing industry and increasing its socio–economic significance as a leading factor in the development of the national economy.

State support should focus on the following areas:

1. Creation of a system of technological re–equipment of the economy of the Russian Federation on the basis of intersectoral interaction of high–tech, medium-technology and traditional branches of manufacturing industry:

orientation of the mechanical complex on production of products for machine–tool building, heavy mechanical engineering, electronic industry, For technological support of development of information infrastructure, pharmaceutical industry, medical equipment, equipment for petrochemical complex, aviation industry, engineering and agriculture [34];

transition to intensive development of the agricultural sector, which requires the provision of modern machines for harvesting and tillage; equipment for livestock complex, as well as creation of technological conditions for selection and seed production;

meet the requirements of domestic medicine in equipment and necessary materials [34].

2. Transfer of technologies from industries where there is some groundwork and

[29] Import substitution in mechanical engineering: which segments will dominate. RB.ru — business network (online resource). 29.03.2022. URL: https://advis.ru/php/view_news_ajax.php?id=D 70362E 6–1A2D-764A-B 405–9428C 400508D

competitive advantage in international markets (defense and industrial complex, nuclear energy and power engineering, aviation and space engine industry) In the catching–up sector of technological development, which is one of the most important tasks of Russian industrial policy.

3. Creation of an effective system of management of interdisciplinary interaction, development of a network model of an integrated system of state regulation of development of manufacturing industry on the basis of formation of an interdepartmental center of interdisciplinary interaction.

4. Development of an indicative plan for meet the requirements of domestic economy in complex technology for the most popular nomenclature groups.

5. Creation of a value chain system for the production of complex equipment:

- departure from the support model from one enterprise or group of enterprises and the transition to value chain development in multi–industry and to create a high–tech products [34];
- creation of its own material base (equipment for the digital economy, electronic industry and computing).

At present, it is not individual enterprises that compete in the global manufacturing market, a value chains in which technology and production linkages, diversification of demand markets, optimization of business processes helps to sharp improvement enterprise competitiveness, which should lead to more cost–effective operation. This is the only way to increase the competitiveness of domestic products in this segment of complex equipment at the international level under conditions of destabilization of the domestic market (the recession in the major economies, the decline in the level of international trade and the decline in income from commodity exports).

Value chains should be the main instrument for implementing the industrial policy of the State. They can be created through cross–industry cooperation, for example, in manufacturing with the digital economy, energy and transport sectors, for which a project needs to be developed as a governance body. China, South Korea, the Philippines, Taiwan, Japan and Malaysia have positive experiences with such industrial restructuring. In Russia, value chains were implemented in the system of the corporation "Rosatom", which allowed it to become the leading enterprise for the construction of nuclear power plants in the world. Value chains were also created in the automotive and aviation industries through localization programmes.

7. Focus on developing a system of agreements between domestic consumers and producers, an interaction of development institutions with the management company of value chains in import substitution and in this context. The agreements define the level of investment, the volume of production, the system of interaction with consumers, leasing payments, the organization of service maintenance of complex equipment and investment protection measures [27].

TASKS OF INCREASE THE TECHNOLOGICAL SOVEREIGNTY OF RUSSIA

At the moment, proactive preparations for existing and new sanctions measures by unfriendly countries are required to minimize losses in the economy. Below are proposals for the organization of relevant activities under this agenda:

1. Creation of a mechanism for management of enterprises of foreign investors, which have ceased their economic activity in the Russian Federation due to the imposition of sanctions

against Russia for conducting operations on foreign economic activity and its isolation from the world market of goods and services.

2. Holding in Russia of stress test for economic resilience to sanctions (similarly to the Chinese initiative[30]), both sectoral and regional (by entity of the Russian Federation). In the framework of this audit, organize targeted surveys of experts representing business and domestic science, taking into account the already introduced and possible sanctions. This will help to identify the sectoral and regional vulnerabilities of the economy; the main factors preventing the elimination of vulnerabilities as targets of targeted anti–stress economic policies; directions of expanding, correcting and complementing already introduced systemic and targeted measures of anti–stress economic policy.

3. In the medium term, it is proposed to focus not only on analogues (prototypes), but also on the original developments of domestic scientists, possibly in tandem with partners from friendly countries. It is recommended to extend the financing of the development of design documentation for import substitution beyond 2022 for original components capable of surpassing the level of foreign analogues and oriented to the competitive advantage of the country. Here it is necessary to take into account the later readiness to develop design documentation (beyond 2022 year) on the results of scientific research, which are breakthrough nature.[31] This will improve the efficiency of the import substitution program and the sustainability of the national economy in the medium term.

4. Introduction of a preferential regime for the import into the Russian Federation of high–tech and investment goods from friendly countries and the development of an incentive mechanism.

5. Creation of a scientific and technological platform (hub) to solve the relevant problems to strengthen the technological sovereignty of the Russian Federation. Monitoring of scientific, technical and technological capacities will identify both areas where the indicators are higher than the global ones and where cooperation with countries with technological superiority (China and South–East Asia) is required.

6. Formation of the economic and political course for the development of domestic industrial software and servers and/or modernization of foreign by creating specific functionality in Russia — platforms that meet domestic production needs and reduce national security risks.

7. International cooperation with friendly and reliable economic partners — EAEC countries and BRICS. Emerging markets in China, India, Brazil and South Africa demonstrate high economic, trade, production and technology performance in recent years. In this regard, the strengthening of trade and economic relations with these countries opens new opportunities for Russia and is of special value.

In conclusion, it should be noted that it takes at least 3–4 years to restructure high–tech industries and deepen

[30] China conducts stress test of economy in case of sanctions. Vestu.ru (Online resource). 05.05.2022. URL: https://www.vesti.ru/finance/article/2724683.

[31] According to Resolution of the Government of the Russian Federation No. 522 from 31.03.2022, amendments to the Government Resolution No. 208 from 18.02.2022. If earlier to receive a grant from "Agency for Technological Development" developer had to attract at least 20% of own funds for the implementation of a specific project, now this condition is removed. The state, represented by the agency, is ready to allocate up to 100% of the funding for the creation of Russian analogues of components. However, the document stipulates that such a procedure would be in effect only in 2022 year. URL: http://publication.pravo.gov.ru/Document/View/0001202204040037?ysclid=l650ts2dnv604803441

import substitution. It is necessary to work together with regional ministries, associations, development institutions, business associations in such areas as joint monitoring of the situation and even regulation of individual processes in a manual mode, for example, distribution of components by industry.

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REFERENCES

1. Manturov D., Nikitin G., Osmakov V. The Russian government approach to import substitution planning in industry. *Voprosy ekonomiki*. 2016;(9):40–49. (In Russ.). DOI: 10.32609/0042–8736–2016–9–40–49
2. Mokin V.N., Kapustina I.V., Stepanova T.V. et al. Analytical study of import substitution processes in the Russian economy: Theory and practice. St. Petersburg: Politechnical University Publ.; 2017. 174 p. (In Russ.).
3. Biryukov P.A. The import substitution in Russia: Trends and sustainability. *Finansy: teoriya i praktika = Finance: Theory and Practice*. 2016;20(5):45–57. (In Russ.).
4. Leontyev B.B. Import substitution: View of a problem. *ETAP: ekonomicheskaya teoriya, analiz, praktika = ETAP: Economic Theory, Analysis, and Practice*. 2014;(6):85–96. (In Russ.).
5. Ryazanov V.T. Import substitution and new industrialization of Russia, or how to overcome stagnation. *Ekonomist*. 2014;(11):3–19. (In Russ.).
6. Sorokina A.I., Mozharova E.I., Bordova A.A. Import substitution in modern conditions. *Sbornik nauchnykh trudov Angarskogo gosudarstvennogo tekhnicheskogo universiteta*. 2022;(19):360–367. (In Russ.).
7. Fal'tsman V.K. Import substitution in the economic sectors of Russia. *Studies on Russian Economic Development*. 2015;26(5):452–459. (In Russ.: *Problemy prognozirovaniya*. 2015;(5):52–62).
8. Chernikova A.A., Vertakova Yu.V., Plotnikov V.A. Import substitution as a tool of economic policy for import substitution risk management: Choosing an approach. *Ekonomika i upravlenie = Economics and Management*. 2016;(10):28–39. (In Russ.).
9. Vatolkina N., Gorbunova N.V. Import substitution: International experience, instruments. *Nauchno-tekhnicheskie vedomosti Sankt-Peterburgskogo gosudarstvennogo politekhnicheskogo universiteta. Ekonomicheskie nauki = St. Petersburg State Polytechnical University Journal. Economics*. 2015;(6):29–39. (In Russ.). DOI: 10.5862/JE.233.3
10. Grabchak E.P., Medvedeva E.A., Golovanov K.P. Import replacement — driver for evolution or forced measure. *Energeticheskaya politika = The Energy Policy*. 2016;(3):74–85. (In Russ.).
11. Borisov V.N., Pochukaeva O.V. Developing import substitution as a result of the growth of the competitiveness of investment equipment. *Razvitie territorii = Development of Territories*. 2021;(2):10–18. (In Russ.). DOI: 10.32324/2412–8945–2021–2–10–18
12. Polovinkin V.N., Fomichev A.V. Fundamentals and prospects of import substitution policy in the domestic economy. PRoAtom. Sept. 18. 2014. URL: http://www.proatom.ru/modules.php?file=article&name=News&sid=5541 (In Russ.).
13. Ganichev N.A., Frolov I.E. Long-term development of the Russian high-tech complex in terms of unstable growth of the world economy (model and forecast). *Studies on Russian Economic Development*. 2010;21(6):573–588. (In Russ.: *Problemy prognozirovaniya*. 2010;(6):3–22).

14. Kokhno P.A. High-tech industry in the context of import substitution. In: Russia: Trends and development prospects. Yearbook. Moscow: Institute of Scientific Information for Social Sciences of RAS; 2016:323–327. (In Russ.).
15. Vertakova Yu.V., Plotnikov V.A. Prospects for import substitution in high-tech industries. *Analiticheskii vestnik Soveta Federatsii Federal'nogo Sobraniya Rossiiskoi Federatsii*. 2014;(27):7–19. (In Russ.).
16. Klochkov V.V., Kritskaya S.S. Prediction of the long-term economic impact of the sanctions against the Russian high-tech industry (a case of civil aviation industry). *Natsional'nye interesy: prioritety i bezopasnost' = National Interests: Priorities and Security*. 2014;10(41):14–25. (In Russ.).
17. Silinskii V. Harmonization of sales and operations of high-tech industrial enterprise in the conditions of uncertainty and instability. *Ekonomicheskii zhurnal = Economic Journal*. 2015;(1):6–17. (In Russ.).
18. Faltsman V.K. Prerequisites for import substitution and export development of high-technology products. *EKO: vserossiiskii ekonomicheskii zhurnal = ECO Journal*. 2016;(4):56–74. (In Russ.).
19. Kokhno P., Kokhno A. Problems of import substitution at enterprises of the military-industrial complex. *Obshchestvo i ekonomika = Society and Economy*. 2022;(4):82–103. (In Russ.). DOI: 10.31857/S 020736760019574–0
20. Volkodavova E.V., Zhabin A.P. The methodology of assessing the need for import substitution at an industrial enterprise. *Organizator proizvodstva = Organizer of Production*. 2016;(3):5–17. (In Russ.).
21. Smirnova D. The head of the Ministry of Industry and Trade of the Russian Federation listed priority areas for import substitution. Gazeta.ru. Mar. 10, 2022. URL: https://www.gazeta.ru/business/news/2022/03/10/17407963.shtml (In Russ.).
22. Abdikeev N.M., Bogachev Yu.S., Trifonov P.V., Dontsova O.I. Priority areas for the aviation industry development. *Polet. Obshcherossiiskii nauchno-tekhnicheskii zhurnal = All-Russian Scientific-Technical Journal "Polyot" ("Flight")*. 2020;(9):24–31. (In Russ.).
23. Dontsova O.I., Abdikeev N.M., Bogachev Yu.S. The development of managerial mechanisms to ensure a technological breakthrough in the Russian economy. *Upravlencheskie nauki = Management Sciences in Russia*. 2019;9(4):15–31. (In Russ.). DOI: 10.26794/2304–022X-2019–9–4–15–31
24. Dubolazov V.A., Silinskii V.S. Import substitution in the market of special-purpose computer equipment: Possible ways of implementation. *Ekonomicheskii zhurnal = Economic Journal*. 2017;(1):15–27. (In Russ.).
25. Bendikov M.A., Ganichev N.A. Dependence on electronic components import and ways to overcome it (the space industry case). *Ekonomicheskii analiz: teoriya i praktika = Economic Analysis: Theory and Practice*. 2015;(3):2–17. (In Russ.).
26. Shuvalova M. Import substitution in the field of IT. Garant.ru. May 04, 2022. URL: https://www.garant.ru/article/1542142/ (In Russ.).
27. Kalmykov Yu.P., Abdikeev N.M., Bogachev Yu.S., Trifonov P.V. Directions of improving industrial policy in Russia. *Vestnik mashinostroeniya = Russian Engineering Research*. 2021;(9):82–88. (In Russ.). DOI: 10.36652/0042–4633–2021–9–82–88
28. Abdikeev N.M. On some problems of the activities of development institutions aimed at supporting high-tech sectors of the manufacturing industry. Finansovaya gazeta. Sept. 28, 2021. URL: https://fingazeta.ru/authority/state-regulation/473310 (In Russ.).
29. Balashov M.M. Import substitution in the power engineering industry. *Strategicheskie resheniya i risk-menedzhment = Strategic Decisions and Risk Management*. 2020;11(2):182–195. (In Russ.). DOI: 10.17747/2618–947X-2020–2–182–195

30. Pochukaeva O.V., Pochukaev K.G. Import substitution in the engineering industry under the conditions of growing demand. *Nauchnye trudy: Institut narodnokhozyaistvennogo prognozirovaniya RAN = Scientific Articles: Institute of Economic Forecasting. Russian Academy of Sciences*. 2019;17:192–209. (In Russ.). DOI: 10.29003/m817.sp_ief_ras2019/192–209
31. Borisov V.N., Pochukaeva O.V., Balagurova E.A., Orlova T.G. The role of import substitution in the RF engineering. *Nauchnye trudy: Institut narodnokhozyaistvennogo prognozirovaniya RAN = Scientific Articles: Institute of Economic Forecasting. Russian Academy of Sciences*. 2015;13:300–323. (In Russ.).
32. Miller A., Miller M. Study of the problems of technological integration in the manufacturing industry in Russia. *Strategic Management*. 2019;24(3):33–42. DOI: 10.5937/StraMan1903033M
33. Trifonov P.V. Analysis of the competitiveness of products of high-tech sector of the manufacturing industry of the Russian Federation in domestic and foreign markets. *Nauchnye trudy Vol'nogo ekonomicheskogo obshchestva Rossii = Scientific Works of the Free Economic Society of Russia*. 2021;230(4):196–203. (In Russ.). DOI: 10.38197/2072–2060–2021–230–4–196–203
34. Abdikeev N.M., Bogachev Yu.S. Improving state support for the manufacturing industry taking into account the influence of various factors. *Ekonomika. Nalogi. Pravo = Economics, Taxes & Law*. 2020;13(6):77–85. (In Russ.). DOI: 10.26794/1999–849X-2020–13–6–77–85

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Features of Context the Sustainability Report as a Reflection of Company Policy for ESG-principles

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ABSTRACT

Sustainability reports allow checking the company's proper understanding of the concept of "sustainability" in the context of its activities. The article shows the problems and features of the sustainability reports language as part of the company's corporate reporting. **The purpose of article** is to review the linguistic methods of evaluation of sustainability reports to obtain summaries on corporate transparency of companies (absence of "greenwashing"), and **its task** is to interpretation texts through analysis using these tools. Linguistic methods of evaluation of sustainability reports, reviewed by author, provide an opportunity to test intuitive assumptions about the availability of marketing information or data on innovation positioning, and that there is a difference between the texts of the reports of organizations that disclose information and those that issue those documents for other purposes. Based on the analysis, the need to create rules for the interpretation of results related to linguistic features and extracted from sustainability reports when using natural language processing methods was summarized.

Keywords: sustainability report; ensure sustainability; corporate reporting; linguistic tools

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INTRODUCTION

Despite all the range of definitions related to the terms "corporate social responsibility", "sustainability", "ESG principles", there are no clearly developed metrics, which characterize a company reaching a certain level in addressing environmental, social and corporate issues. The existing ones are criticized for lack of depth and significant measurement errors. The desire, especially from investors, to receive data in a transparent and understandable way, along with the growth of social awareness, gave an impulse to transformation of business reporting. It is not enough for the public to see financial indicators, they need to know how the company's activities affect the environment and climate, whether it respects human rights, whether there are no opportunities for corruption schemes. Information is necessary but extremely difficult to accurately assess and structure. A sustainability report is published on the official website in response to the demands of all stakeholders and as a proof that an economic entity is serious about positioning itself in the eyes of society. It is the main tool for voluntary communication of the results of a company's activities, the impact (positive or negative) on the environment and social sphere, as well as demonstrating compliance with ESG-principles.

The data contained therein, structured by management, should be relevant to all internal and external stakeholders (investors, employees, suppliers, customers, etc.) and ensure transparency of the company's contribution to sustainable development. Its preparation requires regular collection of a large amount of information on the organization's performance to enhance its reputation and image. Russian scientists are interested in studying the problems of this non-financial reporting, namely on increasing information transparency, emphasizing its importance in creating a positive image of the organization and noting in individual documents the absence of a logical link between the description of boundaries of significant aspects and the failure to comply with existing conformity principles [1–5].

In October 2016, the Global Sustainability Standards Board (GSSB), working under the auspices of the organization "Global Reporting Initiative" (GRI) published sustainability reporting standards that aimed at improving the company's reputation (without increasing accountability to investors) with a focus on compliance with the seventeen UN goals, publication of figures on carbon emissions reduction, etc., which define significant and obligatory disclosures and take into account the interests not only of shareholders but also of all interested parties.[1] GRI standards are a set of interrelated documents divided into four series:

- 100 series — universal standards for all organizations producing sustainability reports;
- 200 series is devoted to economic issues (for example, by "GRI 202: Market Presence" the company talks about the company's contribution to the economic development of the region);
- 300 series include environmental issues (e.g., "GRI 301: Materials"; "GRI 302: Energy"; "GRI 303: Water", etc.);
- 400 series (most extensive) are related to social issues: from recruitment to consumer labelling.

Companies may use single standards from the full set to disclose their specific business issues (without making a full report). Due to global changes, reporting guidelines should be updated.

[1] The global standards for sustainability reporting. URL: https://www.globalreporting.org/standards/

Table 1

Number of companies publishing sustainability reports meeting the minimum requirements, 2020

USA	475	Canada	76
Peru	279	Finland	73
UK	212	China	67
South Africa	165	Argentina	62
Sweden	120	France	60
Australia	112	Russia	59
Brazil	89	India	34
Singapore	78	Malaysia	33

Source: compiled by the author based on the data of a project Out World in Data of Global Change Cata Lab. URL: https://ourworldindata.org/grapher/companies-publishing-sustainability-reports-minimum-requirements?country=CHL~CHN~PAN~WSM~DEU

GRI standards are authoritative but not the only ones in the world: they and their analogues overlap in content, but focus on various aspects of sustainability [6, 7]. Russia also highlights the methodology of sustainability reporting developed by the Russian Union of Industrialists and Entrepreneurs [8, 9].

The review of the websites of the largest Russian enterprises shows that every year more companies consider it necessary to draw up a report on sustainable development, which is a big step towards global business models in terms of transparency, responsibility and reputation management. Not all companies follow GRI standards — some prefer evidence of independent certification of reports verifying the adequacy of allegations, statements and data on a selective basis using interviews, analysis of objectives achieved, selection of media and Internet resources data, review of preliminary editions for inaccuracies and contradictions, benchmarking, etc. Nevertheless, according to the UN Conference on Trade and Development (UNCTAD), in 2020, the number of organizations publishing sustainability reports meeting the minimum requirements (information on a set of key disclosure elements covering company management, practices, and economic, social and environmental impacts) in Russia reached 59,[2] but compared to many countries, Russia is not among the leaders (*Table 1*).

Reluctance to disclose information becomes a stumbling block for positions in ESG ratings and a barrier to communication with investors and international credit organizations. Economic entities (regardless of industry) providing data prove the practical implementation of ESG initiatives. Search for alternative sources of information is also a good way to assess company policies for all stakeholders. It is not uncommon for information to be provided without reliable external certification and/or with useless diversionary propaganda. The context of sustainability reports is based on both people's emotional response and concern for the environment and ecology.

[2] OUR World in Data. URL: https://ourworldindata.org/grapher/companies-publishing-sustainability-reports-minimum-requirements?country=CHL~CHN~PAN~WSM~DEU

One of the most interested categories of the company — investors — expects structured disclosure of the company's liability without "greenwashing",[3] which is considered not only bad PR, leading to loss of consumer confidence, but also an indicator of issuing sustainability reports on the basis of unreliable data, which are relied upon to make decisions. Reports should:

- provide full and detailed information, including, and this is important for investors, on the relationship of sustainability indicators to company performance, sustainable development goals and steps taken in this direction (that will help to avoid misunderstandings that can cause the accusation of "greenwashing");
- be easily available for sharing, downloading and printing as well as mobile and "friendly".

The authors further consider the linguistic methods of evaluation of sustainability reports and the possibility (with their help) of testing intuitive assumptions about the availability of marketing information or data on innovative positioning, and that there is a difference between the texts of the reports of organizations disclosing information and those issuing those documents for other purposes.

SUSTAINABILITY REPORT AS A LINGUISTIC CONSTRUCTION

Researching reports on sustainable development as a linguistic construction starts with *"readability"* — such a concept can characterize their perception by the target audience. The genre of corporate financial reporting, intended mainly for professionals, is quite difficult for other categories of users (excluding the part of the document that contains the address of the head). The text falsity of such materials should not be an obstacle to reading. However, at the end of the last century, in a study of selected annual reports of foreign companies [10] it was described as "going beyond the freely understood skills of about 90% of the adult population and 40% of investors" based on the results obtained by formula "readability". In contrast to this term, researchers defined the "understandability" of the text as the interaction between it and the reader on the basis of prior knowledge [11]. Implicit but existing sustainability reporting function — marketing and organizational planning tools — further expand the target audience, supporting the above-mentioned idea of "readability". The analysis of organizations' strategic use of text complexity yields different results, and these include — evidence of a positive relationship between the actual disclosure of a document and its readability; concealing certain aspects and intentionally complicating language to mitigate potential negative reactions and create confusion. On the other hand, accusations against report authors in strategic use text difficulty for "coding" negative news are not always sustainable: For example, researches of 30 similar documents of German companies in 2014 show that the text with positive information is not necessarily easier to read than, for example, the one with unfulfilled promises [12]. However, the authors of reports prefer a table and graphical form to show positive trends, and additional accompaniment (graphics and photos) are used to embellishment the results [13].

In an attempt to eliminate subjectivism in the assessment the technologies of "measurement" text complexity and subsequent simplification/ complication are used. For the first, formulas have been developed for different languages

[3] Greenwashing — a term introduced by ecologist J. Westerveld in 1986, used in attempts by companies to present their product produced with full/partial environmental cleanliness when the product is not.

(readability indexes) with their underlying simple metrics: number of sentences, words, letters and syllables (the greatest variety of indexes created for the English language. The Russian texts have their own peculiarities, so the application of the above-mentioned formulas (indexes) developed for other languages is justified only if there is a reasonable change in the coefficients accepted for analysis. The selection of the latter, which can be called "correct", is accompanied by scientific research for the identified audience. Nevertheless, the consensus on how to determine the "readability" of reports remains elusive.

Natural language processing methods use a higher level of text analysis. With the help of NLP-tools quantitatively establish, for example, the use of passive structures, syntactic depth of sentence or lexical density indicating the number of meaningful words (for example, "sustainability" or "company") relative to grammatical (for example, "if", "but", "would be"). Higher lexical density can lead to increased textual complexity [14] due to increased conceptual load.

Despite the fact that abstract of the article states the use of linguistic methods of analysis, we pay attention to paratext features: font, layout, pictures and graphs that influence the interpretation of reports by the majority of readers, as well as subject to manipulation and confusion [13] as it is a general perception of the document. Visual effects to be used, such as backgrounds representing natural landscapes or wildlife or renewable energy sources, are examples of executive elements that cause a sense of difficulty in managing impressions. Research [15] illustrates how attractive images and photos are used for "greenwashing" in cases where the impact of sustainability measures is unclear. Susceptibility of reports to manipulation justifies further examination of their text content: for example, it has been observed that, if they contain information on sustainability or finance, positive trend graphs are preferred.

Analysis of the language by M. Conrad, D. Holtbrügge [16] identified companies that have a symbolic sustainability policy in their reports through the use of an informal language with fewer conjunctures, as well as shorter sentences, fewer references to data, i.e. documents with low linguistic complexity. This is completely different for organizations that actually share the principles of responsible disclosure: use more independent references, less emotional expressions; reporting style can be described as inclusive as possible.

The critics of the degree, with which the language used in sustainability reports puts the company's strengths in a narrative framework [17, 18], points to the risks of stigmatization in readers' perception of corporate social responsibility initiatives as purely strategic. But the opinion of a wider audience is not so critical: Townsend survey [19] shows that a minority of users still view sustainability reporting as a "greenwashing" (KPMG report points to the same, 2013)[4] and considers corporate accountability as the main motivation. The expanded use of narrative language in such documents criticizes and explains the hypothesis of "obfuscation" (blurring, confusing), which implies that it will be more difficult for companies to decode adverse news [20, 21].

The association of the phenomenon "greenwashing" with the notion of "corporate legitimacy", meaning in this context the acceptability of the authors of the report rules and institutional prescriptions observed in

[4] The KPMG Survey of Corporate Responsibility Reporting 2013. URL: https://assets.kpmg/content/dam/kpmg/pdf/2013/12/corporate-responsibility-reporting-survey-2013.pdf

the organization, is mentioned in the works, research reports for discursive process to achieve certain goals. The small amount of papers, however, allows, without giving clear definitions, to assess different types of corporate legitimacy: cognitive, pragmatic and moral — considering that the discursive mechanism is of a linguistic nature, but with little knowledge of the linguistic aspect that confers legitimacy. The pragmatic legitimacy is "the result of calculations of the key stakeholders of the organization, and it is based on the perception by the stakeholders of personal benefits arising from corporate activities and communication" [22]. This idea of "greenwashing" is exactly what happens. However, when companies fail to achieve sustainable development goals, both cognitive legitimacy, based on general assumptions of the internal social environment, and moral judgment of the organization and its behavior (positive green assessment) are diminished.

RESEARCH OF REPORTS OF RUSSIAN COMPANIES

The second part of the paper focuses on the possibility of applying the linguistic methods of analysis described earlier in order to determine the presence of "greenwashing" in sustainability reports, as well as the expected results and assessment of their usefulness in an applied context for different audiences. The research is based on the reports of the companies presented in the ranking of sustainable development, compiled by the journal "Expert".[5] The defining metric in this ranking was the indicator "final rating", expressed in percentage and taking into account four aspects in the following activities: social policy, environmental policy, participation of the company in the development of the region, supporting the economy of the region, and financial evaluation.

The analysis of the content of the reports revealed the main topics: the address of the president of the company/executive director; corporate governance; the history of the company; methodology; mission; corporate values and culture; internal control system and guidance on reading the report. Disclosure of social and environmental aspects, in which the organization's activities, products and services are expected to be significantly affected, its ability to successfully implement a strategy and achieve goals in the diversity presented, does not allow to clearly state what is not important for a particular reader in general, but presents a challenge for research. It is possible that in the future, scholars, while conducting research on, for example, disclosing compliance with international standards or social expectations, will face mandatory use of the necessary software due to the lack of a common standard.

Assessment of reports from the standpoint of following GRI principles showed that the leader of the 2021 rating among Russian enterprises, TMK which climbed up seven positions, does not reflect the principles of following GRI[6] in its document, and indicates compliance with the postulates and recommendations of the Corporate Governance Code of the Bank of Russia (letter No. IN-06–52/8 from 17 February 2016).[7] "Siberian Coal Energy Company",

[5] Official site of journal "Expert". URL: https://expert.ru/expert/2021/50/spetsdoklad/49/

[6] TMK Group. Annual Report 2020. URL: https://report2020.tmk-group.ru/download/full-reports/ar_ru_annual-report_pages_tmk-group_2020.pdf (accessed on 21.01.2022).

[7] Central Bank of the Russian Federation. Letter No. IN-06–52/8 from 17 February 2016 on the Disclosure in the annual report of the public limited liability company of the report on compliance with the principles and recommendations of the corporate governance code. URL: http://www.consultant.ru/document/cons_doc_LAW_ 194240/96c60c11ee5b73882df84a7de3c4fb18f1a01961

which has lost two positions and is now in the seventh place of the rating, publishes on the website in January 2022 the sustainable development report for 2018–2019,[8] based on GRI principles. Group "Lukoil" indicates not only the use of "Guidelines for Sustainability Reporting" in the preparation of the report, but also its inclusion in the GRI database.[9] "Polymetal", which has risen by 7 positions to the 4th place, reports on compliance with GRI principles and standards for metallurgical and mining industries, published by the US Sustainability Accounting Standards Board (SASB),[10] and recommendations of the Task Force on Climate Related Financial Disclosures (TCFD).[11] The report of PJSC "Detmir", which made a leap from 32 to 8, does not make reference to the standards of GRI.[12] In general, it is impossible to draw a conclusion about the full implementation of GRI principles in the practice of Russian enterprises, which makes it difficult to analyze the research of prioritization of report topics.

Evaluation of readability test for reasons described in the first part of the article is subjective without formulas developed for the Russian language. Nevertheless, according to the author, it is possible to speak of a reasonable level of readability and comprehensibility, that many companies still use words that express excessive willingness to follow sustainability principles and promise to fulfill them in the addresses of the manager.

The sustainability report style, as well as the scientific style, is designed to communicate objective, clear and concise information to the reader, including facts and analysis, but without unnecessary description of causal relationships, patterns and abstractions. As a rule, abstract narrative style is emphasized through passive structures. We identified shortage of these constructs in most reports. Frequent use of the pronoun "we" in the context of confirming fulfilled promises demonstrates a clear desire to show the best side and recognize the importance of fulfilling sustainability requirements.

Calculating the proportion of positive keywords in the text is intended to capture excessive optimism and is a meaningful measure for conclusions about the presence of optimistic formulations in the report, including references to "awards" and "achievements". The evaluation of the number of mentions of the word "goal" is based on the idea of obtaining quantitative information, evidence of sustainable behavior and the relationship between what companies report on sustainable development and their future achievements in this field. In other words, it is forecasting the probability of carbon emissions reductions next year, taking into account the stated goals, initiatives and environmental policies contained in the previous year's sustainability report. Some enterprises mentioned their carbon footprint (emissions or impacts), while others were only discussing mitigation or adaptation plans. The presence of the above topics in the report, in the author's view, does not guarantee future emission reductions.

The length of the document, on the one hand, indicates greater transparency, but after a point that is difficult to determine, longer

[8] Siberian Coal Energy Company Sustainability Report 2019–2019. URL: https://www.suek.ru/ sustainability/ reporting/#year_18_19 (accessed on 21.01.2022).

[9] Sustainability Report of the Group "LUKOIL". URL: https://lukoil.ru/FileSystem/9/554305.pdf

[10] SASB Standards.URL: https://www.sasb.org/

[11] Polymetal. Sustainability Report for 2020. URL: https://www.polymetalinternational.com/ upload/iblock/a3e/Polymetal_Sustainability_Report_2020_rus.pdf

[12] PJSC "Detmir". Annual Report 2020. URL: https://ir.detmir.ru/wp-content/uploads/2021/07/Detsky-Mir_AR_2020_RUS_fin_30_06_site.pdf?ysclid=l42uurnofv

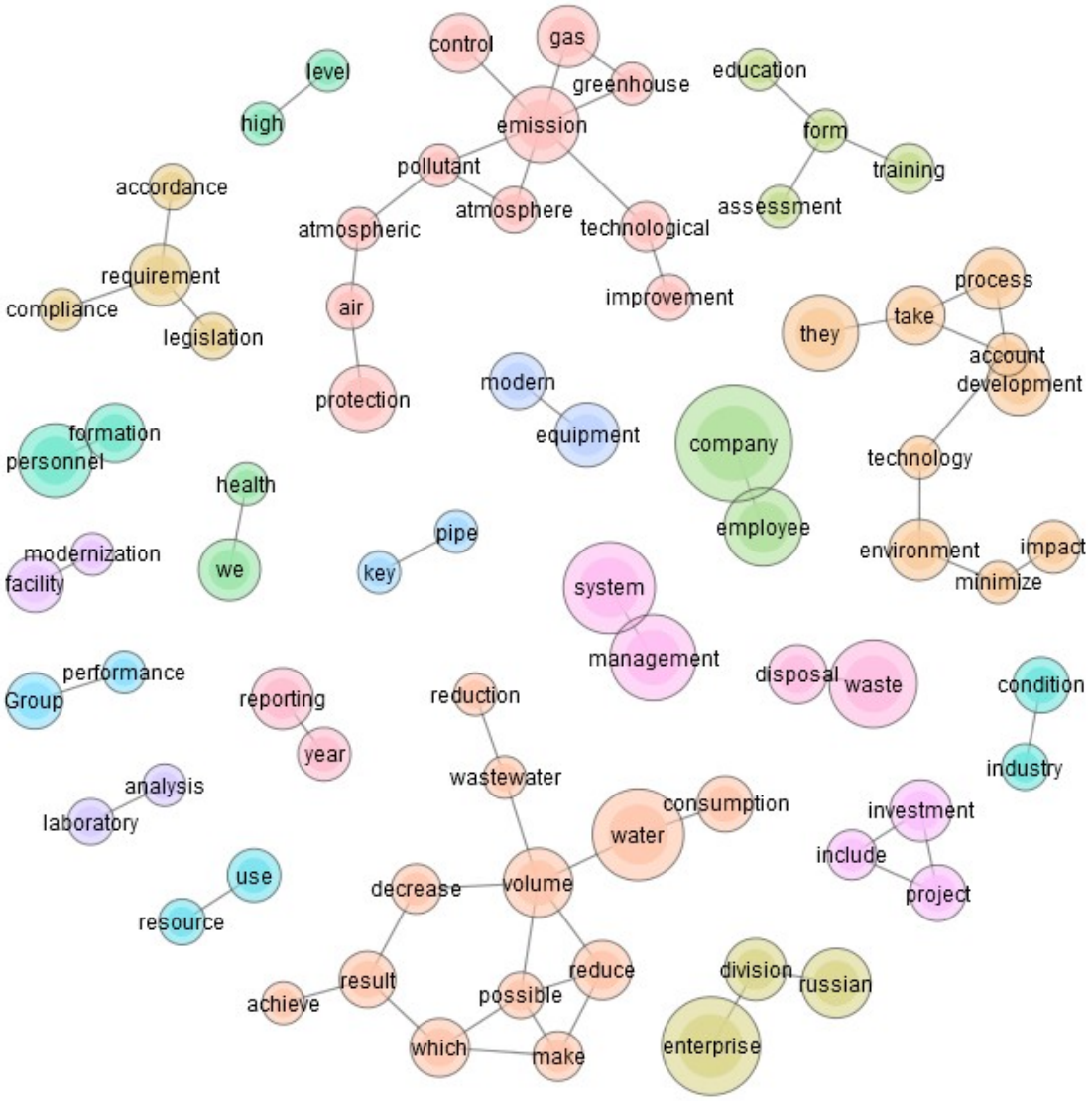

Fig. 1. **Co-occurrence network of frequently occurring keywords**

Source: developed by the author.

documents indicate that it is too long: among those we studied, some consisted of a chapter of 30 pages, others were a separate publication of more than 100. There is no correlation between the rating position and document length, nor between the rating position and the availability of the report in English.

Evaluation of lexical diversity and the number of unique words used can be indicative for marketing creativity and "greenwashing" and requires additional analysis.

We used KH Coder[13] as open-source software for more complex quantitative analysis of the text. The application is compatible with texts in various languages, including Russian. It also provides us with a simple manual, and its use requires no special education. Small expansion of research towards the processing of natural language text (as a separate direction of linguistics and,

[13] URL: https://khcoder.net/en/

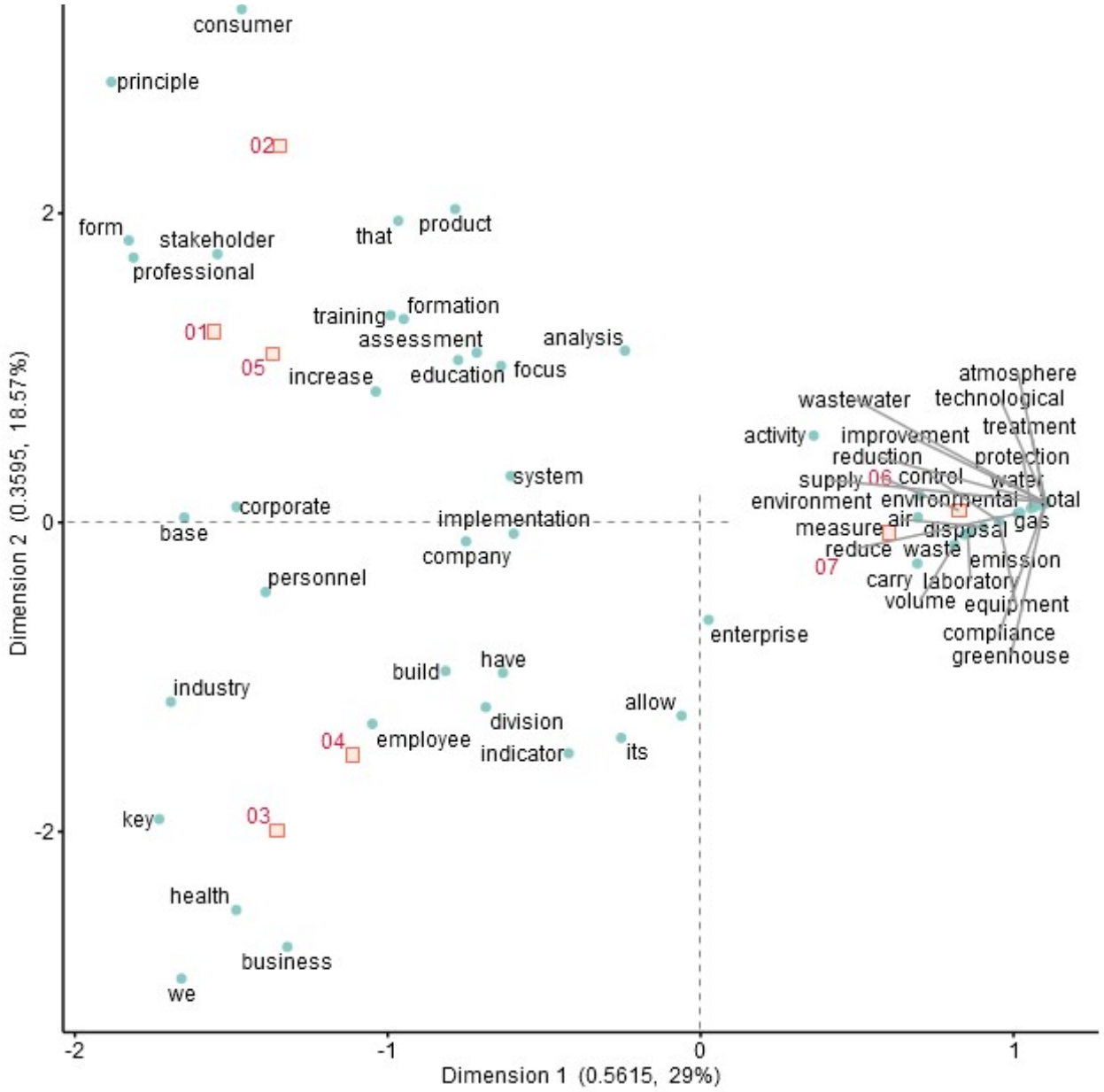

Fig. 2. **Two-dimensional plane with results of correspondence analysis applied to the sustainability report**

Source: developed by the author.

more recently, interdisciplinary field, which combines methods of artificial intelligence) does not go beyond the discussion of sustainability reports and the phenomenon of "greenwashing", as it provides all interested parties with an understanding of how to decode text and what methods and tools to extract the desired information with. In general, the reader's receptivity to the possibility of manipulation by the author of the text is reconfigured to the management of impressions from the report and the formation of a value judgment. And although the final level of understanding of the expert and the user, who is not familiar with the genre of the report, will differ, the simplification of the process helps to draw conclusions and make decisions.

One of the most common tools of natural language processing using *KH Coder* package is *"co-occurrence analysis"* of words: those of their groups that often meet (are used together), highlight "hotly debated" topics and are used to identify patterns and trends.

Fig. 1 shows the network diagram of one of the sustainability reports of the company involved in the current ranking based on *co-occurrence analysis*. Since the goal of this article is not "greenwashing" of individual reports, but demonstration of the capabilities of linguistic methods, it is enough to mention that the text before processing was transformed into CSV format (for presentation of table data) and processed by KH Coder.

Keywords reflecting identical themes are grouped into clusters (highlighted by different colors), which consist of "nodes" (denoted by circles). The most common keyword is the largest of them (located in a circle of larger diameter). From the analysis of *Fig. 1* it follows, for example, that clusters — groupings around the words "volume", "emission", "protection" — do not have intersections with the cluster consisting of words "compliance", "requirement", "legislation". The isolation of clusters can be the basis for assuming that descriptions (and regulations) of sustainability requirements and information on emissions and impacts on nature are in different, unrelated parts of the report.

Another tool — *correspondence analysis*, identifies in the text, based on a predefined frequency, sets of associations, presenting the result on a two-dimensional graph. The words, frequently used and uniformly distributed *among all* parts of the document *under consideration* (pre-defined and pre-configured) are depicted on coordinate axes in the immediate vicinity of the intersection of zero coordinates. The ones that are repeated many times, but in separate parts, and are not typical for the whole text (supporting certain ideas and/or terminology), are further along the axes (*Fig. 2*). For example, the words "principle" and "consumer" in the upper left corner of the coordinate plane in *Fig. 2* are found in the chapter 2 and are hardly used by the authors of the report in other chapters. The word "water", "environmental", etc. (right cluster), are almost equally frequent in chapters 6 and 7.

Other tools include multi-dimensional scaling with visual representation of the structure of text objects and clustering technology ("self-organizing maps"). Based on the analysis, it can be concluded that the use of natural language processing methods requires rules for the interpretation of results related to linguistic features and extracted from sustainability reports. Their widespread application is still open: interest in them is now mostly in the scientific community.

CONCLUSION

The positive evaluation of the application of the above-mentioned and similar methods of analysis opens up opportunities for future collaborative research involving sustainable development, management and linguistics experts, with the aim of developing a methodology within the framework of clearly defined objectives.

The importance of considering the role of language in the process of assessing the reports by stakeholders for "greenwashing" is still negligible. But as the responsibility for implementing ESG principles expands, linguistic measures may yield unexpected results, proving that the company has the ability to influence its performance within the framework of following sustainable development policy, the "washing" report. Language issues will obviously play an important role in the search for false claims, missing important data (assessing the sincerity of a claim), used vague or ambiguous

term, which may be considered a lie because of the lack of clarity. Ambiguity of presentation, facts of use of individual words, phrases that strengthen or, conversely, weaken the context of the document — all this information can tell a lot about the activities of companies and with the help of the developed methodology to distinguish those of them, which accept the conditions for the required publication of reports only for view of other, really disclosing information. Enterprises will be charged with "greenwashing" to a greater or lesser extent depending on the language they use in their reports.

At the same time, reports can help third parties assess the need for intervention or pressure on companies to improve their sustainability.

REFERENCES

1. Emel'yanova Yu.V., Lyakhovenko T.I. Reporting in the field of sustainable development. Compilation practice by Russian and foreign companies. *Korporativnaya finansovaya otchetnost'. Mezhdunarodnye standarty*. 2016;(2). URL: http://finotchet.ru/articles/912/ (In Russ.).
2. Belousov K. Topical issues in formation of the sustainable development strategy of Russian companies. *Problemy sovremennoi ekonomiki = Problems of Modern Economics*. 2013;(3):191–194. URL: http://www.m-economy.ru/art.php?nArtId=4663 (In Russ.).
3. Uglova I.A., Nikolenko A.S., Koroleva E.E., Non-financial reporting as a communication tool for the corporate social policy of an organization. *Estestvenno-gumanitarnye issledovaniya = Natural Humanitarian Studies*. 2019;(26):316–320. (In Russ.).
4. Tumin V., Makhalin V., Kostromin P. Increase of information transparency as factor of the sustainable development of the Russian companies. *Vestnik Universiteta (Gosudarstvennyi universitet upravleniya)*. 2016;(5):39–48. (In Russ.).
5. Fateeva T.N., Lesina T.V. Non-financial reporting as a tool for creating a positive image of the organization. *Naukovedenie*. 2015;7(4):52. (In Russ.). DOI: 10.15862/57EVN 415
6. Kalabikhina I., Krikunov A. A new method of assessing the quality of non-financial reporting (on the example of energy companies). *Vestnik Sankt-Peterburgskogo universiteta. Menedzhment = Vestnik of Saint Petersburg University. Management Series*. 2018;17(3):297–328. (In Russ.).
7. Borzakov D.V., Korsakova M.V. Improvement of the methodological materials for the preparation of non-financial reports in the field of compliance management. *Vestnik Voronezhskogo gosudarstvennogo universiteta. Seriya: Ekonomika i upravlenie = Proceedings of Voronezh State University. Series: Economy and Management*. 2022;(1):28–40. (In Russ.). DOI: 10.17308/econ.2022.1/3918
8. Efimova O.V. Forming reports on sustainable development: Stages and procedures. *Uchet. Analiz. Audit = Accounting. Analysis. Auditing*. 2018;5(3):40–53. (In Russ.). DOI: 10.26794/2408–9303–2018–5–3–40–53
9. Ryabchukova O. Yu. Formation of the methodology of reporting in the field of sustainable development of industrial holdings. *Fundamental'nye issledovaniya = Fundamental Research*. 2020;(7):102–107. (In Russ.). DOI: 10.17513/fr.42812
10. Courtis J.K. Readability of annual reports: Western versus Asian evidence. *Accounting, Auditing & Accountability Journal*. 1995;8(2):4–17. DOI: 10.1108/09513579510086795
11. Smith M., Taffler R. Readability and understandability: Different measures of the textual complexity of accounting narrative. *Accounting, Auditing & Accountability Journal*. 1992:5(4). DOI: 10.1108/09513579210019549
12. Thoms C., Degenhart A., Wohlgemuth K. Is bad news difficult to read? A readability analysis of differently connoted passages in the annual reports of the 30 DAX companies. *Journal of Business and Technical Communication*. 2020;34(2):105065191989231. DOI: 10.1177/1050651919892312

13. Cho C.H., Michelon G., Patten D. Impression management in sustainability reports: An empirical investigation of the use of graphs. *Accounting and the Public Interest*. 2012;12(1):16–37. DOI: 10.2308/apin-10249
14. Smeuninx N., De Clerck B., Aerts W. Measuring the readability of sustainability reports: A corpus-based analysis through standard formulae and NLP. *International Journal of Business Communication*. 2020;57(1):52–85. DOI: 10.1177/2329488416675456
15. Hrasky S. Visual disclosure strategies adopted by more and less sustainability-driven companies. *Accounting Forum*. 2012;36(3):154–165. DOI: 10.1016/j.accfor.2012.02.001
16. Conrad M., Holtbrügge D. Antecedents of corporate misconduct: A linguistic content analysis of decoupling tendencies in sustainability reporting. *Business Ethics, the Environment & Responsibility*. 2021;30(4):538–550. DOI: 10.1111/beer.12361
17. Smeuninx N. (Measuring) Readability: A critical look at sustainability reports through standard formulae and NLP. URL: https://biblio.ugent.be/publication/8161177/file/8507672.pdf
18. Story J., Neves P. When corporate social responsibility (CSR) increases performance: Exploring the role of intrinsic and extrinsic CSR attribution. *Business Ethics: A European Review*. 2015;24(2):111–124. DOI: 10.1111/beer.12084
19. Townsend S., Bartels W., Renaut J.-P. Reporting change: Readers & reporters survey 2010. London: Futerra Sustainability Communications; 2010. 33 p. URL: http://www.csrinfo.org/wp-content/uploads/2016/07/reporting_change_2011.pdf
20. Courtis J.K. Corporate report obfuscation: Artefact or phenomenon? *The British Accounting Review*. 2004;36(3):291–312. DOI: 10.1016/j.bar.2004.03.005
21. Rutherford B.A. Obfuscation, textual complexity and the role of regulated narrative accounting disclosure in corporate governance. *Journal of Management and Governance*. 2003;7(2):187–210. DOI: 10.1023/A:1023647615279
22. Seele P., Gatti L. Greenwashing revisited: In search of a typology and accusation-based definition incorporating legitimacy strategies. *Business Strategy and the Environment*. 2017;26(2):239–252. DOI: 10.1002/bse.1912

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Development Strategy of Vertically Integrated Agro-Industrial Companies as a Pricing Tool for Food Products

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ABSTRACT

In connection with the current trends in the agro-industrial conjuncture, it is becoming increasingly urgent to solve the problem of ensuring the economic security of the state, the financial and economic recovery of industry-forming enterprises and the welfare of the population. Taking into account the high interest in the transformation of food markets, the **object** of this study was the internal management strategies of large agro-industrial companies. The **subject** of the study is the mechanism of food pricing by regulating the value chain in agricultural holdings of the full production cycle (having a vertically integrated organization of the operational and production process). The article provides an analysis of changes in the price index for socially significant food products for the period 2020–2021 and its impact on the cost of a minimum set of food products, which is considered an important indicator of the standard of living of the population and in the current situation accounts for an excessively high proportion of the average income of citizens. To solve the identified problems and ensure a high level of food security, a mechanism for managing the development strategy of vertically integrated agro-industrial companies is proposed as a way to achieve the minimum cost of finished products and rational management of its creation chain. Due to the closed production cycle, agro-industrial companies offset the negative impact of external factors on pricing, and are also more independent of suppliers of raw materials and in matters of the organization of operational activities. **The practical significance** of the research is to develop and substantiate ways to reduce social tension and provide the population with socially significant, high-quality and affordable food by reducing the cost of producing agro-industrial products while creating and developing a vertically integrated organization of the production process.

Keywords: strategy management; pricing; price index; welfare; value chain; agricultural holding; vertical integration; economic efficiency; cost; margin

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INTRODUCTION

In considering trends in the transformation of the world socio-economic order, State food security and access to staple foods for all segments of the population are receiving more attention. Global targets for guarantee all citizens have access to the food are to improve nutrition by increasing the intake of food containing sufficient vitamins, macro– and micronutrients (calcium, iodine, iron, fluoride, selenium, etc.), complete protein [1]. However, rising prices of vital products, the crisis in production of food commodities, together with a sharp decline in the purchasing power of most of the population, are hampering their well-being and socio-economic security.

Analysis of the value of the minimum food set are given a leading role in the implementation of public policies aimed at overcoming this situation and improving the quality of life of citizens. This indicator is directly influenced by factors such as: level of inflation in the country, state of the economy and aggregate demand, changes in world prices and exchange rates, features of tax policy, turnover rate, cost of production, maximum upper limit of the value of goods (usually only of vital importance), collectively affects the movement of the consumer price index.

For the economy of states such as Donetsk People's Republic (DPR), in the conditions of the trade and economic blockade and limited resources, it is necessary to develop their own production of basic vital foods that will ensure food security at an appropriate level, reducing prices to the possible minimum.

In general, in DPR, due to the high availability of some food of own production, the prices in trade enterprises do not exceed the price level of the Russian Federation. Since the low-income categories of citizens spend more than half of their income on food, and for farmers the source of money is agricultural production, that food prices will have a significant impact on the welfare of both consumers and producers.

RESULTS OF THE RESEARCH

When analyzing the level of food prices, the greatest attention is paid to regulating the price of meat on the domestic market as one of the most important components of the human diet. The largest market share of meat products is poultry farm products in DPR. Despite the fact that a significant share of poultry meat in the structure of consumption is domestic product, producers are sufficiently sensitive to changes in the import prices of manufactures and are highly dependent on the cost of imported components.

The main factors that influenced the increase in consumer prices in this food segment in DPR, were: increase in the cost of feed components, raw materials and materials required for poultry production. In addition, the overall increase in consumer prices for poultry meat in DPR was affected by the rise in the price of poultry meat in the Russian Federation, as half of the Republic's demand for poultry meat is met by imports.

The increase in the value of beef and pork meat was also influenced by the increase in the value of the products in the Russian Federation, as a significant part of beef and pork meat is imported (*Fig. 1*). In 2021, due to the increase in meat prices, the cost of sausage products of all types increased by about 11%. In addition to meat and products of its processing, import and the pricing of fish products affect the DPR.

Increase in prices of dairy products by 2022 has averaged 16.4%. Has risen in price of margarine — 33.5%, butter — 21.6%, sour cream (more than 15% milk fat.) — 16.2% (*Fig. 2*).

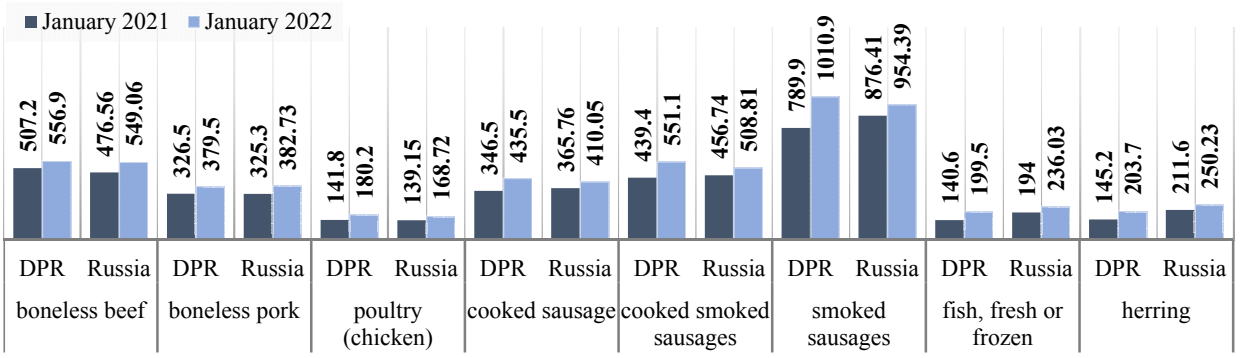

Fig. 1. **Dynamics of the cost of meat, meat products and fish in the DPR and Rostov region of the Russian Federation, rubles/kg**

Source: compiled by the authors on Ministry of Economic Development of the Donetsk People's Republic https://mer.govdnr.ru/index.php?option=com_phocadownload&view=category&id=23&Itemid=655 (accessed on 12.05.2022), EMISS State Statistics. URL: https://fedstat.ru/indicator/31448 / (accessed on 19.05.2022).

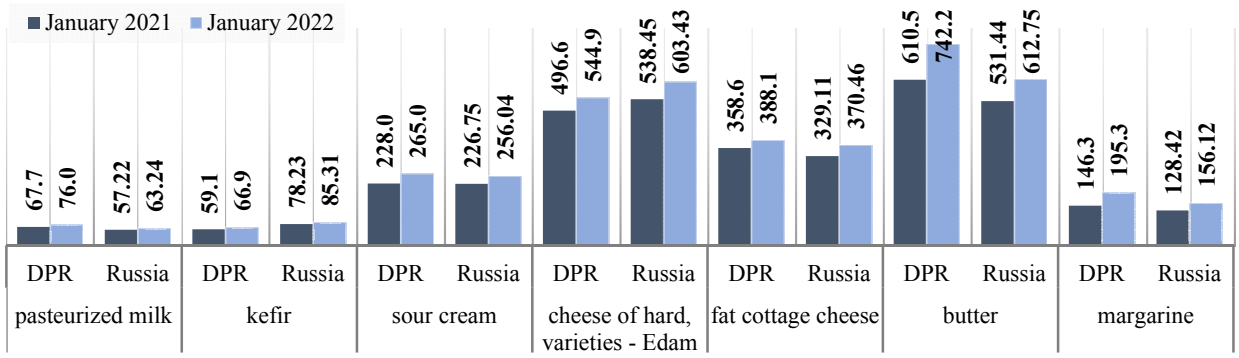

Fig. 2. **Dynamics of the cost of dairy products in the DPR and Rostov region of the Russian Federation, rubles/kg**

Source: compiled by the authors on Ministry of Economic Development of the Donetsk People's Republic https://mer.govdnr.ru/index.php?option=com_phocadownload&view=category&id=23&Itemid=655 (accessed on 12.05.2022), EMISS State Statistics. URL: https://fedstat.ru/indicator/31448 / (accessed on 19.05.2022).

DPR' enterprises are provide about 26% of the actual annual raw milk consumption. From the Russian Federation, milk is supplied in bulk, and the necessary part for production — is in powder form. The increase in the value of this product in the Russian Federation led to an increase in the prices of dairy products and in DPR.

Despite the high yield of wheat in 2021, the price of wheat flour increased by 10.9% between 2021 and 2022, which caused a significant rise in the price of bread and bakery products (*Fig. 3*).

The rise in tariffs for utilities, energy, fuel and lubricants, additional raw materials (sunflower oil, margarine, mixtures, sugar, etc.), most of which are imported from the Russian Federation, also led to the rise in the price of bread and bakery products. Thus, with a high dependence depends on the situation in the food and raw materials market, bakery enterprises are forced to maintain positive profitability by offsetting increased labour, fuel and raw material costs.

The cost of goods flour and cereal industry on average increased by 15.8%,

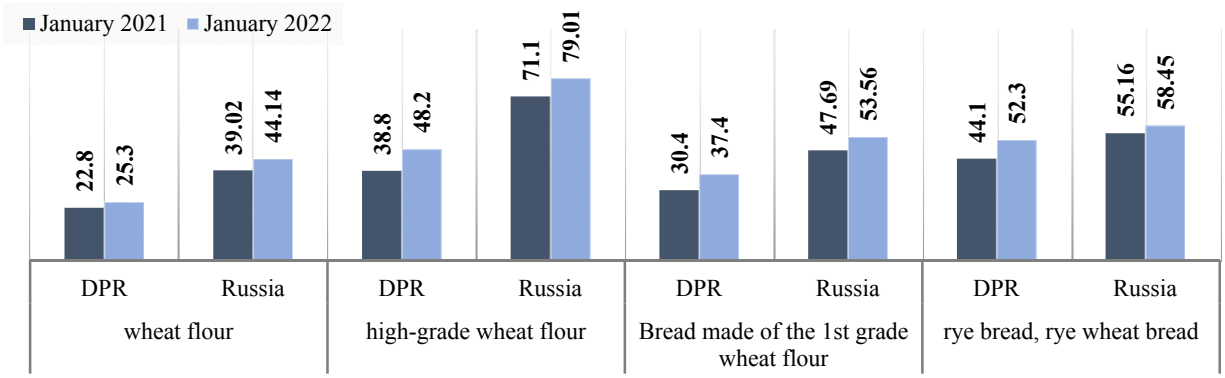

Fig. 3. **Dynamics of the cost of flour and bread in the DPR and Rostov region of the Russian Federation, rubles/kg**

Source: compiled by the authors on Ministry of Economic Development of the Donetsk People's Republic https://mer.govdnr.ru/index.php?option=com_phocadownload&view=category&id=23&Itemid=655 (accessed on 12.05.2022), EMISS State Statistics. URL: https://fedstat.ru/indicator/31448 / (accessed on 19.05.2022)

as for buckwheat — then by a maximum of 40.7% (*Fig. 4*). Since the need for it is fully covered by imports, the price level is directly dependent on its size in the Russian Federation (and the Rostov region in particular).

DPR is fully provided with egg due to its own manufacturers for 2022. Between 2021 and 2022, the cost of a dozen eggs fell by 1.2%, despite an 18% increase in the purchase price of wheat and an increase in the cost of compound, raw materials and materials necessary for the rearing of poultry (*Fig. 5*).

The situation in the fat–and–oil industry of the agro–industrial complex (further — AIC) of the Republic is characterized by the absence of lines for refining sunflower oil. Consequently, the need for sunflower refined oil is fully covered by imports and the price level is directly dependent on the price level in the Rostov region of the Russian Federation. Note that the price of refined sunflower oil directly affects the price of mayonnaise, the need for which is partially covered by imports.

Imports to DPR fully meet the demand of the population for sugar: thus, the increase in the price of sugar in the Russian Federation has affected the increase in its value in the Republic.

It is necessary to note the significant rise in the price of vegetables — in this food segment, prices had on average increased by 50.0% by 2022, At the same time, during the period 2021–2022 the price of potatoes increased by 59.3%, cabbage — by 199.9%, beets — by 52.3%, onions and carrots — slightly. In the case of fruit, the price of apples was reduced by 8.1% in this time interval (*Fig. 6*).

In general, the consumption of potatoes, vegetables and fruits is ensured through imports. The self–sufficiency of DPR vegetables does not exceed 5% (excluding the output of households).

The main internal causes of the increase in wholesale prices of vegetables and fruits are:

- energy cost growth;
- fuel and lubricants cost growth;
- increase in utility tariffs;
- pay rise for workers.

Among the reasons for the increase in retail prices of vegetables and fruits are the following:

- their cost growth;
- rise in transportation costs;

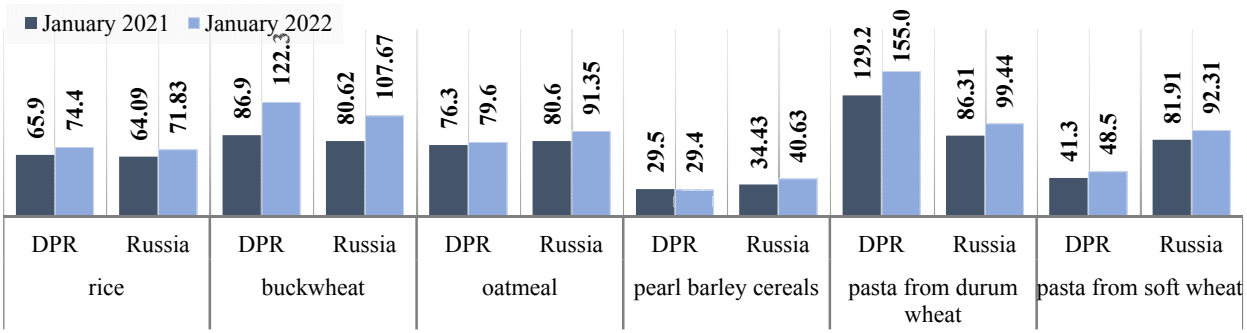

Fig. 4. **Dynamics of the cost of products of the flour and cereal industry in the DPR and the Rostov region of the Russian Federation, rubles/kg**

Source: compiled by the authors on Ministry of Economic Development of the Donetsk People's Republic https://mer.govdnr.ru/index.php?option=com_phocadownload&view=category&id=23&Itemid=655 (accessed on 12.05.2022), EMISS State Statistics. URL: https://fedstat.ru/indicator/31448 / (accessed on 19.05.2022).

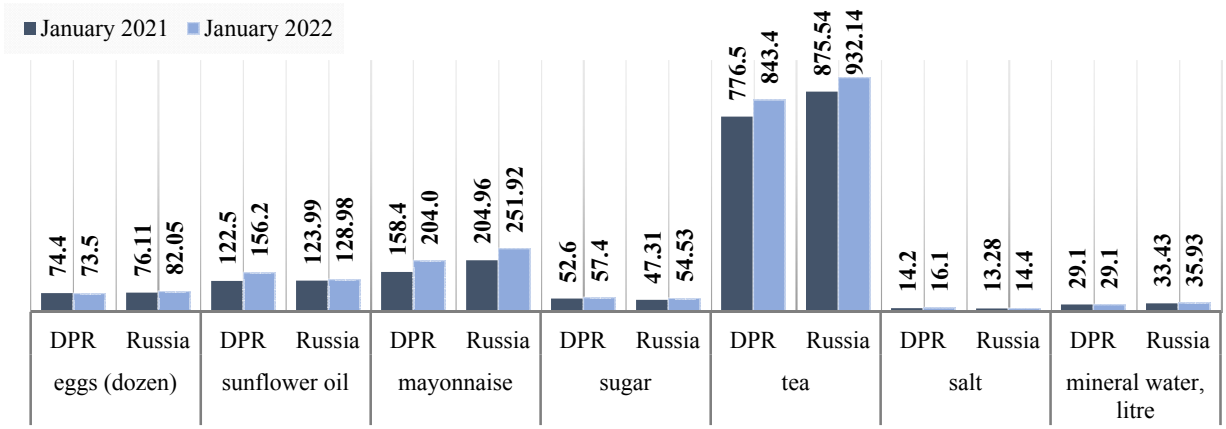

Fig. 5. **Dynamics of the cost of certain types of food industry products in the DPR and Rostov region of the Russian Federation, rubles/kg**

Source: compiled by the authors on Ministry of Economic Development of the Donetsk People's Republic https://mer.govdnr.ru/index.php?option=com_phocadownload&view=category&id=23&Itemid=655 (accessed on 12.05.2022), EMISS State Statistics. URL: https://fedstat.ru/indicator/31448 / (accessed on 19.05.2022).

• speculation of unscrupulous sellers in wholesale and retail trade.

In turn, the consumer price index determines the value of such socio-economic indicators as the subsistence minimum and the minimum wage. In accordance with the Resolution of the Council of Ministers of the Donetsk People's Republic dated No. 10–40 from 03 June 2015 "On approval of the composition of the market basket in the Donetsk People's Republic",[1] cost of the minimum food basket is 50% of the subsistence minimum, which is subject to annual indexation according to the current inflation rate, as minimum wage.

The DPR market basket includes more than 70 items of food, the price change

[1] Resolution of the Council of Ministers of the Donetsk People's Republic dated No. 10–40 from 03 June 2015 "On approval of the composition of the market basket in the Donetsk People's Republic". URL: http://doc.dnronline.su/wp-content/uploads/2015/03/PostanovN 10_40_03062015.pdf

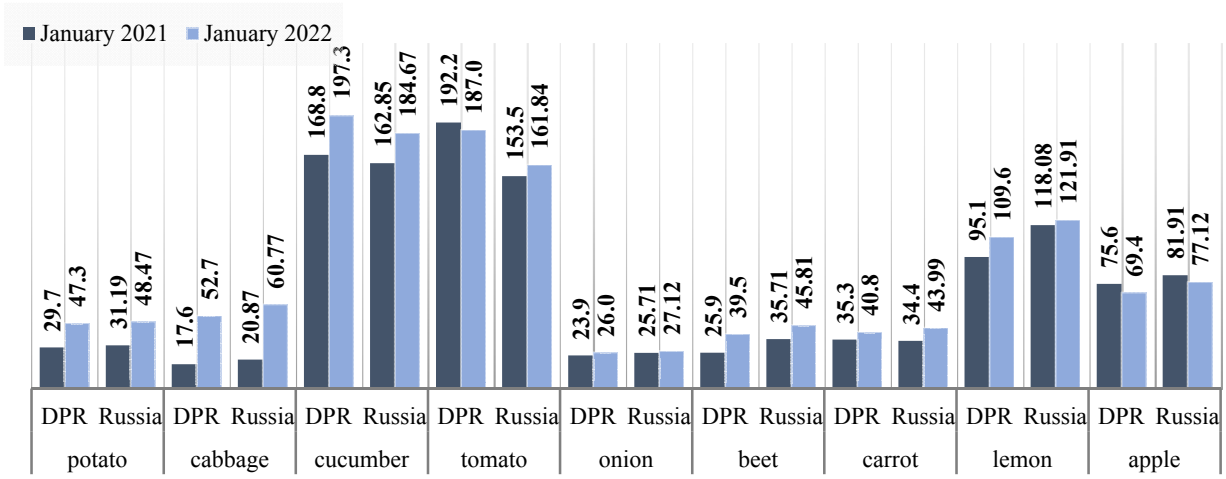

Fig. 6. **Dynamics of the cost of vegetable products and fruits in the DPR and Rostov region of the Russian Federation, rubles/kg**

Source: compiled by the authors on Ministry of Economic Development of the Donetsk People's Republic. URL: https://mer.govdnr.ru/index.php?option=com_phocadownload&view=category&id=23&Itemid=655 (accessed on 12.05.2022), EMISS State Statistics. URL: https://fedstat.ru/indicator/31448 / (accessed on 19.05.2022).

of which is of strategic importance in the socio-economic policy of the Republic.

Today's consumption standard is actually wider than the one in the basket. According to the legislation, the composition of the minimum market basket should be reviewed every 3 years, but since 2015, it has not been changed. Existing food basket methodology does not take into account many of the needs that have become basic. Today in the minimum set there are no such products as: semi–finished products, canned foods, non–alcoholic drinks, alcohol, coffee, chocolate, etc. For pensioners, it excludes fruits and juices, sour milk products, cheeses, sausages, sugar, tea, honey, spices and pastry. Increasing the composition of market basket with additional food products will result in a significant increase in its value and thus in the subsistence minimum.

The structure of the value of the minimum set of products is dominated by imported products, namely: vegetables, fruits and berries, beef, pork, cottage cheese, milk and dairy products, which have the most significant influence on the subsistence minimum (*Fig. 7*).

In accordance with the approved consumption standards for basic social food products[2] at 2021 prices, there was a significant increase in the cost of a minimum set of basic food products for the following socio–demographic groups:

- children aged 0–6 years by 11.2%;
- children aged 6–8 years by 11.8%;
- working–age population — by 19.1%;
- disabled population — by 13.5% (*Fig. 8*).

The cost of the minimum set of products per capita in the DPR on average at the end of 2021 amounted to 5 145 thous. rub., while in the Rostov region of the Russian Federation — 4 963 thous. rub. (*Fig. 9*). The difference is 181 rub. (3.7%). At the same time, the growth rate of the cost of the

[2] Resolution of the Council of Ministers of the Donetsk People's Republic dated No. 10–40 from 03 June 2015 "On approval of the composition of the market basket in the Donetsk People's Republic". URL: http://doc.dnronline.su/wp-content/uploads/2015/03/PostanovN 10_40_03062015.pdf

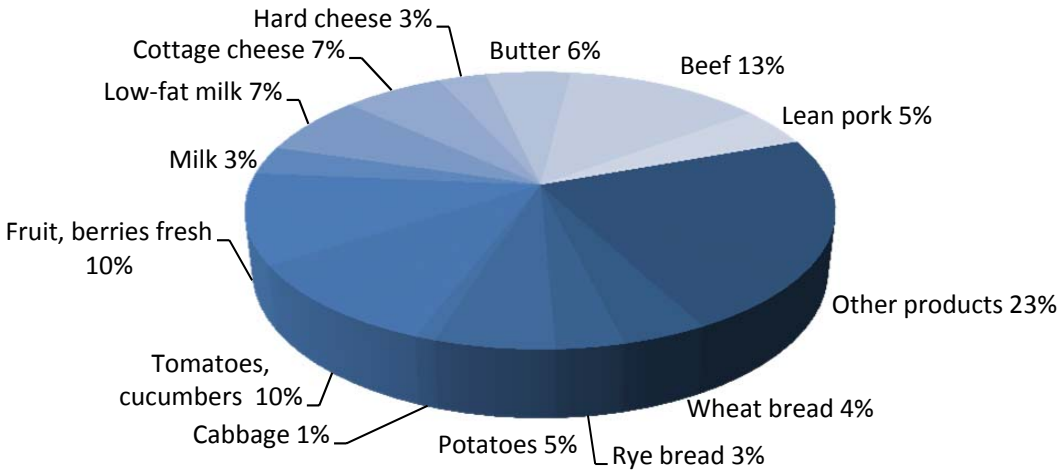

Fig. 7. **The structure of the cost of the minimum set of food products in the DPR**

Source: developed by the authors.

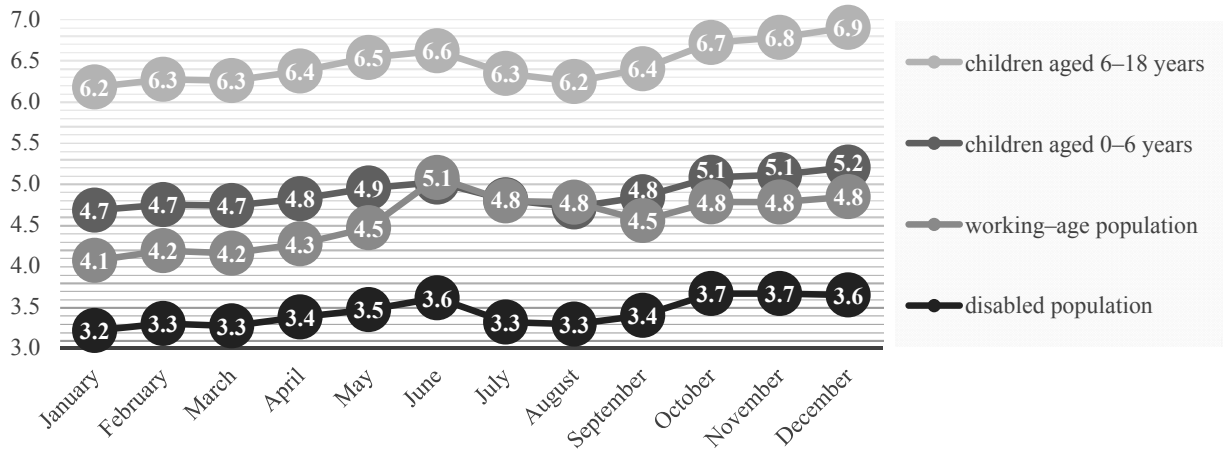

Fig. 8. **Dynamics of the cost of the minimum set of food products in the DPR in 2021, thousand rubles**

Source: developed by the authors.

minimum set of products in the Rostov region of the Russian Federation for the year reached 17.18%.

In order to increase economic security, the share of food costs in the income structure of the population is crucial element. Africans—such as Cameroon and Kenya — spend almost half of their available resources on food, while the average household in UK — about 8%, Switzerland and Luxembourg — 9%, the USA — 6.4%.[3] Given that the minimum market basket represents the necessary amount of food essential for human health and survival, it should be related to the average wage and minimum wage.

According to the Resolution of the People's Council of the DPR No. 100 from

[3] Nutrition and food systems: a report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome. Rome: HLPE; 2017. 151 p.

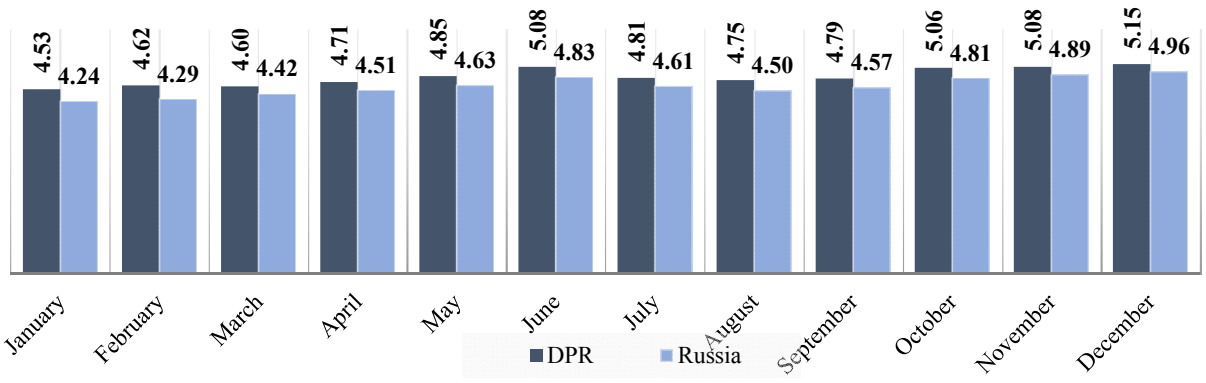

Fig. 9. **Dynamics of the cost of a minimum set of food products per capita in the DPR and the Rostov region of the Russian Federation in 2021, thousand rubles**

Source: compiled by the authors based on data of Federal State Statistics Service. URL: https://rostov.gks.ru/ (accessed on 19.05.2022).

14 February 2020 "On the minimum wage and on the amendment of the law of the Donetsk People's Republic "On remuneration for work", (current version from 28 December 2021),[4] from 1 January 2022 the minimum wage in the DPR is 10 245 thous. rub. In the Russian Federation, according to the Federal Law No. 406 from 6 December 2021 "On amending the article 1 of the Federal Act "On the minimum wage",[5] from 1 January 2022 the minimum wage is 16 668 thous. rub. (not less than 1.2 times the subsistence minimum) for extra budgetary organizations and 13 890 thous. rub.— for budget organizations.

As shown in *Fig. 10*, in the DPR, the value of the minimum market basket at end-2021 prices was 20.0% of the average wage and more than half (50.2%) of the minimum wage (as of January 2022). The indicator indicates a critical level of food security. Most low-income people spend more than half of their money on food that they hold. The subsistence minimum of DPR residents, which includes non-food products in addition to food, is higher than the minimum wage by 4%, indicating a very low level of well–being of the population.

It should be noted that in the Rostov region of the Russian Federation, along with a higher average monthly wage compared to DPR (an increase of 51.5%), the cost of the minimum set of products is at the same level as in DPR and is at the beginning of 2022– 12,7% of wages and 35.7% of minimum wage.

The method of calculating the subsistence minimum of the market basket may still be possible to manipulation — decline its cost with cheaper products or decline in nutritional standards for the main socio–demographic groups. Achieving food security implies increasing the market basket's availability and improving its composition every year in favour of useful and high-quality product; but, as a result, of such measures in some cases its actual value may be above minimum, because the actual consumption pattern differs significantly from its underlying level of physical

[4] Resolution of the People's Council of the DPR No. 100 from 14 February 2020 "On the minimum wage and on the amendment of the law of the Donetsk People's Republic "On remuneration for work", (current version from 28 December 2021). URL: https://dnrsovet.su/zakon-donetskoj-narodnoj-respubliki-o-minimalnom-razmere-oplaty-truda-i-o-vnesenii-izmenenij-v-zakon-donetskoj-narodnoj-respubliki-ob-oplate-truda/

[5] Federal Law No. 406 from 6 December 2021 "On amending the article 1 of the Federal Act "On the minimum wage". URL: http://www.consultant.ru/document/cons_doc_LAW_402538/

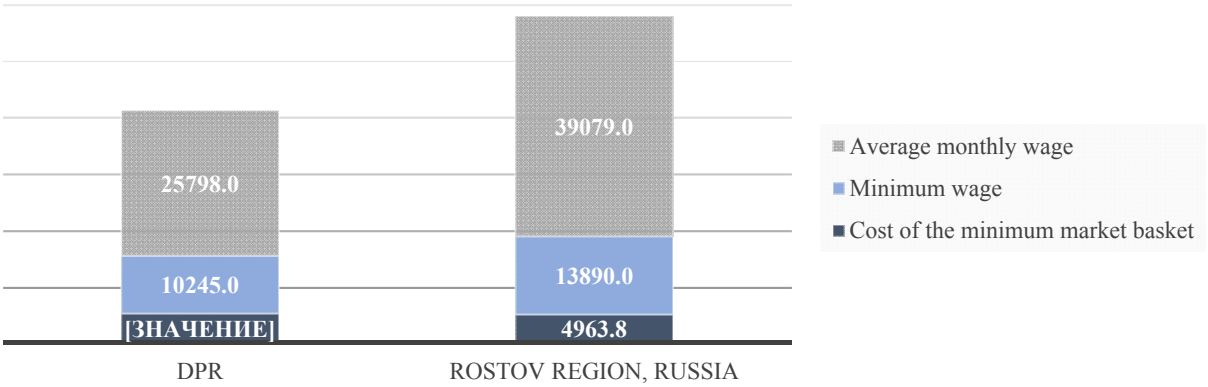

Fig. 10. **The ratio of the average accrued wages of full-time employees and the minimum wage to the cost of the minimum set of food products per capita in the DPR at the beginning of 2022**

Source: compiled by the authors on Federal State Statistics Service. URL: https://rostov.gks.ru/ (accessed on 19.05.2022).

survival. In addition, must be considered that real consumption is due to climatic zones: people, depending on where they live, require different quantities and composition of food and non-food items.

In view of the negative trend of increasing the share of the minimum market basket in the income of the population, a set of measures is needed to increase the availability of food products to the population of DPR. Reducing the price of socially important products — one of the objectives that will contribute to reducing social tensions and growth of welfare of citizens. Considering that the pricing of food by the importing States is the main lever of foreign policy impact on the country's economy and social stability, ensuring access to food and resources becomes a major focus of the management of the development strategy of vertically integrated agro–industrial companies.

These problems must be addressed comprehensively: both at the level of the state policy in the field of food security and in the corporate strategy of leading agro – industrial producers to improve the quality of life of the population. Large vertically integrated companies that are producers of both raw materials and finished goods in the market basket provide most of the products. At the same time, a significant share of farms and processing enterprises producing products through processing of raw materials acquired from third-party enterprises remains on the market.

Since the structure of production resources and raw materials is unbalanced, many agro-holdings and industrial companies have limited productive capacity due to rising intermediation, logistics and customs costs. Insufficient carryover stocks of agricultural raw materials and food, due to shortages, can trigger dramatic increases in the value of final products [2].[6]

This problem can be solved with the development strategy of vertically integrated agro-industrial companies (VIAC) [3–9], based on the use of new market mechanisms and building competitive capacities and aimed at reducing costs in the value chain, this will minimize the cost of finished products and enable sustainable food security, including improving the quality of life of the population.

[6] The State of food and agriculture. Leveraging food systems for inclusive rural transformation. Food and Agriculture Organization of the United Nations. Rome; 2017. 170 p.

VIAC is characterized by a variety of activities aimed at the harvesting and processing of raw materials, production, delivery and sale of finished products, marketing, united in the value chain (which ultimately affects the formation of price) [10]. From the point of view of the organization of the production process, value chains include a set of productive (valuable) actions that carry out of capital and labour (or firms and employees) at all stages from the "origin" of a good or service to its final consumption and beyond (*Fig. 11*).

The process of food production can be broken down into multiple segments, each of which corresponds to a separate task and can be performed in different countries where companies add value to the final product, which also has a negative impact on pricing. Local production of intermediate goods that are part of the value chain and are used in final products in the VIAC integrated production cycle will reduce their cost by not limiting the trade margin after each stage of processing and harvesting of raw materials by third–party companies, as well as through self-management of quality and value added [11–13].

DPR does not have fully functioning VIAC. At the beginning of 2022, it is possible to speak only about a few AIC enterprises, characterized by a closed production cycle for some segments.

As the analysis showed, in 2021–2022 among products produced in the territory of DPR, the highest price increase was recorded for poultry meat (27.08%), sausage smoked (27.97%), butter (21.56%), margarine (33.49%), mayonnaise (28.82%), wheat bread (24.07%) and loaf of bread (26.32%). Among poultry producers, large enterprises are: LLC "Amvrosiyevskaya Poultry Farm", PJSC "Novoazovskaya Poultry Farm", LLC "Ekoprodtorg" (GP "Shahterskaya Poultry Farm") and LLC "Roz–Agro", specializing in poultry production, rearing stock and incubation production. In addition to the main activities, LLC "Roz–Agro" is engaged in the cultivation of cereals and oilseeds, thus providing itself with the necessary raw materials, while most poultry farms are forced to buy imported feed and rearing stock.

Of the domestic enterprises of the industry of meat processing and production of sausage products (LLC Trade House "Gornyak", LLC "Artemida", LLC "Kolbiko", LLC "Vector" (trademark ["YUZOVSKY DELICACY"], FOP Pavlov Oleg Vladimirovich [trademark "Zenit"], FOP Berest S. G. [trademark « Snezhnyanskoe sausage farm"]), most are engaged only in the processing of finished imported raw materials. Vertically integrated system of production of raw materials followed by production of finished products, starting from cattle and pigs, as well as material support of this direction, until the sale of finished meat and sausage products in this industry is not formed. An exception is the LLC Trade House "Gornyak", which receives part of the raw material from the local LLC "Agrofirm "Gornyak".

In the market of milk processed and dairy products, DPR share of domestic production is about 70%. The main enterprises working in this field are LLC Trade House "Gornyak" and LLC "Your manufacturer".

Milk and dairy products are produced from a dry product supplied by the Russian Federation and other imported components. The low number of cattle dairy breeds prevents enterprises from using their own raw material base, which negatively affects the growth of the value of products such as milk, butter, margarine, etc.

Similar situation in the market for production of sauces, mayonnaises and ketchups, where the main producers of

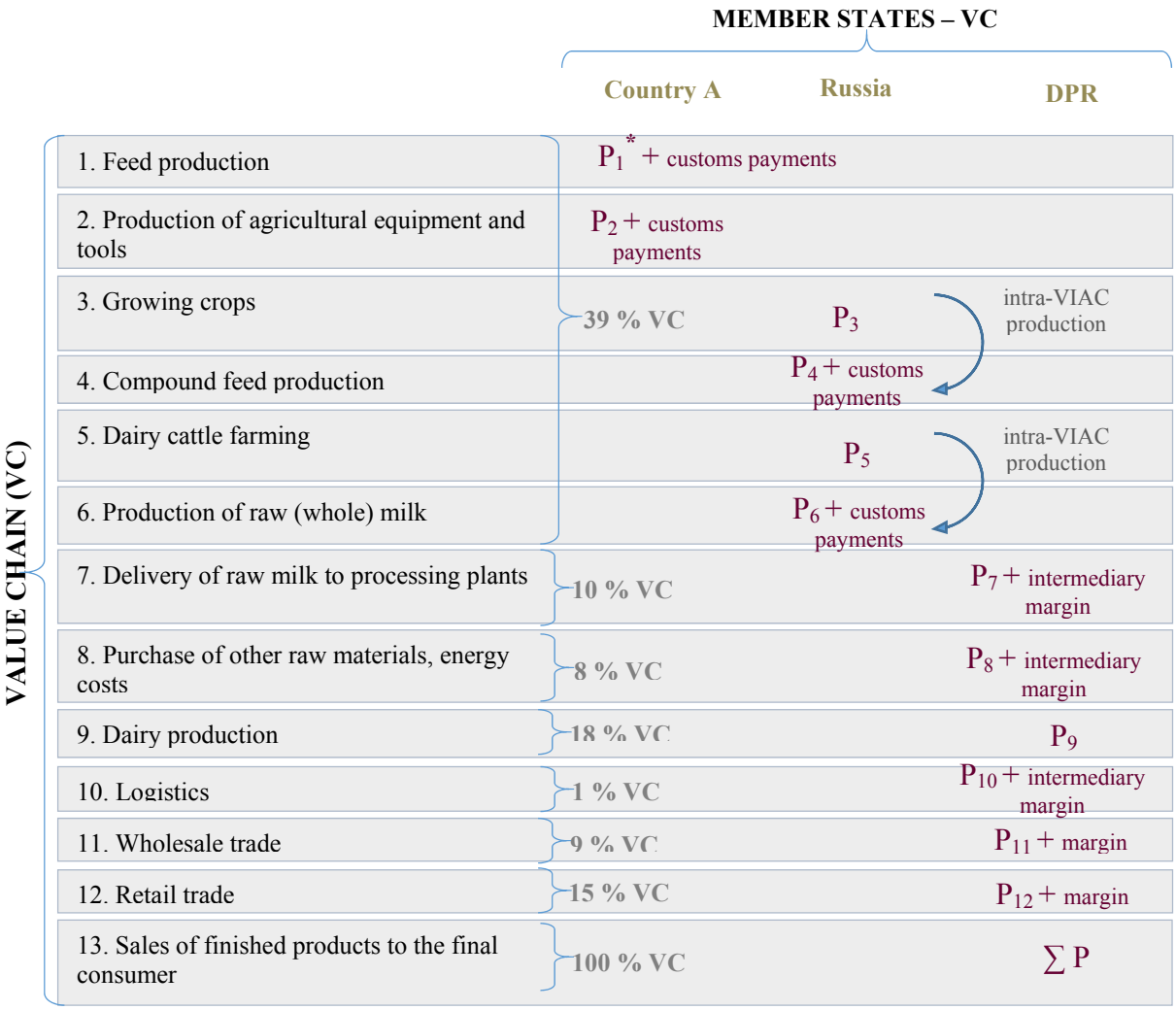

Fig. 11. **The value chain on the example of a dairy processing enterprise of the DPR**

Source: developed by the authors.

Note: P – value.

LLC "Slavolia groups" and LLC Trade House "Products of Donbass" do not independently produce raw materials to be processed.

The largest company in the market of bread and bakery products DPR is LLC "World of bread", which is part of the group of companies "Atlant–Donbass" and produces its products under the trademark "Harvest". The enterprise unites 7 bakeries with a total capacity of about 9 thous. tons / month, for the production of bread and bakery products uses only flour of own production (trademark "Harvest"), has a wide range and occupies a significant place in the food security of the DPR. The remaining producers of this product work on the purchased raw materials that have a high margin.

Thus, because of the large share of imported raw materials used, value chains are closely linked to supply chains that focus on the beginning of the production process and aim to integrate supplier and producer processes, while value chains focus on the end of the production process, i.e. value creation from a consumer perspective [14].

Table

Pricing of goods for which a significant increase in prices was recorded in the DPR in January 2022, rubles

Customs commodity code	Category	Actual price	Sales price of agricultural enterprises	Customs value of goods	Customs rate	Value with import duty and trade margin limit			
						Trade margin to import value		Trade margin to producer price	
						value of margin	final cost	value of margin	final cost
020711	Poultry meat (chicken)	180.2	140.6	125.2	20%	25%	181	15%	162
1601 00 9100	Smoked sausage	1010.9	-	626.4	5%	-	658	-	-
0401 20	Pasteurized milk (more than 2.5% fat)	76.0	31.9	76.6	1%	25%	96	15%	37
0405 10	Butter	742.2	-	486.4	2%	25%	618	15%	-
0405 20 3000	Margarine	195.3	-	441.8	2%	25%	561	15%	-
2103 90 9001	Mayonnaise	204.0	-	120.6	5%	-	127	-	-
0704 90 1001	Cabbage	52.7	-	13.5	1%	25%	17	15%	-
0701 90	Potatoes	47.3	16.3	15.0	1%	25%	19	15%	19
0706 90 9001	Beet	39.5	-	15.0	1%	25%	19	15%	-

Source: developed by the authors.

The following factors influence the pricing of food products based on imported DPR components: import value and trade margin to producer's wholesale price. The first consists of:

Customs value of goods.

Customs payments:

- customs duty;
- customs fees;
- single fee.

Costs of delivery of the goods from border crossing point to delivery.

Customs terminal services (temporary storage warehouse).

Customs broker services.

Services related to obtaining documents confirming the safety and quality of food products (Declaration of Conformity).

In addition to customs payments, the final price includes trade margins, the amount of which is determined on the basis of the Order of regulation and control of prices (tariffs) in the territory of the Donetsk People's Republic, approved by the Resolution of the Council of Ministers of the Donetsk People's Republic No. 10–41 from 03 June 2015 "On the approval of the Order of regulation and control of prices (tariffs) in the territory of the Donetsk People's Republic" (amended on 02 July 2021).[7] This document regulates

[7] Resolution of the Council of Ministers of the Donetsk People's Republic No. 10–41 from 03 June 2015 "On the approval of the Order of regulation and control of prices (tariffs) in the territory of the Donetsk People's Republic". URL: https://pravdnr.ru/npa/postanovlenie-pravitelstva-doneczkoj-

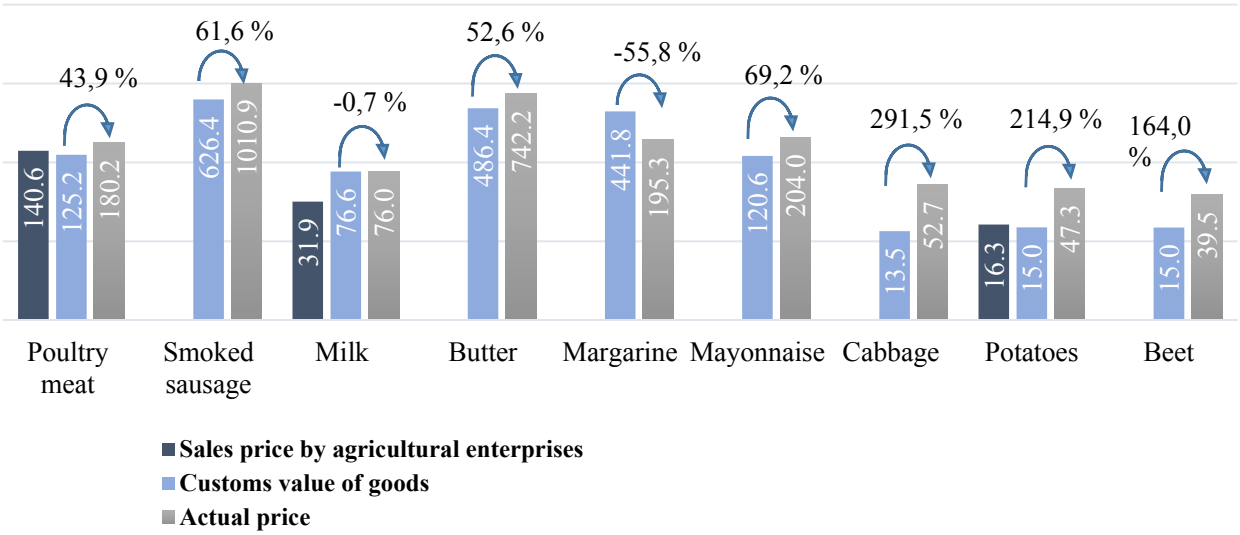

Fig. 12. **Comparative characteristics of the excess of the actual cost of food over the customs value in the DPR at the beginning of 2022, rubles**

Source: developed by the authors.

the maximum (limit) level of wholesale and trade margins to the import value and price of DPR manufacturers for socially important foods. Other goods not included in the Order, according to the legislation, do not have a limit level of margins.

Thus, the high level of actual prices is due to their significant deviation from both the customs value and the release price of agricultural producers, and consequently accounts for a significant share of food costs in the income of the DPR population (see *Table*).

Figure 12 shows that at the beginning of 2022, the actual cost of food exceeded the customs value of vegetables by 300%, i.e. cabbage and potatoes — 214.9%. At the same time, based on the data of the *Table*, the cost of cabbage, taking into account the import duty and the maximum trade margin was 17 rub./kg (i.e. 3 times less price in DPR trading networks); and potatoes, respectively — 19 rub./kg (which is 2.5 times, or 149.9%, less than the price in DPR trading networks).

It should be noted also that the actual price exceeded the price of sale of AIC goods by agricultural producers for subsequent retail sale: poultry meat (28.1%), milk (138.4%) and potatoes (190.2%). The most challenging and pressing issues in the system of prices and pricing is the discrepancy between the retail prices of food and production costs, as well as the cost of selling the produce to agricultural enterprises. In turn, the presence of a high share of imported food and processing products at the expense of intermediation and logistics costs leads to higher prices.

All this causes difficulties in the development of social production and is manifested in the food shortages and the increase in the cost of the market basket. Difficulties in saturating the market with necessary products cause deficit, and deficit — unjustified increase in retail price.

One of the most important means of ensuring sustainable development is the

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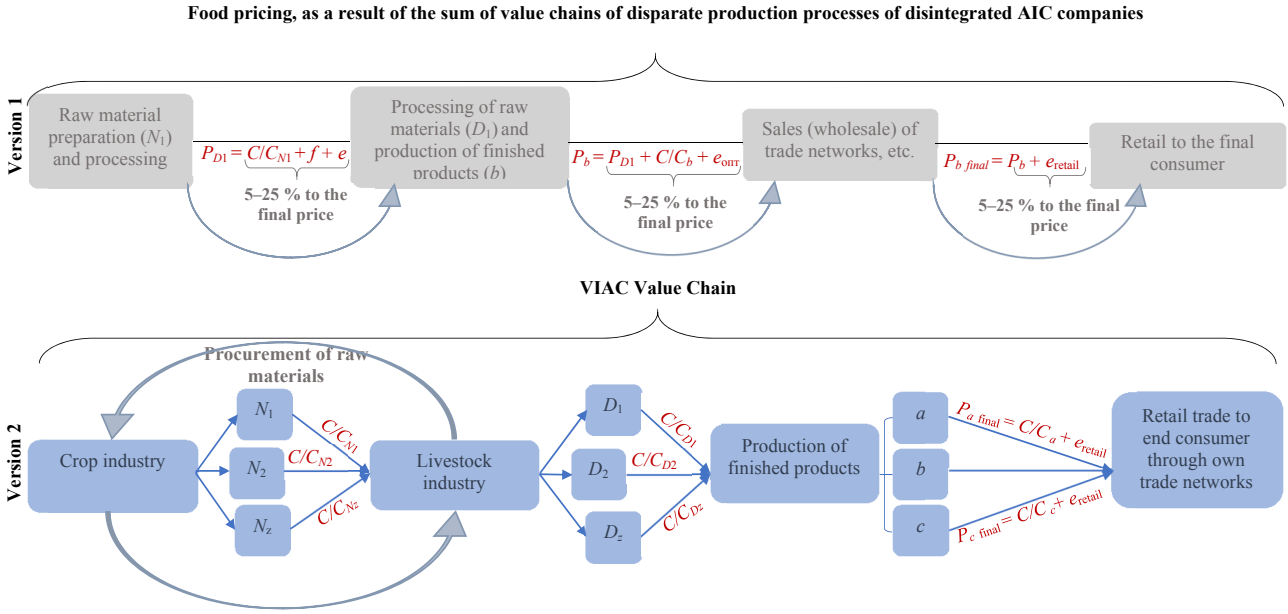

Fig. 13. **Schematic representation of value chain options at the maximum and minimum price of finished products**

Source: developed by the authors.

Note: P — the price of the product; *C/C* — cost price; *f* — customs payments; *e* — wholesale and retail margin; *N* — crop production (raw materials); *D* — livestock products (raw materials); *a, b, c* — prepared food products.

State's pricing policy. Its main tasks — are to expand market pricing mechanisms, control the sphere of direct state price regulation, protect the economic interests of the Republic, create conditions for free fair competition of producers in the domestic market. Government regulation of pricing through direct (administrative) as well as a number of indirect (economic) methods involves both the introduction of fixed prices and the retention of limit level of price and changing market conditions. The basic solution to this problem is the creation of agro–holdings with a closed production cycle, actively implementing processes to stimulate their own production.

At the VIAC, production will contribute to a 50% reduction in the final value of the goods. The main advantage of VIAC is that the products for processing enterprises come directly from its own departments specializing in the crop production and farming (*Fig. 13*).

The wide specialization within VIAC allows to independently supporting business processes in every industry, from seed production to marketing. For example, the production of quality seeds ensures a high yield of cereals, oilseeds and fruit and berry crops. When purchasing seeds from third–party suppliers, there are risks of poor quality material being obtained, which can lead to losses of up to 70% in some cases. In this way, local control service of quality is minimizes risks and helps to reduce the cost of finished products.

In addition, VIAC has the ability to manage surplus crop production, some of which goes to farms as raw materials, and the rest is sold on the AIC market as finished products. The effectiveness of VIAC development strategy management is in the development of operating process in response to demand and possible reorientation depending on market conditions. Planning and independence

of agricultural holdings with a complete (closed) type of production process will allow to level the risks of negative impact of factors of external and internal environment, on which the final cost of products depends.

DPR has all the prerequisites for the creation and development of VIAC: favorable climatic conditions for agriculture, trade and economic blockade and a high concentration of AIC enterprises that contribute to the formation of inter sectoral linkages. As an example GC "Agricultural Donbass" — the only enterprise of this kind specializing in the cultivation of cereals (including their storage, processing and transportation), cattle and gardening. Vertical integration has a higher level of competitiveness, safety in the conditions of uncertainty and the abolition of customs borders with the Russian Federation, so the development of the production process in this company, in addition to the social effect, will increase investment activity in the region and reduce dependence on imports.

CONCLUSION

Food production should be part of the VIAC and should be carried out together with other co–dependent activities. This organization of production eliminates unnecessary costs in the value chain (such as margins of producers of raw materials and customs payments), which lowers the cost of goods and hence consumer prices. In addition, VIAC helps to increase the level of import substitution; they, as sector–forming units of the economy, contribute to the growth of rural employment and, thanks to the increase in productivity, the high efficiency of AIC.

Saturation of the market with food products of own production and reduction of prices — the most important factors of recovery of social and economic life of DPR. At the micro level, the latter is an indicator of the standard of living of the population, while at the macro level — it is a guarantee of economic security that economically independent VIAC is fully capable of providing.

REFERENCES

1. Vakhrusheva V. E., Mel'tinova E. V. The standard of living of the population and its indicators. In: Scientific works of students of the Izhevsk State Agricultural Academy. 2021:708–712. (In Russ.).
2. Gusakov V. G. Food security of the Republic of Belarus in the context of the functioning of the Eurasian Economic Union. Monitoring-2015 (in 2 pts.). Pt. 1. Minsk: Institute of Systems Research in the Agro-Industrial Complex of the NAS of Belarus; 2016; 205 p. (In Russ.).
3. Apiakun A. Tools of organizational-economic mechanism of innovative development of enterprises. *Ekonomika i upravlenie (Minsk).* 2014;(4):34–37. (In Russ.).
4. Urunov A. A. Economic integration and its contradiction in regional merging of the EEU. *Ekonomika i predprinimatel'stvo = Journal of Economy and Entrepreneurship*. 2017;(8–3):132–137. (In Russ.).
5. Krasnova V. V., Fomenko A. S. Features of the organizational and operational activities of vertically integrated agro-industrial corporations. *Vestnik Belorusskoi gosudarstvennoi sel'skokhozyaistvennoi akademii = Bulletin of the Belarusian State Agricultural Academy.* 2021;(3):10–14. (In Russ.).
6. Kosheleva E. G., Leont'eva L. N. Assessment of the current state and prospects for the development of the agro-industrial complex of the Donetsk People's Republic. In: Geographical and economic research in the context of sustainable development of the state and the region. Proc. 3rd Int. sci.-pract. conf. (Donetsk, November 11–12, 2021). Donetsk: Donetsk National University Publ.; 2021:122–124. (In Russ.).

7. Kosheleva E. G., Gabilin I. G. Innovative business models as a factor of sustainable development of the agroindustrial complex of the region. *Regional'naya ekonomika i upravlenie: elektronnyi nauchnyi zhurnal = Regional Economics and Management: Electronic Scientific Journal*. 2021;4(68). (In Russ.). DOI: 10.24412/1999–2645–2021–468–24
8. Gryzlova E. V. Restructuring of vertically integrated companies as a factor in increasing their efficiency. Cand. econ. sci. diss. Synopsis. Moscow: Lomonosov Moscow State University; 2012. 32 p. (In Russ.).
9. Amit R., Zott C. Creating value through business model innovation. *MIT Sloan Management Review*. 2012;53(3):41–49.
10. Porter M. E. Competitive advantage: Creating and sustaining superior performance. New York: The Free Press; 1998. 592 p. (Russ. ed.: Porter M. Konkurentnoe preimushchestvo: Kak dostich' vysokogo rezul'tata i obespechit' ego ustoichivost'. Moscow: Alpina Publisher; 2020. 942 p.).
11. Andreeva T. V., Ermakova Zh. A. Formation of product value chains in the food industry. *Vestnik Orenburgskogo gosudarstvennogo universiteta = Orenburg State University Vestnik*. 2011;(1):108–113. (In Russ.).
12. Casadesus-Masanell R., Ricart J. E. From strategy to business models and onto tactics. *Long Range Planning*. 2010;43(2–3):195–215. DOI: 10.1016/j.lrp.2010.01.004
13. Prots T. A., Danilchenko A. V. Formation of vertically integrated structures as a factor in the sustainable development of the meat industry. In: Actual problems of socio-economic development of modern society. Coll. pap. 1st Int. correspond. sci.-pract. conf. (Kirov, April 20, 2020). Kirov: Kirov State Medical University; 2020:738–743. URL: https://kirovgma.ru/sites/default/files/conferencefiles/2020–08–27/kirovskoy-gma/i-mezhdunarodnaya-zaochnaya-nauchno-prakticheskaya-konferenciya-aktualnye-problemy-socialno/sbornic2020aktualnyeproblemy.pdf (In Russ.).
14. Christopher M. Logistics and supply chain management: Strategies for reducing cost and improving service. Harlow: Financial Times/Prentice-Hall; 1998. 328 p. (Russ. ed.: Christopher M. Logistika i upravlenie tsepochkami postavok: kak sokratit' zatraty i uluchshit' obsluzhivanie potrebitelei. St. Petersburg: Piter; 2004. 315 p.).

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Fomenko A. S. — collection of statistical data, description of the results and formation of research conclusions.

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Measures for the Prevent and Resolve Conflicts of Interest in Public Authorities in the Russian Federation and Foreign Countries

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ABSTRACT

The article is aimed at studying of measures to prevent and resolve conflicts of interest in public authorities in the Russian Federation and foreign countries. The **task** of the study is to analyze the list of methods to resolve conflicts of interest in public authorities in Russian and foreign legislation, with an emphasis on the need for its concretization and clarification of the boundaries of the applicable legal technique, and finding an alternative to the list. The article offers an instrumental basis for clarification of gradation of ways of exit from the real conflict of interests. The thesis is argued that indicating measures to prevent and resolve conflicts of interest in public authorities in Russian legislation is advisable to legally delineate and formalize them consistently, defining specific forms, stages and mechanisms for solving the problem, based on foreign practice, recommendations are made to prevent conflicts of interest in public authorities.

Keywords: conflict of interest; settlement of conflicts of interest; public authorities; public (municipal) employee; duties; powers

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INTRODUCTION – INTERPRETATION OF THE CONCEPT OF "CONFLICT OF INTERESTS" IN RUSSIAN AND FOREIGN LEGISLATION

In accordance with the provisions of part 1 art. 10 of Federal Law No. 273 from 25.12.2008 "On combating corruption", conflict of interest is defined " as a situation in which the personal interest (direct or indirect) of a person in a position whose appointment includes a responsibility to take measures to prevent and resolve a conflict of interest affects or may affect the appropriate, objective and impartial performance of his official responsibilities (exercise of the powers)".[1] In the practice of foreign law–making, for example, the Bulgarian legislator takes a similar position. Thus, in the Law of the Republic of Bulgaria SG No. 97 from 10.12.2010 or the prevention and identification of conflict of interest was revealed that "conflict of interest arises when a person holding public office has personal interests that may affect the impartial and objective performance of his official responsibilities or powers".[2]

Interpretation is accepted in the Russian legislation as the only legal. There is, for example, in part 1 art. 19 Federal Law No. 79 from 27.07.2004 "On State Civil Service of the Russian Federation",[3] part 1 art. 14.1 Federal Law No. 25 from 02.03.2007 "On municipal service in the Russian Federation",[4] art. 249.1 Labour Code of the Russian Federation[5] and other acts of private law indicate that for the purposes of these documents the concept of "conflict of interest" is used, installed of part 1 art. 10 Federal Law No. 273. Of course, in the national legal field, as well as in the existing research practice, there are other variants of the interpretation of the category in question.

EXISTING METHODS TO RESOLVE CONFLICTS OF INTEREST

At the same time, the legislator does not give a detailed description of its conceptual components, in particular "preventing conflicts of interest" and "resolution of conflicts of interest", that the position of S. N. Sheverdyaev is due to the variety methods of such resolution (prevention), as well as the need to distinguish them from other measures that may be attributed to other types and reactions to an alleged or actual conflict of interest [1, p. 246]. Thus, the law defines the following methods to resolve conflicts of interest:

1) change of official position, which is a party to the conflict of interests of the civil employee up to dismissal from the performance of official responsibilities;

2) refusal by such an employee of the benefit resulting in a conflict of interest (p. 3.1 art. 19 No. 79);[6]

3) removal (recusal) of a civil employee in cases and order prescribed by law (p. 5 art. 11 No. 273);[7]

4) transfer of securities belonging to a person [shares of participation, share in

[1] Federal Law No. 273 from 25.12.2008 "On combating corruption" (amend. from 06.03.2022). No. 52. Part. 1. Art. 6228. URL: http://www.consultant.ru/document/cons_doc_LAW_82959/?ysclid=l59dot61rt144678407

[2] Conflict of Interest Prevention and Ascertainment Act (SG No. 97/2010, effective 10.12.2010). Ministry of Economy and Industry of the Republic of Bulgaria. URL: https://www.mi.government.bg/en/library/conflict-of-interest-prevention-and-ascertainment-act-447-c25-m258–2.html (accessed on 25.03.2022).

[3] Federal Law No. 79 from 27.07.2004 "On State Civil Service of the Russian Federation". URL: http://www.consultant.ru/document/cons_doc_LAW_48601/?ysclid=l5b18k1nkq345626980 (accessed on 25.03.2022).

[4] Federal Law No. 25 from 02.03.2007 "On municipal service in the Russian Federation". URL: http://www.consultant.ru/document/cons_doc_LAW_66530/?ysclid=l5b1f0y5he93362701 (accessed on 25.03.2022).

[5] Labour Code of the Russian Federation No. 197 from 30.12.2001. URL: http://www.consultant.ru/document/cons_doc_LAW_34683/?ysclid=l5b1mal2cd162425443 (accessed on 25.03.2022).

[6] See above.

[7] See above.

authorized (folding) capitals of organizations) into trust management in accordance with civil legislation in p. 7 art. 11 No. 273].

We should agree with the position of E.V. Parkhomenko that the content of some of the listed methods of resolving conflicts of interest is very ambiguous [2]. Thus, a change in an official position which is a party to a conflict of interests of a public servant, including his removal from the performance of official responsibilities, certain aspects of practical implementation of this method are prevented, in particular the fact that the very concept of "change of the official position of the civil employee" is not defined by law. On the basis of the positions of the authors of scientific sources, change of the latter should be understood to mean the transfer of an employee to another civil service post or dismissal.[8] At the same time, civil service law does not consider conflict of interest as a ground for termination of employment contract.

The same applies to the second method of resolve the conflict. Benefit category in anticorruption legislation is also not disclosed. Noting this, N.S. Ermachenkova considers that it is advisable to consider the benefit as "entitlement of an employee to benefits or advantages directly related to the use of its official status, as well as any other entitlement arising from outside activities" [3]. Other authors take a similar position, for example G.A. Alimov, B.I. Isroilov, O.N. Kostyuk [4, 5] and others. In addition, there is a lack of clarity in the implementation of the procedure and the form of disclaiming the benefit of the employee.

We share the view with T.R. Meshcheryakova, A.V. Ponomarev and I.A. Trofimova that the legal means of resolving conflicts of interest in public authorities lack specificity [6–8]; moreover, their legal techniques are blurriness, which may result in undue discretion in their application [9, p. 282]. For comparison, a list of methods to resolve conflicts of interest in the public service, as presented in the OECD Guide,[9] seems to be more appropriate because of the detail (see *Figure*).

ALTERNATIVE OPTIONS FOR RESOLVING CONFLICTS OF INTEREST

In our view, the following options can be considered as alternatives, taking into account domestic and foreign experience on this issue:

- first, implementation of temporary delegation of authority from a public officer who is a party to a conflict of interest to another officer;
- second, the suspension of a public officer on a permanent or temporary basis from functions that have become the source or background for a conflict of interest;
- third, delimitation for the duration of the conflict of interest in admitting a public officer to the data, if the conflict is related to their use;
- fourth, correcting (improving) the control measures adopted by the State body regarding the performance officer of official responsibilities in a conflict of interest situation;
- fifth, the establishment of a collegial decision–making process for issues involving conflicts of interest.

In fact, in the circumstances under consideration, there are only two possibilities:

[8] Guide to the prevention of conflicts of interest in Croatia. Anti-corruption portal HSE. 19.11.2020. URL: https://anticor.hse.ru/main/news_page/v_horvatii_vypuscheno_rukovodstvo_po_predotvrascheniyu_konflikta_interesov (accessed on 25.03.2022).

[9] OECD Guidelines for Managing Conflict of Interest in the Public Service. URL: https://www.oecd.org/gov/ethics/49106105.pdf (accessed on 25.03.2022).

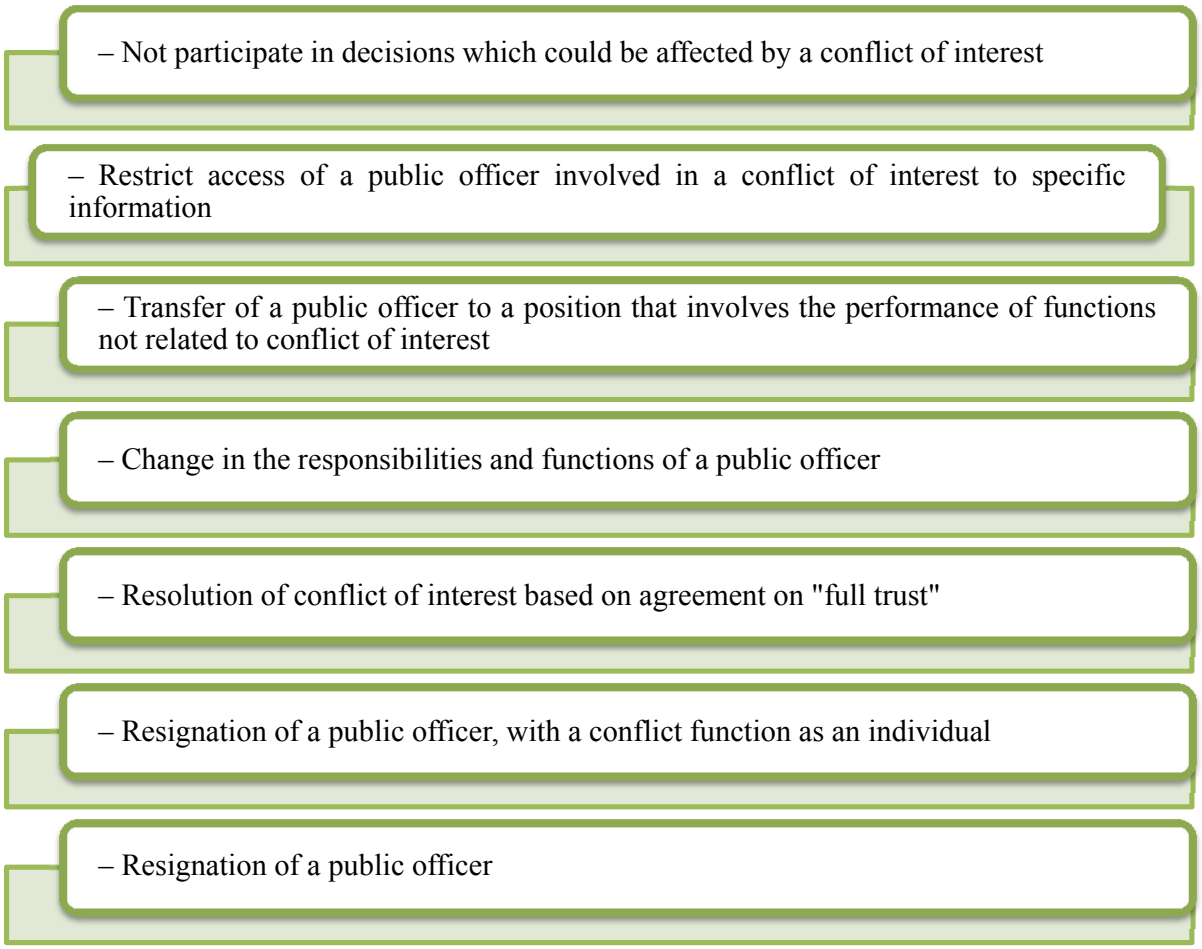

Fig. **Ways of resolving conflicts of interest presented in the OECD Guide**

Source: compiled by the author on the basis of the OECD Guide for managing conflict-of-interest in the public sector. URL: https://www.oecd.org/gov/ethics/49106105.pdf (accessed on 25.03.2022).

either to resolve (eliminate) the conflict of interest, or not to resolve it (do not eliminate). In this regard, for example, cases of its minimization to little or no significant (from this point of view) will relate exclusively to the specific situation. If a special decision has been taken to resolve the conflict of interest of the officer, then in this case the non–recourse of the conflict will be formally considered as a violation, although the latter may actually have lost its meaning. Certainly, for example, from the provisions of para. 3.1 art. 59.3 Federal Law No. 79 that penalty may be applied to a public officer in the form of a remark when the corruption offence he committed is not significant,[10] then responsible authority, as an appropriate response, has the power to take less than stringent disciplinary measures against the public officer.

Nevertheless, we consider that the doctrine, in addition to detailing, will also be optimal to clarify the gradation of ways out of the real conflict of interest, and the classification of options for the response of the employee to the conflict situation may be taken as a basis: resolution of conflicts of interest in accordance with the methods

[10] See above.

recommended by the law or other means not expressly provided for by it but recommended by the commission for the settlement of such conflicts, compliance officer of the authority, external legal adviser (auditor), independently developed and other:

- minimization of conflicts of interest;
- erroneous involuntary non–elimination of conflict of interest in a situation where all necessary actions in such cases have been taken, but the fact of contradictions of service and personal interests is preserved;
- proposing action in situations of conflict of interest without sanctions;
- continuing to act in a situation of conflict of interest that does not entail the application of sanctions, combined with the application of additional measures that provide a guarantee against personal preferences of the public interest;
- non–resolution conflict of interest with sanctions: disciplinary and dismissal — due to loss of confidence.

Russian anti–corruption legislation uses the term "resolve to conflict of interest" when describing ways of eliminating conflicts of interest in pairs with the term "prevention of conflicts of interest" (art. 11 FL No. 273). The difference between these categories is clear, but the measures listed by the legislator are the same for both scenarios. To some extent it is justified: The joint indication of measures to prevent and resolve conflicts of interest in public authorities can be explained by differentiation as such, i.e. applicable to the apparent conflict, they will act as ways to prevent it, and to the real — resolution. At the same time, in our view, it is advisable to distinguish these measures by law and to formulate them consistently, defining specific forms, stages and mechanisms for solving the problem. This logic is followed by foreign legislators, who, despite the dominant soft law nature of regulating measures to prevent and resolve conflicts of interest [10], do not exclude the reasoned use of prohibitions and restrictions.

For example, in the Croatian Law from 16.02.2011[11] on preventing conflict of interest mentioned, that upon election or appointment to public officer, an employee must organize its personal affairs accordingly to avoid a foreseeable conflict of interest, and, in the event of the actual occurrence of one, is obliged to resolve it in such a way as to protect the public interest.

In case of doubt about a possible conflict of interest, the employee must do whatever is necessary to separate the personal from the public interest. Moreover, the Law specifies the conditions for the prevention of the types of conflicts that arise as a result of the conscious will of officials, by establishing explicit prohibitions on the conduct of actions that lead to them [11].

Croatia Issues Guidance on conflict of interest prevention at the end of 2020,[12] in particular, the provisions of art. 7 of the above–mentioned law on the following prohibitions are explained: receive or request public officer benefits; acquisition of rights through violation of the principle of equality before the law; abuse of the special rights of an official that arise in connection with the holding of a particular public officer; additional remuneration for the performance of the responsibilities of a specific public officer; acceptance or receipt of values or services for a certain result of voting on a particular issue; influence on a decision taken by a public authority or for reasons of personal

[11] URL: https://www.sukobinteresa.hr/sites/default/files/dokumenti_clanaka/osnovne_obveze_i_ogranicenja_duznosnika_sukladno_odredbama_zakona_o_sprjecavanju_sukoba_interesa.pdf (accessed on 25.03.2022).

[12] Croatia Issues Guidance on Conflict-of-Interest Prevention. Anti–corruption portal of the HSE. URL: https://anticor.hse.ru/en/main/news_page/croatia_issues_guidance_on_conflict_of_interest_prevention (accessed on 25.03.2022).

benefit or benefit of a related person; promise of a work or other right in exchange for a gift or promise of a gift; influencing employment or contracting through public procurement; use of confidential information on the activities of public authorities for personal benefit and for the benefit of an associated person; use of official position in any other method, influencing the decisions of the legislative, executive or judicial authorities for the personal benefit or benefit of the related person, obtaining privileges or rights.

Also of interest are the provisions of the Law No. 159/2006 from 16.03.2006 "Conflict of interest in the Czech Republic". So, in par. 2 art. 3 State that a public authority may not: use any information obtained by reason of their official position to obtain material or other benefits for themselves or any other person; seek help from your subordinates on issues of personal interest (such as doing business); use your name or invention in relation to your position for commercial and advertising purposes for reward [12]. The Estonian Law of 06.06.2012 mentioned that within one year after the termination of office, an official may not accept appointment (election) or conclude employment contracts with legal persons, officer with whom business relations were established during the performance of their responsibilities.[13]

From our point of view, the introduction of specific prohibitions for public authorities into the legal field would not be entirely appropriate, as the list of measures a priori will remain open. Taking into account foreign law enforcement practice, we consider that for the purpose of developing the concept of conflict of interest prevention in Russian legislation it is necessary:

- firstly, to specify and avoid duplication of powers between authorities and state (municipal) employees;
- secondly, optimize the use of state (municipal) resources, placing orders for the supply of goods, the execution of works, the provision of services for state (municipal) needs;
- third, to develop an organizational and legal mechanism for transferring state (municipal) employees and persons filling state (municipal) positions to the trust management of securities, shares (shares in the authorized capital of organizations);
- fourth, to enhance the motivation component of the activities of state (municipal) employees by rewarding them for conscientious and effective performance of their responsibilities.

CONCLUSION

In general, it is becoming evident that the institution of preventing and resolving conflicts of interest in public authorities in our country needs changes and additions. In any case, however, we believe that, even if a current list of measures, forms, methods and ways of prevention is formulated, as well as the settlement of such conflict shall be determined according to the circumstances of each case, taking into account the character and degree of aggravation, the type of State (municipal) service, the functions and powers of the State (municipal) employee.

[13] Anti-corruption Action Plan 2021–2025. Justiitsministeerium. URL: https://www.korruptsioon.ee/sites/ www.korruptsioon.ee/files/elfinder/dokumendid/anticorruptionaction-plan20212025.pdf (accessed on 25.03.2022).

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REFERENCES

1. Sheverdyaev S.N. Management of the conflict of interests of persons holding state and municipal positions: Constitutional and legal analysis. Moscow: Yustitsinform; 2021. 392 p. (In Russ.).
2. Parkhomenko E.V. The concept of conflict of interest. The procedure and methods of settlement in the state structures of the Russian Federation and experience of foreign countries. *Vestnik ispolnitel'nogo proizvodstva = Herald of Enforcement Procedure*. 2021;(1–2):43–57. (In Russ.). DOI: 10.30729/2414–0015–2021–7–1–43–57
3. Ermachenkova N.S. Problems of conflict of interest settlement in the public service. *Molodoi uchenyi = Young Scientist*. 2018;(44):135–137. (In Russ.).
4. Alimov G.A., Isroilov B.I. Shadow economy, corruption, bribery: Criminal law assessment. Tashkent: Adolat; 2020. 185 p. (In Russ.).
5. Kostyuk O.N. The procedure for resolving a conflict of interest in the public service. *Mir sovremennoi nauki*. 2012;(3):83–91. (In Russ.).
6. Meshcheryakova T.R. Certain problems of managing conflict of interest in the public service. *Gosudarstvennaya vlast' i mestnoe samoupravlenie = State Power and Local Self-Government*. 2015;(9):59–63. (In Russ.).
7. Ponomarev A.V. Problems of conflict of interest settlement in the public service. *Probely v rossiiskom zakonodatel'stve*. 2017;(3):289–290. (In Russ.).
8. Trofimova I.A. Reasons and features of conflicts of interest settlement in the civil service system. *Zakon i pravo = Law and Legislation*. 2021;(10):194–198. (In Russ.). DOI: 10.24412/2073–3313–2021–10–194–198
9. Sheverdyaev S.N. Consolidation of anti-corruption issues in modern Russian constitutional law. Doct. legal sci. diss. Moscow: Lomonosov Moscow State University; 2020. 417 p. (In Russ.).
10. Mukhamedyarova L.V. Corruption as a social phenomenon in the context of globalization (social and philosophical analysis). Ufa: Ufa Law Institute of the Ministry of Internal Affairs of Russia; 2017. 118 p. (In Russ.).
11. Kenenova I.P. Regulation of a conflict of interest: Typology of foreign experience. *Konstitutsionnoe i munitsipal'noe pravo = Constitutional and Municipal Law*. 2021;(2):62–69. (In Russ.). DOI: 10.18572/1812–3767–2021–2–62–69
12. Petráková L. Analysis of the enforceability of conflict-of-interest laws in the Czech Republic. New York: UN; 2014. 30 p.

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ORIGINAL PAPER

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Institutional Opportunities for the Development of Option Programs for Top Management Remuneration in the Russian Federation

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ABSTRACT

In the context of the sanctions pressure on the economy of the Russian Federation and the opportunistic behavior of certain foreign members of the boards of directors, it is necessary to develop a national model of corporate governance in terms of remuneration of top management, the level of which in Russian corporations is currently focused on the practice of foreign companies, which entails significant overpayments and causes public complaints. Companies do not personalize the payments made, do not disclose the remuneration structure as a whole, nor do the criteria by which the amounts are determined, which are the overall performance of the company, generally, techno-economic. In the world practice, of remuneration of top managers there is a shift from direct cash payments to optional programs. In Russian practice, such programs are not sufficiently developed: there is a brief information about their use, but without explaining the details. The **purpose** of the article is to identify institutional opportunities for the development of options for the remuneration of managers of Russian companies, and its **tasks** – analysis of experience of application and possibilities of development of optional programs of remuneration of the top management of Russian companies, analysis of the legislative base for allocation of its shares. In the article applied **methods** of generalization, analysis and synthesis in the part of the study of methodical and legislative approaches to the identification of variants for the application of option programs. There has been shown that remuneration of stocks of top management in the Russian practice is possible through shareholder agreements.

Keywords: corporations; top management; remuneration; motivation; stocks; options; bonuses

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INTRODUCTION

Unprecedented anti-Russian sanctions contribute to improvement of corporate management mechanisms in Russia — many foreign members the boards of directors of domestic companies have effectively ceased their functions, which could significantly disrupt the activities of these organizations. Digitalization of the economy and related processes require major changes. In this situation, it is appropriate to raise the issue of remuneration of board members. The size and transparency of their compensation raises many questions for both minority shareholders and society as a whole. In Russian companies, compensation to labor of top management is focused on international experience and consists of constant (basic) and variable parts, but in the annual reports of corporations it is noted that their management is entitled to bonuses that lie outside these amounts. The practice of remuneration of board members in domestic companies is reflected in the reports of Korn Ferry [1]: the amount of the basic compensation in 2020 averaged from 2.2 to 36.4 mln rub. reaching 123.7 mln rub. (at the chairman of the board of directors of UC Rusal). There is a direct dependence of basic remuneration on the profitability of the industry in which the company operates. And in the sources considered by the author they are described, being expressed in monetary form, and the mechanisms of remuneration the top management options on the stock of the company are poorly developed.

In this study, the author considers the institutional possibilities for the development of options for the remuneration of managers of Russian companies.

DISCUSSION

There is considerable disagreement over the permissible transparency of compensation to labor for higher management. Some researchers think that such disclosures are necessary only in companies with state participation, while in private — management remuneration is determined by shareholders and is a commercial secret. Proponents of this approach argue that those owners who disagree with the remuneration of senior managers may not vote on these issues at the general meeting of shareholders. The following arguments are used to justify extremely high payments to board members:

- the level of their remuneration is determined by international practice, including in the US and Europe. Such high fees are universal for top managers invited from abroad;
- they are, for the most part, employees with high managerial qualifications who are able to perform the most difficult tasks;
- remuneration policy is determined by the public joint stock company itself and is not subject to state regulation.

These issues are constantly analyzed both in Russia and abroad. Research of methodical bases of remuneration of top managers of both public joint-stock companies and companies with state participation[1] are devoted to research of B. Bataeva, M. Kuznetsov, O. Fedorov, A. Mikheev [2, 3]. Features of motivation of top management are devoted to the work of D. Evgenova [4], mechanisms for its stimulating described Yu. Aleshina [5]. In the research of M. Kuznetsov et al., Yu. Aleshina, I. Bocharova and A. Rymanov show that the amount of remuneration of top managers of Russian companies is poorly

[1] Letter of the Federal Property Management Agency No. GN-13/3802 from 15 February 2011 "On recommendations for determining the amount of remuneration of employees of state companies". URL: http://www.consultant.ru/document/cons_doc_LAW_193313/96c60c11ee5b73882df84a7de3c4fb18f1a01961/

oriented for the long term and reflects mainly economic indicators achieved by organizations in the previous period [3–6]. At the same time, it has long been noted, in particular, Yu. Petrova, that in Russian practice, high management costs are not justified [7]. There is also an opinion that the most important disadvantages of the mechanisms applied in Russia for remuneration of top managers are orientation on the practice of the Western labor markets, short–term motivation, as well as a weak, unclear relationship of compensation with the results achieved. Taking into account the recommendations of the Corporate Governance Code on equal payments to all board members (except the Chairman),[2] the trend to follow international standards leads to cost overruns by overstatement, and short–term motivation encourages opportunistic management actions to increase remuneration.

The question of the criteria for determining the latter remains poorly studied: they are a commercial secret and are not disclosed, as is the very amount of income of each top manager.[3] It is generally accepted to be defined on the basis of profit/profitability or selected performance indicators (such criteria are corporate –wide and determine 70–80% of its size). The features of the remuneration methods include the fact that the executive members of the Board of Directors are not performed,[4] and the non-executive receive additional payment for work in the committees of the Board of Directors.

Digitalization of the economy leads to increase of intangible assets and development of ecosystems outside the organization, which reduces the role of profit (profitability) in calculation of labor compensation. One specific feature of intangible assets is that they increase as they are used, as opposed to physical assets that are amortized. Recognizing the benefits of increased intangible investment is currently difficult. Physical companies are becoming increasingly digital, and profit and loss reports are less relevant to investors' decisions [8]. Profit loses its value as an indicator of efficiency and, consequently, as a criterion for calculating the remuneration of the top management; the same applies to the income of the organization. World's leading companies reduce cash premiums based on profits and move to share–based payment. Such mechanisms reduce the risk of valuable investment by opportunistic managers to generate higher returns and higher compensation [9].

The remuneration of top management, defined in this way, can be carried out under several options, which apply to the variable part of income of top managers, leaving the basic unchanged. The simplest method — is to determine its size based on the increase in the value of shares during the reporting period. The reward is paid, which effectively turns the optional program into a bonus system. This approach does not motivate senior managers in the long term and creates risks of their opportunistic behavior to increase the one–time payment.

The long-term motivation is created by optional compensation programs, providing incentives to managers by shares of the company (the so-called "administrative option" [further — option]). In general, an option — is an agreement to buy/sell an asset at a certain price within a specified period. Administrative option is an additional promotion from management: each employee has the right

[2] Corporate Governance Code. URL: https://nand.ru/professional-information/corporate-governance-code/?ysclid=l58bw3rn7h593236442 (accessed on 01.07.2022).

[3] In annual reports for 2020–2022, individual companies, such as RUSAL, disclose the personal compensation of board members. URL: https://rusal.ru/ (accessed on 01.06 2022).

[4] The focus — is people. Report on sustainable development for 2021 (RUSAL). URL: https://rusal.ru/ (accessed on 01.06.2022).

to repurchase a certain number of shares of the company at a certain price (usually lower than the market) over a certain period of time [10, p. 267]). Execution of an administrative option results in the issuance of shares and changes in the ownership structure of the organization, potentially creating a conflict of interest. The value of the shares is set either on the date of the option announcement or at the offering price; managers acquire them on their own funds and, according to the contract, have no right to sell for a certain time (2–3 years). Monetary reward can be received once or in parts for a specified optional period of time. Income is generated either as dividends to the shareholder or when the latter are sold at the option price at the time of sale. It is obvious that if worsening the efficiency of the organization, the share price may decline, and the managers, accordingly, will not receive income. An important condition of the option is the ban on the sell or transfer it to another person: they have both advantages and disadvantages, but generally increase the long–term motivation of top management to work to increase the efficiency of the organization and, as a result, increase the value of its shares. In foreign companies, optional programs are widespread, facilitated by an appropriate legislative framework: companies can issue a portion of the reserved stock or buy their own in the market to form special funds under options.

In the Russian practice in the methodological plan of variants of options are studied in depth enough, their advantages and disadvantages are revealed, conditions of their application are considered,[5],[6] motivating effect [11, 12]. Recommendations on the criteria for granting shares[7] to company employees [13], have been developed, proposals on formation of compensation plans for the top management have been known [14]. However, most developments note that the possibilities of using administrative options in Russia are limited by the legislative framework. However, M. Kuznetsov, O. Fedorov and A. Mikheev showed [3], that optional long–term management compensation program is used in Russian companies with government participation. As a shortage the authors noted that the use of bonuses based on "phantom" shares (PJSC "Aeroflot", PJSC "SCF Group"). In such cases, they are paid in cash, depending on the development of the capitalization and the stock price. In some cases (PJSC "Rosseti") provides a two–stage option in two stages: on the first — for an equity stake of PJSC "Rosseti", on the second — for an equity stake of subsidiaries and dependent companies. In general, in the article [3] options are recognized as a promising mechanism of remuneration both for Russian companies with state participation and for private firms.

The main problem with the application of administrative option in Russia is the absence of an explicit mechanism of giving managers shares at a discount price, unlike the Western practice, which provides for the issuance of shares under administrative options.

For the latter, the institutional environment can be considered at three levels. First level — federal — includes the Federal Law No. 208 from 26 December 1995 "On Joint Stock Companies" (further — Law on JSC), the

[5] Options for employees — principle of motivation. Information and analytical portal ForexCity. URL: http://www.forexcity.ru / traders/articles/84660.html

[6] What are the options for employees in Russian companies. HR-Portal. 09.06.2011. URL: http://hr-portal.ru/article/kak-vyglyadyat-opciony-dlya-sotrudnikov-v-rossiyskih-kompaniyah (accessed on 18.05.2022).

[7] Option ripe: how to distribute business shares to employees of the company. TheVillage. URL: https://www.the-village.ru/village/business /management/149583-optsiony-v-startape (accessed on 16.04.2022).

Table

Options and the effect of motivating the allocation of shares to top management

No.	Method of provide the manager stocks of the company	Necessary conditions	Motivating effect	Risk of interest conflict of shareholders
1	Free purchase on the market	Free sale of shares in the market	Weak	Low
2	Sale of shares to shareholder managers	Owners' desire to sell shares	Medium	Low
3	Distribution between managers of additional issue of shares	Consolidation of possibility of additional issue of shares in documents of a company. Concurrence of existing shareholders. Top managers have a stake	High	High
4	Sale to managers of shares purchased by the company on the market	Stock available on the market. Concurrence of existing shareholders. Top managers have a stake	Medium	High
5	Any distribution of shares to top managers at reduced cost as per shareholder agreement	Presence of a written shareholder agreement. Presence of conditions p. 1–4	High	Low

Source: compiled by the author.

provisions of which regulate the mechanisms of work with shares of the company.[8] Let's consider possible mechanisms of granting shares to top managers:

A. Purchase shares in the market. In this case, managers buy shares at the market price and regardless of the option. No motivating effect is achieved.

B. Sale of shares by majority (less often — minority) shareholders. It is obvious that it is possible at a price not less than the share price at the placement. Owner–seller share in equity decreases. The mechanism is possible either with a large share in one hand or in preparation for sale.

C. Issue and distribution of additional shares is allowed by the Law on JSC (par. 1 art. 39): Placement of additional shares is possible through open or private subscription or by conversion — n case of closed subscription they can be offered to a limited, predefined circle of persons. At the same time, art. 40 Law on JSC provides that these shares shall be distributed to all shareholders and at market price, but not below nominal value (in order to protect shareholder rights). Under

[8] Federal Law No. 208 from 26 December 1995 (ed. from 02.07.2021) "On Joint Stock Companies" (amend. and supplem., ent. into 13.07.2021). URL: https://base.garant.ru/10105712/?ysclid=l50w4u95he435777442

such a method of placement, as a subscription, the amount of the authorized capital and the number of shares of a company changes, so for its implementation it is necessary to have in the Charter a sufficient number of declared shares of the appropriate category (type) [15]. Consequently, a number of conditions must be met in the implementation of this mechanism.

- Top–managers should already have enough shares in the company.
- The issue of additional must be provided in the constituent documents of a company.
- Most shareholders need to agree on the allocation of management shares, which is unlikely in companies with a large number of participants.

The serious obstacle to the application of such a mechanism is its tendency to increase the authorized capital of a company, not to remuneration the top management, and its use to compensate the work of the management of the company may entail a conflict of interests within the JSC and regulatory claims.

D. Repurchase of shares by a company, which is possible under restrictive conditions. Within one year from the moment of acquisition of shares the company is obliged to make a decision on reduction of the authorized capital or to realize them at a price not lower than their market value. If the shares will not be realized during this period, the "company is obliged to make a reasonable decision on reduction of its authorized capital by repayment of such shares".[9] The use of this mechanism is possible, but the mandatory condition of the sale of shares at a price below the market reduces the motivating effect and requires the consent of shareholders.

All the options considered for long–term remuneration with the company's top management shares either do not form an appropriate economic motivation or may lead to a conflict of interests of shareholders. Law "On Joint Stock Companies"[10] provides for the avoidance of conflicts of interest through written equity agreements to determine the voting in a certain way or the acquisition/alienation of the share at a certain price or in certain circumstances, as well as to carry out other coordinated actions related to the management of the company.

Options for the allocation of shares to top management reviewed in the *Table*, should be considered as an interim solution. To develop optional remuneration programs, it is necessary to improve the legal framework of the Russian Federation.

CONCLUSION

In the current economic environment, it is necessary to develop domestic mechanisms of remuneration of the top management of corporations and to abandon the practice of focusing on the experience of foreign companies in matters of payment, but at the same time keep a constant part of the latter to those members of the board of directors for whom they are provided in accordance with the documents of the organization. Gradual transition from direct cash compensation to optional 3–5 — year programs is recommended to increase management's motivation for long–term and effective work. As intermediaries, you can use any options provided by the Federal Law "On Joint Stock Companies", but with the mandatory conclusion of an agreement of shareholders to avoid conflicts of interests. Understanding the opportunities and mechanisms of using existing options to reward top management will enable owners to increase long–term motivation and executive responsibility for corporate value; and for their development requires improvement of the national legislative framework.

[9] See ibid.

[10] See ibid.

REFERENCES

1. Lyalikova A. UC Rusal became the leader in terms of remuneration to the head of the board of directors. Forbes. Jan. 31, 2022. URL: https://www.forbes.ru/biznes/454005-us-rusal-stal-liderom-po-razmeru-voznagrazdenij-glave-soveta-direktorov?from=feed&utm_referrer=https%3A%2F%2Fzen.yandex.com (In Russ.).
2. Bataeva B. S. Development of remuneration of top management in Russian companies with state participation. *Diskussiya = Discussion*. 2019;(1):21–27. (In Russ.). DOI: 10.24411/2077–7639–2018–10021
3. Kuznetsov M., Fedorov O. R. Mikheev A. A. Long-term motivation of members of management bodies in companies with state participation. Aktsionernoe obshchestvo. Aug. 29, 2015. URL: https://ao-journal.ru/dolgosrocnaj-motivacij-clenov-organov-upravlenij-v-kompanijk-s-gosudarstvennym-ucastiem (accessed on 18.06.2022). (In Russ.).
4. Evgenova D. A. Features of motivation of top managers. *Nauchnye zapiski OrelGIET = Scientific Journal of Orel SIET*. 2015;(2):206–211. (In Russ.).
5. Aleshina Yu. N. Long-term instruments for stimulating of top management activities. *Innovatsii i investitsii = Innovation & Investment*. 2020;(10):75–79. (In Russ.).
6. Bocharova I. Yu., Rymanov A. Yu. Remuneration of top management and board of directors in Russian companies. *Russian Journal of Agricultural and Socio-Economic Sciences*. 2017;(10):107–115. (In Russ.). DOI: 10.18551/rjoas.2017–10.17
7. Petrova Yu. Spending on top managers does not justify itself in Russia. Vedomosti. Dec. 14, 2017. URL: https://www.vedomosti.ru/management/articles/2017/12/14/745216-rashodi-top-menedzherov (In Russ.).
8. Govindarajan V., Rajgopal Sh., Srivastava A. Why financial statements don't work for digital companies. Harvard Business Review. Feb. 26, 2018. URL: https://hbr.org/2018/02/why-financial-statements-dont-work-for-digital-companies (accessed on 15.05.2022).
9. Grebennikova V. A., Polyakov E. I. Advantages and disadvantages of the optional incentive program for top managers of the company. *Ekonomika ustoichivogo razvitiya = Economics of Sustainable Development*. 2020;(1):190–193. (In Russ.).
10. Lee Ch.F., Finnerty J. E. Corporate finance: Theory, method, and applications. San Diego, CA: Harcourt Brace Jovanovich; 1990. 765 p. (Russ. ed.: Lee Ch.F., Finnerty J. E. Finansy korporatsii: teoriya, metody i praktika. Moscow: Infra-M; 2000. 686 p.).
11. Pashkina Yu. Options for employees. Klerk. June 07, 2012. URL: https://www.klerk.ru/boss/articles/278518/ (accessed on 16.05.2022). (In Russ.).
12. Loginov A. A. Modern corporate governance — employee motivation based on shares. *Aktsionernoe obshchestvo: voprosy korporativnogo upravleniya*. 2007;(9). (In Russ.).
13. Mustafaev S. Options for employees: "Phantoms" and "classics". *Finansovyi director*. 2014;(4):60–65. (In Russ.).
14. Dudysheva A. Promotions for company employees. Structuring options. CJSC "Bonnier Business Press". URL: http://blog.dp.post/6082/ (In Russ.).
15. Becker I. Bonus plans: Scratch whatever you had. Korn Ferry. URL: https://www.kornferry.com/insights/articles/bonus-plans — scratch-whatever-you-had

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Formation of Management Model for Assessment the Economic Security of Individual Interests

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ABSTRACT

In the conditions of reformatting and transformation of the world economy, as well as the aggravation of the international situation, there is an objective need to form a model for assessing the economic security of an individual, taking into account both economic factors and other aspects of social life.

As the **object** of article, the author considers relationships that influence the economic security of vital interests of the individual. The **subject** is indicators of its condition and performance on which its survival and sustainability depend, and **tasks** are to study the raw data for their formation. The **aim** of the article is to develop a model of economic security of the individual.

As a result, the author has formed a model of assessment of economic security of the person, which takes into account assessment of income, expenses, debt, property, family, education, as well as environmental impact, that is, not only its financial and economic situation, but also socio-cultural traits. The relevance of the study, conducted using logical and mathematical **methods** is due to the possibility of applying its results for the rapid identification of places of social tension and the adoption of the necessary measures, and to obtain information on the presence or absence of threats to a particular person's economic security in order to make certain management decisions.

***Keywords*:** personality; economic security; multiple linear regression model; indicators of economic security; assessment of economic security of the individual

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INTRODUCTION

In the XX century in connection with the collapse of the USSR began the change of the economic system from administrative command to market: strong public administration replaced self–regulation to higher quality and fully satisfies the needs of society. At the same time, Russia's economy was being integrated into the global world market.

However, changes in the economic model have led to certain negative developments.

Structural features of the global market, as well as the cyclical development of the economy lead to negative trends and periods of recession, which carry risks for the Russian economy. In 2008–2009, 2014–2018, 2020–2021 there were world economic crises with significant consequences for our country and accompanied by a fall in the standard of living of the population and an increase of debt load.

Currently, the national economy of the Russian Federation is undergoing a period of reformatting and rapid transformation: in the context of changes in the situation over the past two years, under the influence of sanitary and epidemiological restrictions in 2020–2021 and international conflicts in 2021–2022, it intensifies crisis phenomena.

As a result, threats to the vital interests of society and the State, as well as individuals, are increasing. In view of the new realities, the problem assessment of economic security the specific facilities become relevant.

Based on their classically accepted levels of "personality–society–state", it is necessary to consider existing variants of objects taking into account the features, as well as to determine their main indicators that signal a critical change.

At the same time, both in conditions of a relatively stable environment and in times of economic turbulence, the individual's ability to counter economic threats is quite limited, since the latter are global in relation to the vital interests of the individual, they must therefore be confronted without government assistance — only entity with the full resources and possibility to counteract — a particular person is often unable. The Russian Federation was obviously attempts in the interests of society and individuals: as a result of a significant reduction in citizens' incomes, increased costs and debt burden, a series of measures are being implemented to implement social payments to the population, as well as to provide preferential credit facilities.

When the economic situation deteriorates, there is an objective need to assessment the economic security of the individual.

The relevance of this task is due to the possibility of timely diagnosis and identification of existing threats, as well as subsequent reaction and counteraction.

In the conditions of acceleration of social processes, and digitalization of various areas of social and economic life, there is an urgent question of the formation of tools to assessment the security interests of the facility at a particular time, monitor his condition for some time and also anticipate possible developments. In this regard, it is appropriate to create a model that relevant to this task using methods of correlation and regression analysis. And indicators to determine (based on income, expenditures, debts, as well as indicators not directly related to economic, but influencing their formation), influencing the level of protection of economic interests of the individual, by which this article means the condition of its economic interests, in which the possibility of occurrence of threats is minimized and which is described by specific indicators of the model, relevant ratings.

LITERATURE REVIEW

The above problems are devoted to the works of domestic and foreign economists: the description of the person as an economic security object is given in the works D. Zapylenkova [1], O. Bank [2], Yu. Dubyagin, O. Dubyagina, E. Tsaturyan [3], E. Drobot, M. Vartanova [4], O. Kolotkina [5], K. Kurayan, A. Dagldian, K. Marchenko [6], E. Akimova [7]; the position of the individual on the basis of the postulates of the theory of the State and the law is considered in [8–11]; and security of the individual — in [12–13].

The concepts of "rate", "indicator", and "level" of economic security are currently debated, and in the studies describing them the author conventionally identifies two main groups: in some sources, the description of the economic security indicator is based on the condition of its definition as such [14] and, as a result, studying of a specific factor, in effect, means working with the calculated safety characteristic of the facility [15–16]. But there is another approach to the concept, which is the implementation of the results of research obtained in other areas of knowledge from economics and management [17–21].

It is possible to note separately the application of mathematical and econometric methods of research of economic systems and processes [22–24].

At present, the Russian Federation has established a significant regulatory framework for the legal status of the individual (*Table 1*). Thus, the legal status of the individual is governed by the provisions of the Civil Code of the Russian Federation[1] taking into account the requirements of special federal laws.

[1] Civil Code of the Russian Federation No. 51 from 30.11.1994. Published in the Collection of Laws of the Russian Federation No. 32 from 05.12.1994, Chapter 3, art. 3301. URL: http://www.consultant.ru/document/cons_doc_LAW_5142/b8f17657382c206f564e8a7573b96a2bf2c210b3/

RESEARCH

Given that the individual is considered to be the object of economic security, one must keep in mind that interest is an internal priority that drives it and thus determines its behavior. The latter, being subject to emotions, is not rational. In this connection, the concept of "personality" in terms of behavior and decision-making in the article is equated with the concept of "person".

At the same time, in some sources, personality (person) is viewed not only from the position of its biosocial essence, but also as integrated multi– dimensional and multi–level system with interrelated components: cosmological, social, spiritual–moral, psychological, etc. Each of the levels of the individual is formed as a result of its development, is linked to relevant elements of socio–natural and space systems and is in constant contact with them [25]. At the same time, the transition from the concept of "person" to the concept of "personality" implies consideration to a greater extent of socio–economic factors, since the determining factors are not natural, but only socially significant qualities — views, abilities, needs, interests, moral convictions.

The concept of "personality" is signifying the fact of the most complete separation of man from nature, enabling the relationship to it by a specific historical system of social relations.

As a personality, person does not relate to nature as its "body", but through the prism of the social attitudes of civil society, and scientists assume that human activity is purely pragmatic and individualistic [26]. The person acquires property and also earns money in the revenue–generating activities and spend it to meet its needs.

In order to determine the indicators (factors) that influence the level of economic security of the individual, it is necessary to

Table 1

Normative legal acts regulating the legal situation of objects of economic security

No.	Normative legal act	Regulatory field
1	Constitution of the Russian Federation[a]	The rights and freedoms of man and citizen
2	Family Code of the Russian Federation[b]	Marital and family relations
3	Tax Code of the Russian Federation[c]	Tax relations
4	Labour Code of the Russian Federation[d]	Labour relations
5	Code of Administrative Offences of the Russian Federation[e]	Administrative responsibility
6	Housing Code of the Russian Federation[f]	Housing relations
7	Federal Law No.129 from 08.08.2001 "On State Registration of Legal Entities and Individual Entrepreneurs"[g]	Business regulation
8	Federal Law No. 127 from 26.10.2002 "On Insolvency (Bankruptcy)"[h]	Personal bankruptcy
9	Federal Law No. 115 from 25.07.2002 "On the Legal status of foreign citizens in the Russian Federation"[i]	Legal status of foreign nationals
9	Federal Law No. 273 from 29.12.2012 "On education in the Russian Federation"[j]	Education
10	Federal Law No. 125 from 26.09.1997 "On Freedom of Conscience and Religious Associations"[k]	Relations in the field of human and civil rights to freedom of conscience and freedom of religion
11	Law of the Russian Federation No. 3612-I from 09.10.1992 "The Fundamentals of the Legislation of the Russian Federation on Culture"[l]	Cultural relationship

Source: developed by the author.

Note: a) URL: http://www.consultant.ru/document/ cons_doc_LAW_28399/; b) URL: cons_doc_LAW_8982/; c) URL: http://www.consultant.ru/document/cons_doc_LAW_19671/; d) URL: http://www.consultant.ru/document/ cons_doc_LAW_34683/; e) URL: http://www.consultant.ru/document/ cons_doc_LAW_34661/; f) URL: http://www.consultant.ru/document/ cons_doc_LAW_51057/ g) URL: http://www.consultant.ru/document/ cons_doc_LAW_32881/; h) URL: http://www.consultant.ru/document/ cons_doc_LAW_39331/ i) URL: http://www.consultant.ru/document/ cons_doc_LAW_37868/; j) URL: http://www.consultant.ru/document/ cons_doc_LAW_140174/; k) URL: http://www.consultant.ru/document/ cons_doc_LAW_16218/; l) URL: http://www.consultant.ru/document/cons_doc_LAW_1870/

refer to the main areas of knowledge that describe the behavior of the individual.

Internal and external stimuli that affect the behaviour of the person, i.e. what motivates the person to carry out a certain activity, are researched by psychologists and sociologists.

An analysis of the works of scientists on this issue shows that individuals act in pursuit of their individual interests arising from different needs. An example is the "pyramid of needs" A. Maslow [27], whose hierarchy assumes basic needs (e.g., food, water) as well as the need for safety. Failure to satisfy them results in loss of personality. When the needs of the next level (social) are not implied, this is not implied, but personality development becomes impossible.

The individual will always strive to meet the needs, giving priority to those that are most important to him at one time or another;

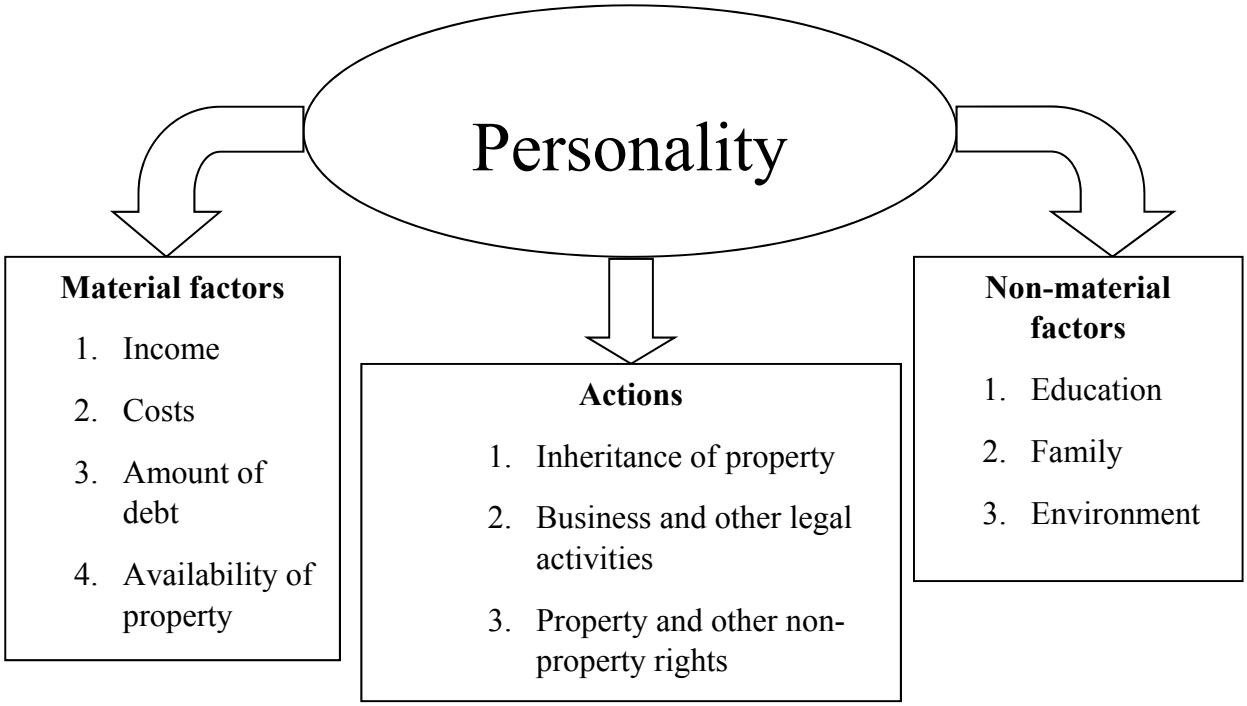

Fig. **Factors affecting the level of economic security of the individual**

Source: compiled by the author.

but until the needs of the lower levels are met, higher levels will not be of interest to the individual.

Construction of a mathematical model of a phenomenon is possible on the basis of both *specific* indicators characterizing the object and *assessment* (i.e. defined criteria for certain assessments), which are used in this article.

It should be noted that threats to the economic interests of the individual are actually taken into account in the indicators and, consequently, in the estimates given. Therefore, the protection of its interests is implicit in the high values of the latter.

At the level of the individual, it is necessary to assess the factors affecting their situation. When investigating this issue, we will assume that a particular person lives in a certain territory, has some property, receives income and, with its help, over the life course, acquires a certain economic prosperity as a result of activities: business and other, not prohibited by law, provided that the State recognizes its property and non–property rights.

The level of economic security of the person is influenced by factors that can be conditionally divided into tangible and intangible. Their change will affect her vital interests, including financial, "food" and other.

Tangible assume a "material" component of life, therefore imply the presence of income and property, in particular housing. At the same time, costs and total debt will have an impact.

From the point of view of the non–material component of the individual's life, which allows him to occupy a position in society and influences the level of wealth, the level of education, the presence and composition of the family, and the existence of a favorable environment.

It follows that the level of economic security can be determined on the basis of tangible and intangible factors, provided that the change in any of them threatens

Table 2

Input data and criteria for indicators of the model for assessing the economic security of the individual

Indicator	Value of classification
Income (X_1)	
1	Income to 10 000 rub.
2	Income from 10 000 to 20 000 rub.
3	Income from 20 000 to 30 000 rub.
4	Income from 30 000 to 40 000 rub.
5	Income from 40 000 to 50 000 rub.
6	Income from 50 000 to 60 000 rub.
7	Income from 60 000 to 70 000 rub.
8	Income from 70 000 to 80 000 rub.
9	Income from 80 000 to 90 000 rub.
10	Income from 90 000 to 100 000 rub.
Costs (X_2)	
1	Costs above 90 000 rub.
2	Costs from 80 000 to 90 000 rub.
3	Costs from 70 000 to 80 000 rub.
4	Costs from 60 000 to 70 000 rub.
5	Costs from 50 000 to 60 000 rub.
6	Costs from 40 000 to 50 000 rub.
7	Costs from 30 000 to 40 000 rub.
8	Costs from 20 000 to 30 000 rub.
9	Costs from 10 000 to 20 000 rub.
10	Costs to 10 000 руб.
Debt burden (X_3)	
1	Presence of long–term debts of more than ten annual incomes
2	Presence of short–term debts of more than one year
3	Presence of long–term debt more than one year income
4	Presence of short–term, long-term debts of more than half a year's income
5	Presence of long–term debts of more than monthly income
6	Presence of short–term debts of more than monthly income
7	Presence of short–term debts of less than monthly income
8	Presence of long–term * debts of less than monthly income

Table 2 (continued)

Indicator	Value of classification
9	Presence of debts of less than daily income
10	Absence of debts
"Presence of asset" (X_4)**	
1	Presence of personal property
2	Presence of sub–housing either at a considerable distance in the absence of a vehicle or the absence of property
3	Presence of habitable but substandard housing far from the workplace with one vehicle per family
4	Presence of habitable but substandard housing, located near from work with one vehicle per family
5	Presence of low–quality and habitable housing located far from work or income — generating activities and one vehicle per family
6	Presence of low–quality and habitable housing located near from work or income — generating activities and one vehicle per family
7	Presence of high–quality and habitable housing located near from work or income — generating activities and one vehicle per family
8	Presence of quality and habitable housing, located near from work, or income — generating activities, and one or more vehicles per family
9	Presence of quality and habitable housing, located far from work, or income — generating activities, and one or more vehicles per family
10	Presence of quality and habitable housing located near the place of work or income–generating activity, several real estate units, and one or more vehicles per family
Education (X_5)	
1	Lack of education
2	Availability of primary education
3	Availability of secondary incomplete education
4	Availability of general secondary education
5	Availability of secondary special education
6	Availability of undergraduate education
7	Availability of higher education
8	Availability of several higher education institutions not used in professional activities
9	Availability of several higher education institutions used in professional activities
10	Availability of academic degrees considered in professional activity
Family (X_6)	
1	Presence of 1/2 minor and 1/2 young children, as well as several dependent persons, including in the absence of a spouse
2	Presence of two or more children and one dependent or two or more young children and in the absence of a spouse

Table 2 (continued)

Indicator	Value of classification
3	Presence of 1/2 minors and 1/2 young children, 1/2 or more minor children and in the absence of a spouse
4	Presence of two or more young children or one young child and in the absence of a spouse
5	Presence of spouse and two or more minor children or one minor child and in the absence of a spouse
6	Presence of spouse and two or more dependent persons (except children)
7	Presence of spouse and one young child
8	Presence of spouse and one minor child
9	Presence of spouse and one dependent person (except children)
10	Presence of spouse without children and dependents
Environment (X_7)	
1	When living outside the town (lack of infrastructure)
2	In the presence of unfavorable natural conditions (remote, northern and highland areas) and unequipped infrastructure (village)
3	In the presence of relatively favorable natural conditions (temperate climate, lack of high mountain areas) and unequipped infrastructure (village)
4	In the presence of favorable natural conditions (mild climate, plain) and unequipped infrastructure (village)
5	In the presence of unfavorable natural conditions (remote, northern and highland areas) and relatively unequipped infrastructure (urban village, district center, village)
6	In the presence of relatively favorable natural conditions (temperate climate, flat terrain, no highland areas) and relatively unequipped infrastructure (urban village, district center, village)
7	In the presence of unfavorable natural conditions (remote, northern and highland areas) and developed infrastructure (regional center, city of more than 500 000 inhabitants)
8	In the presence of relatively favorable natural conditions (temperate climate, lack of high mountain areas) and developed infrastructure (regional center, city of more than 500 000 inhabitants)
9	In the presence of favorable natural conditions (mild climate, plain) and relatively developed infrastructure (urban village, district center, village)
10	In the presence of favorable natural conditions (mild climate, plain) and developed infrastructure (regional center, city of more than 500 000 inhabitants)

Source: developed by the author.

Note: * – the maturity period for short-term debts is less than one year, long-term – more than one year;

** – the expenses incurred by the owner for the maintenance and maintenance of the property are taken into account when calculating X_2.

the possibility of survival and progressive development (see *Figure*).

In order to form a mathematical model of dependence on the existing factors of the general level of economic security of the individual, we shall designate their variables and set the limits of possible values (*Table 2*).

In order to form the final model, let's consider the Y level of economic security of the individual and form a model of multiple

Table 3

Model for assessing the economic security of the individual based on an analysis of 1 020 observations

Variable	Rate	Standard error	*t*-statistics	*p*-value	Importance
Const	–8.40573e-011	2.72131e-012	–30.89	<0.0001	Yes
X_1	0.142857	1.05916e-013	1.349e+012	<0.0001	Yes
X_2	0.142857	1.14075e-013	1.252e+012	<0.0001	Yes
X_3	0.142857	0.000000	1.564e+012	<0.0001	Yes
X_4	0.142857	1.01161e-013	1.412e+012	<0.0001	Yes
X_5	0.142857	1.07032e-013	1.335e+012	<0.0001	Yes
X_6	0.142857	0.000000	1.462e+012	<0.0001	Yes
X_7	0.142857	2.46182e-013	5.803e+011	<0.0001	Yes
Average value of dependent variable		6.947059	Standard deviation of a dependent variable		0.872128
Sum of squares of residues		5.08e-21	Standard model error		2.24e-12
R–square		1.000000	Corrected R–square		1.000000

Source: developed by the author.

linear regression of assessment of economic security of the individual:

$$Y = const + X_1 + X_2 + X_3 + X_4 + X_5 + X_6 + X_7 + \varepsilon.$$

Based on calculations made for the maximum and minimum values of the independent variables given in the *Table 1*, maximum permissible value $X_{max} = 10{,}00$, and $X_{min} = 0{,}00$. Therefore, the maximum protection of the interests of the individual is possible when $X_n = 10$.

In the course of the research, the author modelled a system of indicators of economic security of a person during 85 years of life (1 020 months), and also 11, 20 and 30 years. In order to form private models, samples were considered, including 1 020 observations recording the level of economic security of the person once a month for 85 years; 180 observations (age period 18–33 years); 240 observations (age period 18–38 years); and also 360 observations (age period 18–48 years) with significant indicator, equal 0.01.

Results of the model research from 1 020 observations are shown in *Table 3*.

Based on the data of the *Table 3*, form a private model of assessment of economic security of the individual:

$$\hat{Y} = -8{,}41*10^{-11} + 0{,}143*X_1 + 0{,}143*X_2 + 0{,}143*X_3 + \\ + 0{,}143*X_4 + 0{,}143*X_5 + 0{,}143*X_6 + 0{,}143*X_7.$$

Next, we learn about the model of assessment of the economic security based on 180 observations equivalent to 15 years of human life. As mentioned above, consider the age range 18–33 years as a sample (*Table 4*).

According to the *Table 4* form a private model of assessment of economic security of the individual:

$$\hat{Y} = 2{,}45468*10^{-11} + 0{,}143*X_1 + 0{,}143*X_2 + 0{,}143*X_3 + \\ + 0{,}143*X_4 + 0{,}143*X_5 + 0{,}143*X_6 + 0{,}143*X_7.$$

Table 4

Model for assessing the economic security of individuals based on the analysis of 180 observations

Variable	Rate	Standard error	*t*-statistics	*p*-value	Importance
Const	2.45468e-011	0.000000	Not defined	Not defined	Yes
X_1	0.142857	0.000000	Not defined	Not defined	Yes
X_2	0.142857	0.000000	Not defined	Not defined	Yes
X_3	0.142857	0.000000	Not defined	Not defined	Yes
X_4	0.142857	0.000000	Not defined	Not defined	Yes
X_5	0.142857	0.000000	Not defined	Not defined	Yes
X_6	0.142857	0.000000	Not defined	Not defined	Yes
X_7	0.142857	0.000000	Not defined	Not defined	Yes
Average value of dependent variable		6.347619	Standard deviation of a dependent variable		0.211460
Sum of squares of residues		0.000000	Standard model error		0.000000
R–square		1.000000	Corrected *R*–square		1.000000

Table 5

Model for assessing the economic security of individuals based on the analysis of 240 observations

Variable	Rate	Standard error	*t*-statistics	*p*-value	Importance
Const	–1.42998e-011	0.000000	Not defined	Not defined	Yes
X_1	0.142857	0.000000	Not defined	Not defined	Yes
X_2	0.142857	0.000000	Not defined	Not defined	Yes
X_3	0.142857	0.000000	Not defined	Not defined	Yes
X_4	0.142857	0.000000	Not defined	Not defined	Yes
X_5	0.142857	0.000000	Not defined	Not defined	Yes
X_6	0.142857	0.000000	Not defined	Not defined	Yes
X_7	0.142857	0.000000	Not defined	Not defined	Yes
Average value of dependent variable		6.382143	Standard deviation of a dependent variable		0.195730
Sum of squares of residues		0.000000	Standard model error		0.000000
R–square		1.000000	Corrected *R*–square		1.000000

Table 6

Model for assessing the economic security of individuals based on the analysis of 360 observations

Variable	Rate	Standard error	*t*-statistics	*p*-value	Importance
Const	−4.55435e-012	2.51329e-012	−1.812	0.0708	No
X_1	0.142857	1.18734e-013	1.203e+012	<0.0001	Yes
X_2	0.142857	1.34168e-013	1.065e+012	<0.0001	Yes
X_3	0.142857	0.000000	2.067e+012	<0.0001	Yes
X_4	0.142857	0.000000	1.967e+012	<0.0001	Yes
X_5	0.142857	0.000000	1.609e+012	<0.0001	Yes
X_6	0.142857	0.000000	2.104e+012	<0.0001	Yes
X_7	0.142857	1.24418e-013	1.148e+012	<0.0001	Yes
Average value of dependent variable		6.497619	Standard deviation of a dependent variable		0.238653
Sum of squares of residues		2.00e-22	Standard model error		7.53e-13
R−square		1.000000	Corrected *R*−square		1.000000

Now consider a similar model based on 240 observations (equivalent to 20 years of human life, selected age range 18–38 years). The results of the indicator analysis are reflected in *Table 5*.

Based on this data, we formed a private model:

$$\hat{Y} = -1,42998*10^{-11} + 0,143*X_1 + 0,143*X_2 + 0,143*X_3 + \\ + 0,143*X_4 + 0,143*X_5 + 0,143*X_6 + 0,143*X_7.$$

Finally, to the latest model, based on 360 observations equivalent to 30 years of human life (taking the age range of 18–38 years) — see *Table 6*.

In this case, the private model for assessment of economic security of the individual is as follows:

$$\hat{Y} = -4,55435*10^{-12} + 0,143*X_1 + 0,143*X_2 + 0,143*X_3 + \\ + 0,143*X_4 + 0,143*X_5 + 0,143*X_6 + 0,143*X_7.$$

The determination coefficient of the obtained private models shows that 100% of the research cases are described by the equations. All independent variables are significant; any change per unit results in a change of 0.143 assessment of economic security of the individual. The conclusion is as follows: because the values of the indicators in the model change slowly throughout life, the description of the level of economic security of the individual will be more accurate the longer the analysed period and the larger the sample of observations.

Thus, the method of analysis proposed by the author makes it possible to effectively record changes in the level of economic security of individual interests throughout life by analyzing different periods of his life. At the same time, the formation of private models gives the opportunity to build a mathematical forecast.

DISCUSSION OF RESEARCH RESULTS

In the course of the study, private models for assessing the economic security of individuals were obtained and formed (for analyzing the size of the sample corresponding to a certain life period), effectively reviewing the level of economic security of the individual and

identifying threats to economic security of their vital interests.

Comparing the results with the views of other scientists who have studied this topic, the following should be noted: the author defines indicators of economic security as enabling individuals to develop progressively and independently at a particular time, based on the concept of "economic security" proposed by L. I. Abalkin [28], which is also consistent with the concept, given by S. N. Silvestrov, who notes that "the system of indicators for assessment of economic security should reflect knowledge of the state of the economy as a system, its spheres (subsystems), all major processes and relationships in the economy, ensuring its dynamic equilibrium and its ability to perform its functions to provide national interests in the foreseeable circumstances, and to allow for a more comprehensive assessment of the performance and management of the economy" [29].

M. A. Alabicheva considers the economic security of the individual in the structure of the economic security of the State, arguing that "the economic security of the individual is represented as the readiness and ability of the individual to form a vital level of self–protection and self–determination in the context of the establishment by the institutions of State power of such mechanisms of realization and protection of vital important interests of the individual, which can ensure balanced and sustainable development of the national economy and the State as a whole as a self–developing system" [30]. Due to the fact that the author of the research establishes vital interests of the individual taken for indicators of economic security, the question of the relationship of the personality with the state in the models proposed in the article is not disclosed.

E. V. Romanyuk is formed a factor model for assessing the protection of economic interests of the individual, taking into account only the issues of reproduction of the population. The model proposed by the author shows the relationships between variables, which allows to take into account the probability factor, as well as contains the minimum number of necessary indicators, which makes it, on the one hand, universal, and on the other hand, convenient for practical application [31].

I. A. Kuznetsov is studied consumer economic security as "the human condition and ability, under appropriate socio–economic conditions, to protect and exercise their natural right to a certain level of quality of life", states that "among the many factors characterizing the economic security of the consumer, the economic factor is the leading". At the same time, in the model developed by the author, the assumption is applied that in the process of living, a person acts irrationally, not guided by purely economic calculation, so the indicators of the model are present as tangible (economic)and intangible factors [32].

A. V. Grafov is used estimates, but suggests taking into account the different shares of some of them in the development of mathematical models [33]. The author does not take this circumstance into account because of the study of specific factors that affect the level of economic security, so he proceeded from the equal influence of all factors in the model.

CONCLUSION

In the course of the research the article obtains a model of assessment of economic security, which takes into account both tangible and intangible factors, influencing the state of economic interests of the individual, which allows you to quickly

analyze the state of protection of interests both at a certain point in time and for a long period of time. The model has the advantage of assessing the relationship between its variables.

It identifies the equation of multiple linear regression, which is significant, as well as indicators that influence the overall assessment of economic security.

The results of the research can be applied by statistical services as well as personnel departments of enterprises to obtain information on the presence or absence of threats to the economic security of a particular person.

In addition, the author plans to use the results to conduct further research and to translate them into practice. Thus, such methods of analysis may be useful for assessing the protection of the economic interests of the society represented by the population of the region (municipal entity), either by employees of the enterprise or residents of the Russian Federation as a whole.

REFERENCES

1. Zapylenkova D.A. Personal security as a factor of national security (on the issue of ensuring personal security in the city of Moscow). In: Current trends in the development of the city of Moscow and its relations: Modern trends and tendencies. Coll. sci. pap. Moscow: Voskhod-A; 2018:19–23. (In Russ.).
2. Bank O. Economic security of the individual in the system of economic security of the state. *Russian Journal of Management*. 2020;8(2):106–110. (In Russ.). DOI: 10.29039/2409–6024–2020–8–2–106–110
3. Dubyagin Yu.P., Dubyagina O.P., Tsaturyan E.O. Problems of economic security and its connection with other types of security of the state, society, personality. *Vestnik Moskovskogo gosudarstvennogo otkrytogo universiteta. Moskva. Seriya: Ekonomika i pravo*. 2011;(2):5–8. (In Russ.).
4. Drobot E.V., Vartanova M.L. Economic security: conceptual foundations and assessment of personal security in the countries of the Eurasian Economic Union. *Ekonomicheskie otnosheniya = Journal of International Economic Affairs*. 2019;9(4):2621–2648. (In Russ.). DOI: 10.18334/eo.9.4.41279
5. Kolotkina O.A. Economic security of the individual: Concept, place in the national security system of the Russian Federation. In: Problems of interaction of public and private law in the regulation of economic relations. Proc. 2nd Int. sci.-pract. conf. Yekaterinburg: Ural State University of Economics; 2018:55–58. (In Russ.).
6. Kurayan K.A., Dagldian A.S., Marchenko K.O. The place of economic security in the national security system. In: Problems and prospects of development of theory and practice of modern management. Proc. Int. sci.-pract. conf. Roston-on-Don: RANEPA branch; 2019:128–131. (In Russ.).
7. Akimova E.S. Food security indicators of from the position of ensuring the economic security of the personality. *E-Scio*. 2019. 2019;(6):649–656. (In Russ.).
8. Proshnikov D.V. The right of the individual to security. *Pravo i obshchestvo = Law and Society*. 2013;(2):52–56. (In Russ.).
9. Kolotkina O.A. The right of the individual to security: the concept and mechanisms of security in the Russian Federation (theoretical and legal research). Cand. legal sci. diss. Saratov: Saratov State Academy of Law; 2009. 215 p. (In Russ.).
10. Stepanov O.A. Law, the state and personal security in the conditions of the development of the information and electronic environment. *Gosudarstvo i pravo = State and Law*. 2004;(11):34–38. (In Russ.).
11. Krivonoshchenko A.S. The right to personal security and its components. *Pravo.by*. 2017;(4):26–30. (In Russ.).
12. Srinita S. Relationship between maternal, household, and socio-economic characteristics and household food security in Aceh, Indonesia. *International Journal of Human Rights in Healthcare*. 2018;11(3):192–203. DOI: 10.1108/IJHRH-10–2017–0065

13. Gangopadhyay P., Suwandaru A., Bakry, W. On the impacts of globalisation on public employment and human security in India: A long-run analysis. In: Chatterji M., Gangopadhyay P., eds. New frontiers in conflict management and peace economics: With a focus on human security. Bingley: Emerald Publishing Limited; 2021:103–114. (Contributions to conflict management, peace economics and development. Vol. 29). DOI: 10.1108/S 1572–832320210000029007
14. Ilyin P.A. The model of economic security assessment designed using the methods of correlation and regression analysis. *Vektor nauki Tol'yattinskogo gosudarstvennogo universiteta. Seriya: Ekonomika i upravlenie = Science Vector of Togliatti State University. Series: Economics and Management.* 2021;(3):35–42. (In Russ.). DOI: 10.18323/2221–5689–2021–3–35–42
15. Avdiiskii V.I., Senchagov V.K. Methodologies for determining threshold values of the main (priority) risk factors and threats to economic security of economic entities. *Ekonomika. Nalogi. Pravo = Economics, Taxes & Law*. 2014;(4):73–78. (In Russ.).
16. Glaz'ev S. Yu. Strategy of advanced development of Russia in the conditions of the global crisis. *Rossiiskii ekonomicheskii zhurnal = Russian Economic Journal*. 2010;(3):93–100. (In Russ.).
17. Butsenko I.N., Moskvina G. Yu. Economic development of Russia from the perspective of economic security. *Ekonomika i biznes: teoriya i praktika = Economy and Business: Theory and Practice*. 2016;(3):26–31. (In Russ.).
18. Blank I.A. Fundamentals of financial management (in 2 vols.). Vol. 1. Kiev: Nika-Center; 1999. 592 p. (In Russ.).
19. Fischer S., Dornbusch R., Schmalensee R. Economics. New York: McGraw-Hill Book Co.; 1988. 813 p. (Russ. ed.: Fischer S., Dornbusch R., Schmalensee R. Ekonomika. 2nd ed. Moscow: Delo Ltd; 1995. 864 p.).
20. Karanina E.V. Analytical model of the risk system of strategic management. *Ekonomicheskii zhurnal = Economic Journal*. 2011;(3):44–53. (In Russ.).
21. Sheremet A.D., Garmash M.G. Comprehensive rating estimation of corporate sustainability. *Audit i finansovyi analiz = Audit and Financial Analysis*. 2017;(3–4):152–157. (In Russ.).
22. Thomas R. Quantitative methods for business studies. Harlow: Prentice-Hall; 1997. 536 p. (Russ. ed.: Thomas R. Kolichestvennye metody analiza khozyaistvennoi deyatel'nosti. Moscow: Delo i Servis; 1999. 432 p.).
23. Ehrenberg A.S.C. Data reduction: Analysing and interpreting statistical data. London, New York: John Wiley & Sons; 1975. 391 p. (Russ. ed.: Ehrenberg A. Analiz i interpretatsiya statisticheskikh dannykh. Moscow: Finansy i statistika; 1981. 406 p.).
24. Kane E.J. Economic statistics and econometrics: An introduction to quantitative economics. New York: Harper & Row; 1968. 437 p. (Russ. ed.: Kane E. Ekonomicheskaya statistika i ekonometriya. Vvedenie v kolichestvennyi ekonomicheskii analiz. Moscow: Statistika; 1977. 232 p.).
25. Ozerov A.E. Person's socialization and basic personality's needs. *Sotsial'no-gumanitarnye znaniya*. 2010;(3):327–334. (In Russ.).
26. Olkhovikov K.M., Olkhovikova S.V. Life career of personality: Conceptual substantiations of the phenomenon' research. *Diskussiya = Discussion*. 2017;(4):66–71. (In Russ.).
27. Bragina Yu.A. The role of A. Maslow's theory in the system of personnel labor motivation. *Alleya nauki = Alley-Science*. 2018;6(11):418–422. (In Russ.).
28. Abalkin L.I. Economic security of Russia: Threats and their reflection. *Voprosy ekonomiki*. 1994;(12):4–16. (In Russ.).
29. Bauer V.P., Belyaev I.I., Bulavin A.V., Vorozhikhin V.V., Voronin V.V., Gainulin D.G., Pobyvaev S.A., Selivanov A.I., Starovoitov V.G., Troshin D.V. Economic security of Russia: Methodology, strategic management, system engineering. Moscow: KnoRus; 2018. 350 p. (In Russ.).
30. Alabicheva M.A. Economic security of the personality as structural component of economic security of the state. *Sotsial'no-ekonomicheskie yavleniya i protsessy = Social and Economic Phenomena and Processes*. 2014;9(11):9–14. (In Russ.).

31. Kuznetsov I.A. Economic security of the consumer: Prerequisites of methodological dualism of economic behavior. *Sotsial'no-ekonomicheskie yavleniya i protsessy = Social and Economic Phenomena and Processes*. 2015;10(3):41–46. (In Russ.).
32. Romanyuk E.V., Bairakova I.V., Trusevich E.V., Nazarenko G.P. Economic security of the individual and its assessment in modern Russia. *Problemy sotsial'no-ekonomicheskogo razvitiya Sibiri*. 2021;(3):55–62. (In Russ.). DOI: 10.18324/2224–1833–2021–3–55–62
33. Grafov A., Yusupov A., Shahvatova S., Mikhalev D. To the question of assessing the financial condition of the company. *Auditor*. 2018;4(11):47–51. (In Russ.). DOI: 10.12737/article_5bfd010c15f3c8.44982488

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