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Developing Soft Skills Among Managers of Large-Scale International Projects in the Nuclear Industry

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ABSTRACT

This study **aims** to systematize practical recommendations for applying core principles of managing large, multi-tiered international projects in the nuclear industry, based on both Russian and international experience. The resulting compilation outlines specific analytical tools that identify risk-prone areas in the management processes of nuclear power plant (NPP) construction projects, as well as actionable steps to mitigate these risks. Particular attention is given to the project manager's role within the oversight of a parent company and their integration into its broader business processes. Additionally, the proposed classification offers the foundation for a training system capable of dynamically addressing emerging challenges and adapting to new approaches. The research draws upon established project management frameworks and employs both general scientific **methods** – such as analysis and synthesis, observation, grouping, and comparison – and specialized methodologies. The **findings** may be useful to project managers seeking to organize and enhance their knowledge and experience in managing NPP construction projects. **Keywords:** project management; international project; large-scale project; nuclear energy; soft skills; project supervisor training

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INTRODUCTION

The experience of implementing large-scale contemporary business projects demonstrates that their management overwhelmingly prefers to apply the principles of project management [1–3] within the framework of complex adaptive systems theory, rather than relying on traditional management approaches [4]. This tendency is largely justified by the need to address unique tasks with specific final outcomes that meet the technical and economic parameters and expectations of the client, all within strictly defined timeframes and in a rapidly changing economic environment.

The organizational structure of modern project management is typically embodied in a special-purpose vehicle (SPV) or special-purpose entity (SPE¹), created to mobilize the necessary resources for project implementation. It should be noted that the practical realization of such projects cannot rely solely on the rigid discipline characteristic of bureaucratic management models [5] or on the iterative decision adjustments typical of regular management [4]. This substantiates the need to develop soft skills [6] to ensure the flexibility [7] required in project management.

These trends are observable across most industries, including the nuclear sector (see *Table 1*), which has become the focus of this study. The key research question concerns the possibility of scientific and practical generalization of the core competencies required by project managers, based on a systematic analysis of accumulated experience in project management within the nuclear industry, particularly in the implementation of large-scale, international, multi-level projects. *Table 1* presents the

Table 1

Global Structure of the Nuclear Energy Sector

Country	Power in MW	Number of reactors
Argentina	1 641	3
Armenia	416	1
Belarus	2 220	2
Belgium	3 463	4
Brazil	1 884	2
Bulgaria	2 006	2
Canada	12 669	17
China	55 278	57
Czech Republic	3 934	6
Finland	4 394	5
France	62 990	57
Hungary	1 916	4
India	7 550	21
Iran (Islamic Republic of)	915	1
Japan	12 631	14
Republic of Korea	25 825	26
Mexico	1 552	2
Netherlands (Kingdom of the)	482	1
Pakistan	3 262	6
Romania	1 300	2
Russia	26 802	36
Slovakia	2 308	5
Slovenia	688	1
South Africa	1 854	2
Spain	7 123	7
Sweden	6 944	6
Switzerland	2 973	4
Ukraine	13 107	15
United Arab Emirates	5 321	4
United Kingdom	5 883	9
United States	96 952	94
Total	377 221	417

Source: compiled by the authors based on IAEA data (accessed on 05.04.2025).

¹ SPV (Special Purpose Vehicle) or SPE (Special Purpose Entity) is a special purpose company (legal entity) or project company created to implement a specific project or for a specific purpose.

global nuclear energy market volumes, which indicate the potential areas of application for the findings of this research.

RESEARCH METHODOLOGY

The **relevance** of this study is confirmed by the lack of systematization of moderation techniques for project processes in the construction of nuclear power plants across different countries.

The fundamental theoretical principles of project management are currently applied in almost all sectors of the Russian economy and are well covered in the academic literature [8–10]. Building on these principles, the present

research relies on the methodology derived from W. Buckley's theory of complex adaptive systems. The viability characteristic of such systems is determined not by theoretical constructs but by the ability to develop soft skills based on the generalization of practical experience supported by theoretical achievements. To systematize the problems and solutions encountered in the nuclear industry, an approach has been developed based on the formation of a framework, which is methodologically close to our study. It can be described as "a systematic process of collecting information that includes a formal template classifying skills based on the theoretical assessment of practical achievements" [11].

Table 2

General Layout of Nuclear Power Facilities in Russia through 2042

Existing nuclear power plants remaining in operation by 2042	New nuclear power plants planned to be built by 2042
Kola NPP	Smolensk NPP-2
Leningrad NPP-2	Kola NPP-2
Kalinin NPP	Southern NPP
Balakovo NPP	Kursk NPP-2
Novovoronezh NPP-2	Reftinsk NPP
Rostov NPP	South Ural NPP
Beloyarsk NPP	Norilsk SMR (Small Modular Reactor)
FNPP (Floating Nuclear Power Plant)	Seversk NPP
—	Yakutsk SMR
	Siberian NPP
	Chukotka SMR
	Khabarovsk NPP
	Primorsk NPP

Source: Compiled by the authors based on data of Decree of the Government of the Russian Federation dated 12/30/2024 No. 4153-r. "On the General Layout of Electric power facilities until 2042".

The cited article presents the template in the format “problem — theoretical recommendations — accumulated experience”, which we find appropriate to retain for presenting our own findings. A more detailed structure could lead to unnecessary bureaucratization and distort the essence of large-scale project management. The main goal, therefore, is to systematize problems in order to develop a learning system for the subsequent adaptation of practical moderation techniques in project management, thus confirming their effectiveness and viability [12].

In this context, the integration of accumulated practical experience is of particular importance. It is carried out on the basis of Russia’s current General Scheme for the Siting of Electric Power Facilities up to 2042² (Table 2) and the country’s active participation in the international market for nuclear power plant construction. Examples include Akkuyu NPP (Turkey), Kudankulam NPP (India), Paks II NPP (Hungary), Rooppur NPP (Bangladesh), Xudapu NPP (China), Tianwan NPP (China), and El Dabaa NPP (Egypt).

For the purposes of this study, **large-scale projects** are defined as those with a budget of at least 1 trillion rubles or 10 billion euros (based on the exchange rate at the time of writing) and are typically complexly structured. It should therefore be clarified that this research focuses specifically on multilevel projects, the stages of which — namely: the design of project and working documentation; the procurement of equipment, both centralized and through comprehensive contracting and lot-based procurement systems (design + equipment + construction and installation works + other services within a single procurement lot); construction and installation works,

and other associated expenditures (including project management, project team costs, construction supervision, personnel training, licensing, logistics, customs duties, etc.) — are fully consolidated within a single SPV company.

An integral part of the methodology of this study is the consideration of risks inherent in large-scale projects. With respect to multilevel projects, it should be noted that they are characterized by a high level of risk [13–16], which may arise from both the specific features of the project itself and its external environment.

FEATURES OF MULTILEVEL PROJECTS

The research has identified several key (fundamental) characteristics typical of projects of this type (see Fig. 1):

- significant scale: duration from 5 to 10 years, with a budget exceeding 1 trillion rubles;
- need to address a range of resource and technological issues, including those related to materials, machinery and equipment, and labor costs;
- presence of various uncertainties, the so-called “grey zones”;

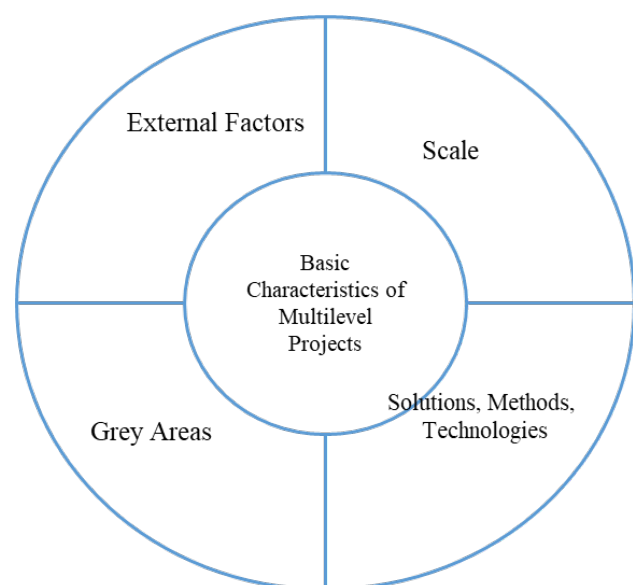


Fig. 1. Key Characteristics of Multi-Level Projects

Source: Developed by the authors.

² Order of the Government of the Russian Federation dated 30.12.2024 No. 4153-r “On the General Scheme for the Placement of Electric Power Facilities until 2042” URL: https://www.consultant.ru/document/cons_doc_LAW_495635/

- lack of tested or formalized solutions, methods, and technologies.
- dependence on external factors, conditions, restrictions

In the context of large-scale international multilevel projects in the nuclear industry (IMPNI), the following specific features should be highlighted [17, 18] (see *Figure 2*):

- IMPNI are associated with a high level of political responsibility and are under the control of the governments of the participating countries, as project financing falls within the domain of international-level competencies;
- each party imposes strict requirements regarding safety and environmental protection, due to the inherent characteristics of projects linked to the global nuclear industry;
- these stringent requirements result in close supervision by regulatory authorities and heightened risks during the approval of technical solutions;
- the implementation of such solutions leads to uncertainty in project cost assessment — for example, the initial cost estimate

may vary within a –50% to +100% range, followed by a gradual narrowing of this range; this also includes engineering surveys at project sites, hydrogeological monitoring, geodetic support for construction and installation works, and related activities;

- there is increased media attention, which tends to be influenced by global political events, owing to the highly politicized nature of multilevel international projects.

When evaluating a multilevel project — which naturally attracts increased attention from the senior management of the SPV/EPC company implementing it — it is proposed that such an evaluation be carried out using a specific set of parameters and in accordance with the stages outlined above. This approach makes it possible to identify the dominant characteristics of the project, which, in turn, will assist the project manager in pinpointing the areas and directions most likely to become sources of problems and risks.

The key management features of a large-scale project can be represented as four main analytical blocks:

- **Scale.** The challenges associated with this factor arise from: the long duration of the project (around ten years); the large number of organizations involved in its implementation, including those that set requirements or provide financing; the significant budget and volume of contracting [18–20]; and the extensive project title list (over 700 items) along with the wide range of professional competencies required.
- **Uncertainty of result requirements.** This block refers to non-formalized requirements for the project outcome and the large number of stakeholders defining them (customers, co-customers, etc.); the lack of sufficient expertise on the part of the customer to fully describe the requirements; and the modifications made to those requirements during project implementation.

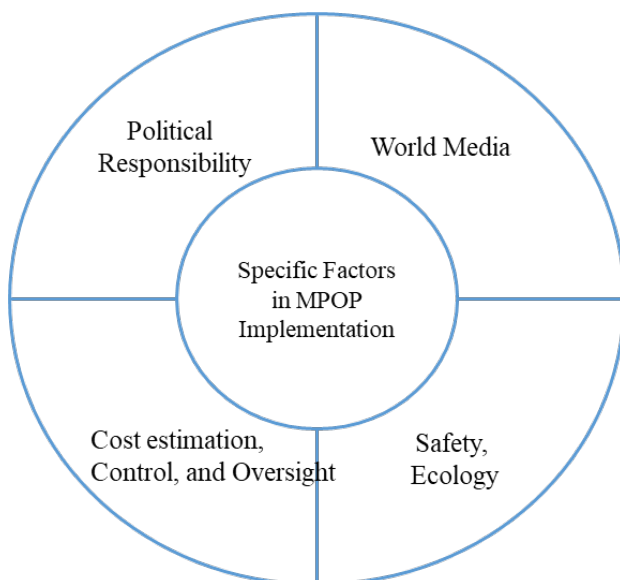


Fig. 2. Specific Implementation Factors of IMTNPs (international multi-tiered nuclear projects)

Source: Developed by the authors.

Table 3

Recommended Soft Skills for Addressing Scale-Related Challenges in Project Management

Problem field	Recommendation to the project supervisor
Duration	
Project duration exceeds 10 years → repetitive processes → lack of visible results → decline in team motivation → loss of valuable project specialists → decreasing interest from the customer.	Theoretical basis: Regular assessment of team motivation; motivation of performers for productive work; organization of knowledge management processes to prevent knowledge loss when project participants are replaced. Example of accumulated experience: when a decrease in motivation was recorded among the MMIA project team (for example, due to repeated “pauses” caused by supervisory authorities or geopolitical events), motivation was restored by temporarily transferring employees to a new project being launched in Russia. This allowed the team to apply its accumulated experience adapted to local conditions. Recommendation: if a projected pause of more than six months arises in the MMIA project, promptly transfer the team to another project. Argumentation: increased team motivation; cost savings for team maintenance over a six-month horizon; application of previously learned lessons on a new or parallel project.
Involved Organizations	
More complex communication processes → decentralization of responsibility → conflicts of interest.	Theoretical basis: building communication channels between participating organizations [22]; forming a project governance structure that reflects the interests of all involved parties (collegial structures); developing unified terminology and rules of interaction. Example of accumulated experience: in a structure that included a general designer directly contracted by the customer, communication proved inefficient because it was disconnected from the contract cost determination process. This regularly caused cost increases for the customer or reduced profit – and even losses – for the EPC contractor.* Eventually, the general designer was placed under the EPC contractor, with centralized relations to the customer tied to pricing mechanisms, resulting in a positive economic effect. Recommendation: contract the general designer as a subcontractor of the general contractor (not directly with the customer). Argumentation: cost savings at the documentation approval stage by eliminating potential changes through the general contractor’s team; prevention of extra work volumes being unjustifiably added by the general designer.
Objects and Work Scope	
Large number of facilities and work volumes → complex project management tools → shortage of specialists with key competencies → project delays.	Theoretical basis: Developing a clear and manageable project structure; using optimization tools by consolidating shared services and resources; building a system of delegation, responsibility distribution, authority, and control. Example of accumulated experience: When a project manager was subordinate to collegial governing bodies of the parent company, decision-making times increased significantly, even for operational matters. After analyzing the causes and consequences, project site managers at nuclear power plant (NPP) construction sites were granted authority to make operational decisions identified under a methodology assessing the impact of critical circumstances on project cost. Recommendation: Grant additional authority to the project manager for operational decision-making at NPP construction sites – effectively debureaucratizing the parent company’s decision-making process. Argumentation: Cost savings by preventing downtime and halts in construction due to long decision-making processes within the parent company.

Continued Table 3

Problem field	Recommendation to the project supervisor
Budget and Contracting Volume	
Large project budget → complex procurement and contracting procedures.	Theoretical basis: Effective interaction between the project team and the procurement departments; determination of appropriate contracting schemes; assessment of procurement-related risks. Example of accumulated experience: During centralized procurement by the parent company of equipment (including complex items with over one year of production time), materials, and construction works for an NPP project, delivery schedules were delayed due to lengthy tendering procedures. A pilot project was therefore launched, establishing an internal procurement unit, which drastically reduced procurement and delivery times to the construction site. Recommendation: Establish a procurement unit within the project structure, effectively decentralizing the procurement function. Argumentation: Cost savings by reducing downtime and halts in construction caused by the lengthy centralized procurement process.
Areas of Professional Competence	
Differences in terminology across professional fields → communication breakdowns, misunderstandings, conflicts, reluctance of experts to cooperate, and potential shortage of competent specialists.	Theoretical basis: Integration of different professional areas and development of a unified language of professional communication; control over interactions between specialists; prevention of conflicts. Example of accumulated experience: To ensure effective communication within a multiproject team, a mapping of company positions was carried out, based on an analysis of the competencies of their structural units and personnel. Recommendation: Align the roles and positions of team members across all participating companies. Argumentation: Preventive time and cost savings for the project team through more efficient communication processes.

Source: Developed by the authors.

Note: * – An EPC (Engineering, Procurement, and Construction) contract is a turnkey agreement under which the contractor is responsible for the design, procurement, construction, and commissioning of the project.

- Uncertainty in technology implementation. This refers to the novelty of applied technologies for the customer, the need for integration of a large number of technologies, and the potential replacement of key technologies during the project lifecycle.

- Critical influence of external factors [21, 22], including: geographical dispersion and cultural diversity among project participants; interconnectedness and interdependence of projects; significant external barriers and constraints such as

political, environmental, and legal limitations; and the strategic importance of the project for the participating organizations, government authorities, and society, which results in increased attention and oversight of its implementation.

The identification of these problem blocks made it possible to systematize generalized recommendations for the development of soft skills among project managers in accordance with the proposed framework (“problem–theory–experience”), as presented in *Tables 3–6*.

FEATURES OF MANAGING A SMALL OR MEDIUM PUBLICLY OWNED COMPANY UNDER THE SUPERVISION OF A PARENT COMPANY

Fig. 3 presents a structural systematization of the areas of new “soft skills” required of a project manager.

Large-scale international multi-level projects in the nuclear industry (MMPAOs) never arise or

are implemented independently of the parent company [34]; rather, they are always conducted within the framework of the company’s predefined strategic goals and objectives, as well as the expectations regarding both the outcomes of operational and project activities and the processes governing them. Naturally, this exerts a significant influence on the projects, with the effect being more pronounced as their complexity and scale increase.

Table 4

Recommended Soft Skills for Managing High Uncertainty in Project Outcomes

Problem field	Recommendation to the project supervisor
Likelihood of Significant Changes in Requirements	
Changes in the project → reduced team motivation → loss of knowledge	Theoretical basis: building an effective change-management process within the project. Example of accumulated experience: The procedure of directly submitting price increase requests to the customer (even when the process was clearly described in the EPC contract and the increase resulted from evaluating the customer’s own requests) turned out to be ineffective. Acting “head-on,” strictly according to the contract, led to misunderstandings, conflicts, and breakdowns in communication. As a result, based on the analysis of such outcomes by the project team, a new procedure was launched: forming rapid-response groups (including a contracts specialist, a cost engineer, and a technical engineer) for each project discipline to communicate the results of evaluating the customer’s requests. In some cases, this approach led the customer to withdraw additional requirements (e.g., relocating training centers from the construction site to a nearby satellite town); in others – to an understanding that the requested actions would increase the cost of the work (which was not always justifiable even from an engineering standpoint). Recommendation: proactively form mobile groups to work with the customer on assessing the feasibility and cost of change requests. Argumentation: cost savings for the customer and reduced time expenditures for the EPC contractor by identifying non-feasible change requests early.
Large number of stakeholders defining requirements	
Each stakeholder may have different expectations about the project and its deliverables → conflicts, acceptance problems.	Theoretical basis: creating an effective requirements-management system; ensuring traceability; timely identification of requirement-related conflicts; their prompt resolution and control throughout project execution. Example of accumulated experience: In nuclear power plant construction, the EPC contractor often encounters situations where the customer does not fully understand what they need. The contractual requirement to deliver a completed nuclear power plant is insufficient to define precise technological solutions. Therefore, a pre-contract stage was introduced to immerse the customer in the specifics of the facility being constructed. This significantly reduced misunderstandings during the construction process. Recommendation: ensure that, at the pre-contract stage, the customer is fully immersed in the specifics of the planned NPP. Argumentation: significant reduction in change requests for design, working, and licensing documentation during construction.

Continued Table 4

Problem field	Recommendation to the project supervisor
Unformalized requirements (expectations)	
Requirements are formulated in general terms, without necessary detail → differences in interpretation → underestimation of workload → difficulties during acceptance of results. [23–25]	Theoretical basis: identification of unformalized requirements and the causes of their emergence; clarifying them; creating reserves to account for the risk of workload underestimation; developing a staged implementation strategy with periodic demonstrations of the evolving product to refine requirements during execution. Example of accumulated experience: Analytical data led to revising the methodology for forming risk reserves, as it has not yet been possible to fully eliminate differences in expectations between the customer and the EPC contractor, especially under a fixed-price contract. Recommendation: increase the calculated risk percentage in the cost structure of an NPP construction project. Argumentation: creation of a reserve financial source to fund the customer's unformalized requirements (expectations).
Customer lacks expertise to formulate requirements	
Lack of expertise → requirements may not reflect real needs → problematic contracting → acceptance issues and insufficient customer resources to support the project during implementation. [27, 28]	Theoretical basis: enhancing the customer's level of expertise: training, engaging experts, developing contracting schemes, and organizing contract work with consideration of these specifics (staged contracts, framework agreements). Example of accumulated experience: Changing the contract terms regarding customer personnel training – moving this component from the optional part of the contract to the mandatory part – helped raise the customer's expertise level. Previously, the customer often refused training to reduce its costs or postponed it, which later led to long negotiations and lack of results. Recommendation: include customer training expenses as a mandatory, not optional, component of the EPC contract. Argumentation: raising the customer's level of expertise.

Source: Developed by the authors.

Table 5

Recommended Soft Skills for Managing Technological Uncertainty

Problem field	Recommendation to the project supervisor
High Probability of Replacing Key Technologies During Project Implementation	
Such a situation may arise in projects where, at the initial stages, several technological solutions were considered without clear advantages of one over another. Problems in these cases include delays (caused by the need to revise decisions, search for new technology and contractors), as well as repeated approval of documentation and integration issues.	Theoretical basis: The emergence of this problem area in large-scale international nuclear projects (MMIA), particularly in nuclear power plant (NPP) construction, is unlikely, since all technological decisions are made before the start of project development, based on the selected construction site and results of geological and engineering surveys. Example of accumulated experience: This issue must be addressed during the investment justification or feasibility study (IJ/FS) stage and subsequently confirmed by the Main State Expert Review (Glavgosexpertiza, GGE) during the defense of the consolidated cost estimate results for the project. Recommendation: Pre-approve and include work execution technologies in subcontract agreements at the stage of excavation waterproofing and soil stabilization. Argumentation: Avoidance of additional, unplanned earthworks not covered by the EPC contract.

Continued Table 5

Problem field	Recommendation to the project supervisor
Novelty of Technologies for the Customer	
There is a high risk that the customer will not be able to master a new technology and will struggle with subsequent management of operations.	Theoretical basis: This risk can be mitigated by contracting for training of the customer's personnel. Example of accumulated experience: Signing supplementary agreements to the main EPC contract for training operational personnel and constructing a training center directly at the NPP site. Recommendation: Include costs for the construction of training centers as mandatory, not optional, components of the EPC contract. Argumentation: Enhancement of the customer's level of technical expertise. Low Readiness of Technologies Used in the Project
Low Readiness of Technologies Used in the Project	
The novelty of applied technologies increases the risk of failures and hidden problems during implementation. Due to a lack of expertise in innovative solutions, dependency on external specialists familiar with the technology rises.	Theoretical basis: Low probability within MMIA projects. Example of accumulated experience: Legal establishment, in the country where the NPP is being constructed, of a requirement for the customer to conduct the corresponding expert review, with the related costs included in the EPC contract price. Recommendation: Include expert review costs as mandatory, not optional, components of the EPC contract. Argumentation: Improvement of the customer's level of expertise.
Large Number of Applied Technologies	
The main problems in such projects are typically related to the integration of different technological solutions	Theoretical basis: Low probability within MMIA projects. Example of accumulated experience: If the risk of this problem area arises, it can be mitigated during the investment justification (IJ) phase. Recommendation: Ensure appropriate emphasis on technological integration issues during the preparation of the IJ. Argumentation: Better control of costs related to change requests during the development of design and working documentation.

Source: Developed by the authors.

Table 6

Recommended Soft Skills for Managing Critical External Factors

Problem field	Recommendation to the project supervisor
Particular Importance of the Project for Involved Organizations	
Increased oversight ⇒ inflated stakeholder requirements ⇒ tense team atmosphere ⇒ reluctance of project participants to take responsibility or implement necessary changes ⇒ project delays [28]	Theoretical basis: Identify the reasons for the project's significance and parameters important to each stakeholder; organize regular activities for managing stakeholder expectations and promptly respond to associated risks. Example of accumulated experience: Recognition of the need for daily work with the customer to manage expectations related to both internal and external processes accompanying the construction of the NPP. Recommendation: Ensure daily interaction with the customer to account for and understand their expectations. Argumentation: Cost management through early identification of change requests during the development of design and working documentation.

Continued Table 6

Problem field	Recommendation to the project supervisor
Geographical Dispersion and Cultural Differences Among Participants	
High risk of conflicts ⇒ lack of mutual understanding among participants ⇒ technical difficulties in communication.	Theoretical basis: Focus on building a comprehensive communication system among participants and forming a unified, cohesive project team. Example of accumulated experience: Work was carried out to familiarize project mediators with the cultural and geographical characteristics of the participating companies [29–31]. Recommendation: Ensure daily work with project participants to support effective communication. Argumentation: Reduction of bureaucratic barriers in communication processes among project participants.
Significant External Barriers and Constraints	
Strict project limitations ⇒ difficulties in managing stakeholder expectations and preparing reporting documentation [32, 33].	Theoretical basis: Identify project-relevant barriers and constraints; ensure the presence of internal or external expertise within the project to address them. Example of accumulated experience: When facing anticipated international barriers, it is necessary (for example, six months in advance) to replace the project manager – appointing an international contract specialist instead of a construction engineer to focus the team on mitigating global-level contractual risks. Recommendation: Ensure the project manager's level of expertise and qualifications correspond to the current stage of project implementation. Argumentation: Improved project management alignment with the stage of project execution.
Interdependence with Other Projects	
Complex change management processes ⇒ conflicts over resource allocation ⇒ emergence of additional requirements linked to external projects	Theoretical basis: Identify dependencies; ensure synchronization of work with related projects; promptly resolve conflicts between interdependent initiatives. Example of accumulated experience: When forming the parent company's investment program, synchronization with all stages of parallel project implementation is required. Recommendation: Ensure a designated funding source within the parent company's investment program. Argumentation: Reduction of bureaucratic barriers in project management related to funding sources.

Source: Developed by the authors.

Fig. 4 illustrates the position of MMPAOs (design, engineering, and construction of nuclear power plants) within the parent company's operational domains. On this basis, the following sequential steps can be identified for developing recommendations to the MMPAO project manager when overseeing projects under these conditions:

- synchronization of the project with the parent company's strategic objectives (1);
- ensuring the realization of anticipated benefits and effects (2);
- analysis of project-specific characteristics and initiation of the project management system (3);
- adaptation of the role structure and personnel management (4);
- adaptation of processes and the information environment (5).

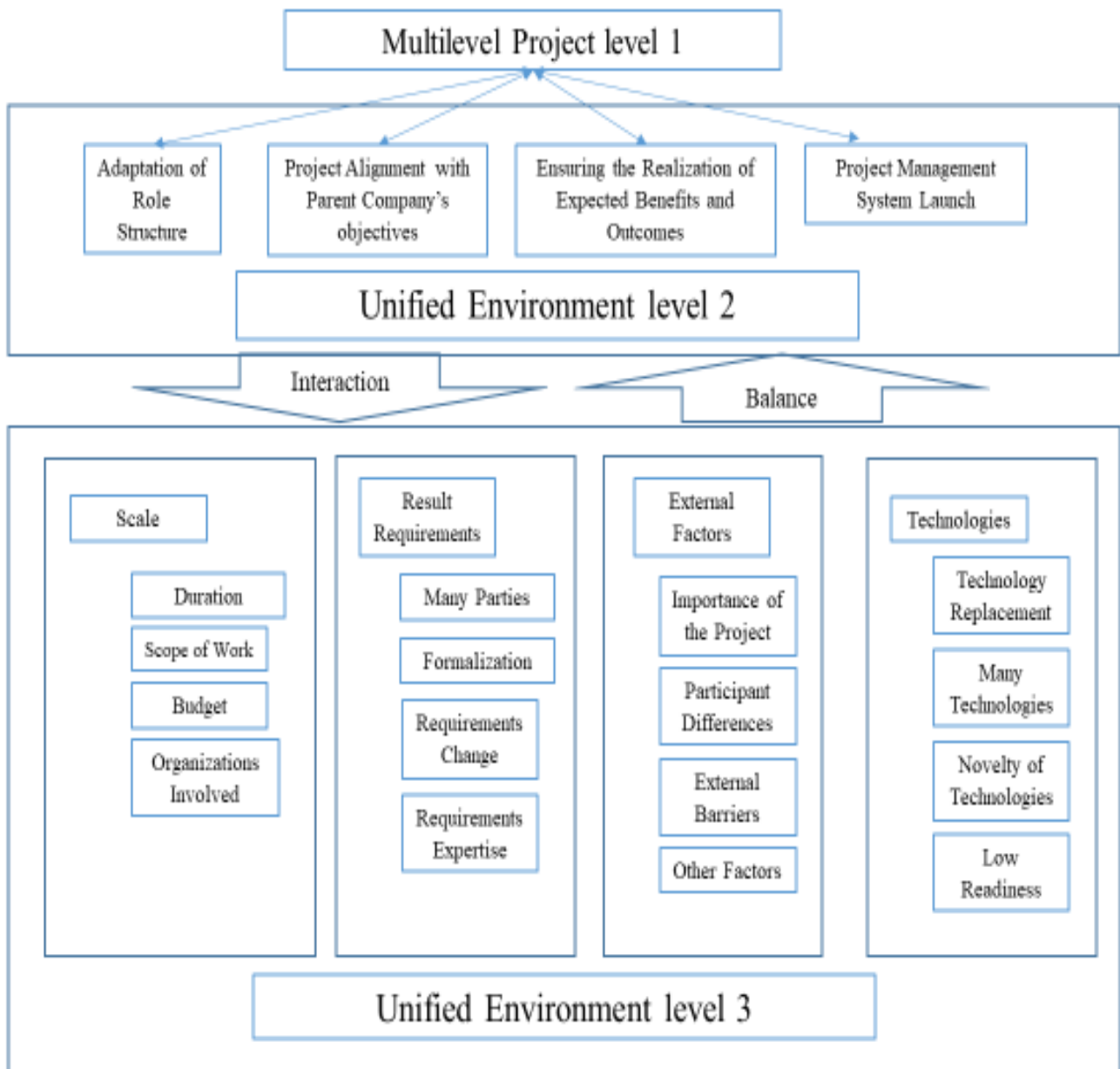


Fig. 3. Structural Systematization of Emerging Soft Skill Domains for Project Managers

Source: Developed by the authors.

Let us examine the above in greater detail:

Synchronization of the project with the parent company's objectives (1) may involve the following risks:

- an unexpected decline in project priority due to adjustments in the parent company's strategy or the launch of new projects, which may result in a reduced allocation of resources;

- conflicts between the objectives of this project and those of related projects, programs, or operational activities of the parent company.

In this case, the project manager is recommended to:

- continuously monitor the alignment of objectives for both the project in question and higher-level projects within the portfolio and

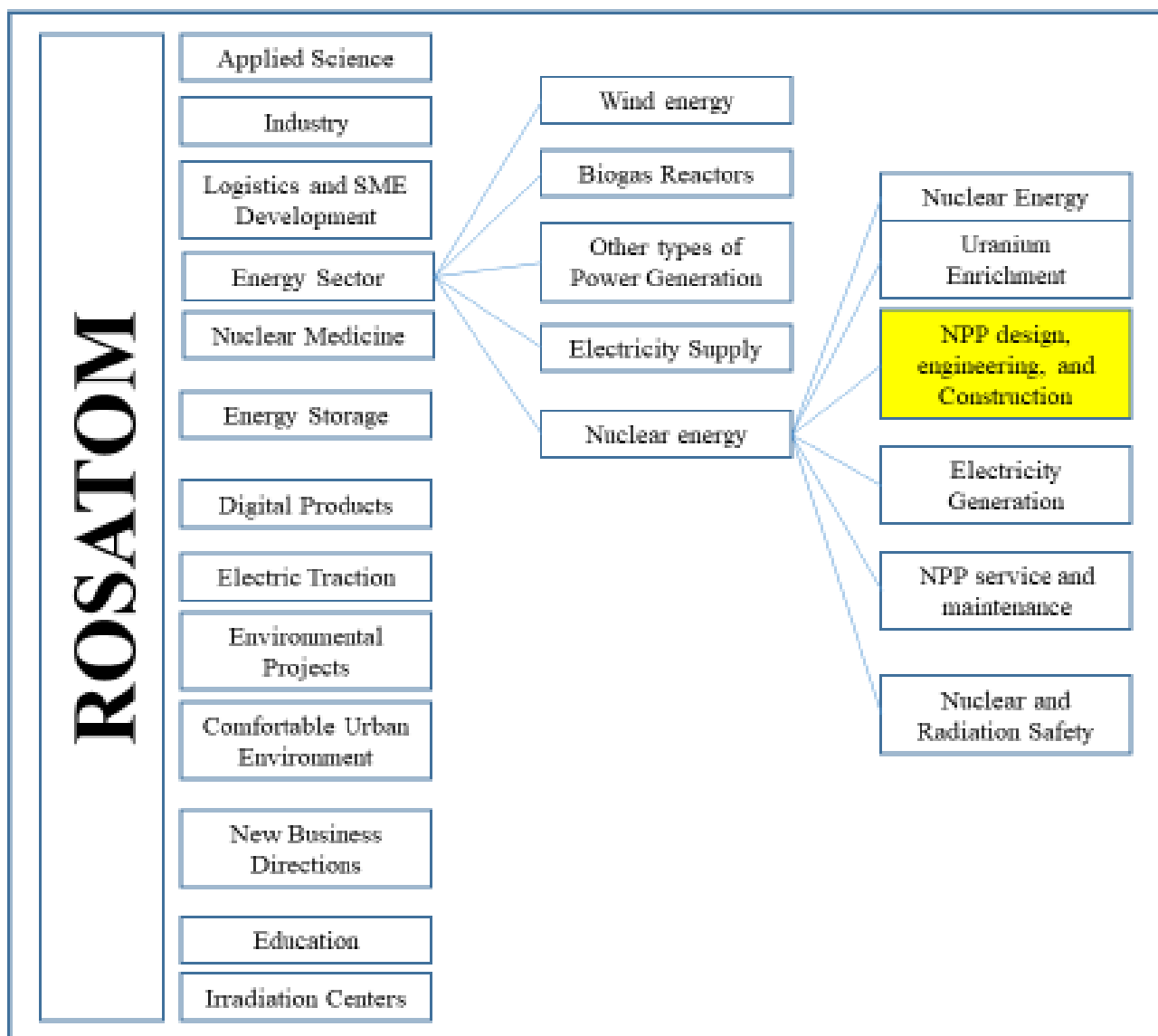


Fig. 4. The Role of International Multi-Tiered Projects in the Nuclear Industry

Source: Compiled by the authors based on data of ROSATOM State Atomic Energy Corporation. URL: <https://www.rosatom.ru/production> (accessed on 05.04.2025).

programs, ensuring their consistency with the strategic goals of the parent organization;

- evaluate, on one hand, the project's impact on the achievement of related projects and programs, and on the other, the influence of these projects and programs on the implementation of the current project;
- analyze the role of the project in achieving the objectives of ongoing operational ac-

tivities, while simultaneously tracking how these activities affect project success.

Ensuring the realization of anticipated benefits and effects (2) entails potential risks such as:

- difficulties with integrating the project's output into operational activities;
- failure to achieve expected benefits;
- divergent approaches by stakeholders in evaluating project outcomes.

To mitigate these risks, the project manager should ensure understanding of:

- the benefits expected from the project by the parent company and other stakeholders;
- the qualitative and quantitative indicators that will confirm the achievement of anticipated benefits and effects;
- the operational conditions and limitations of the project output that may hinder the realization of these benefits.

Analysis of project characteristics and the establishment of the project management system (3) requires that the project manager:

- conduct a thorough review of organizational rules and regulations to identify potential inconsistencies;
- examine the procedures for implementing changes, including the involvement of project participants and the maintenance of innovations before they become part of daily project operations;
- analyze the processes for regular evaluation of project management effectiveness and the procedures for implementing necessary adjustments.

When adapting the role structure and personnel management (4), the manager can be recommended to:

- to master the identification of roles, functions, responsibilities, and workflow;
- to distribute optimally roles among team members, engaging necessary competencies, and ensuring appropriate motivation;
- to secure support from organizational units that influence the project but are not part of the project team.

Adaptation of processes and the information environment (5) requires the project manager to:

- adapt existing or develop new project management procedures according to project specifics;
- adapt or create from scratch an information environment necessary for effective project management, taking into account all project characteristics;
- establish procedures for making non-standard decisions during project implementation.

CONCLUSION

The authors of this study contend that the presented recommendations for managing large-scale international multi-level nuclear projects (LIMNPs) will assist project managers in effectively identifying potential risks and contribute to the development of decision-making skills necessary both for responding to risks and for their proactive prevention.

This approach entails an understanding of the multi-level nature of the project, its inherent challenges, and the available documentation and procedures for addressing them, as well as the recommended management models, concepts, tools, and methodologies for managing LIMNPs. It also emphasizes the necessity of aligning the project with the strategic objectives of the parent company. The contribution of this study to management theory and practice lies in the proposed classification of problems encountered in project management, taking into account the specific characteristics of LIMNPs, and in the recommendations for developing new managerial skills. A notable feature of the classifications presented in this article is their potential to form a continuous learning system that integrates accumulated experience in problem-solving, based on the approach proposed herein.

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Strategic Planning as a Component of the Managing the Socio-Economic Development of a Municipal District

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ABSTRACT

The aim of this study is to develop a strategy for the socio-economic development of a given territory. The relevance of this issue stems from the fact that long-term, including strategic, planning tools and methods play a vital role in the governance system of a municipal district. The research revealed that both standardized methodologies and customized solutions are appropriate for the development of such strategies, depending on the characteristics of the planning object and the availability of data on its performance over a certain period. These custom solutions are especially necessary in later stages of strategic development, such as diagnostics, competitiveness assessment through cluster analysis, goal setting, and the justification of flagship projects (including scenario development and estimation of required financial resources). The strategy must take into account the municipality's specialization, its role in the regional economy, the existing socio-economic development strategy, results of cluster-based competitiveness assessments, funding sources, and other contextual factors. The authors justify the need for continuous monitoring, analysis, documentation, and open access publication of detailed information on changes to the strategy's objectives and the indicators used to measure their achievement. The research employed a variety of scientific methods, including analysis and synthesis, deduction and induction, systems thinking, analogy, comparison, classification, logical generalization, graphical data presentation, and content analysis of literature sources. Based on the results, methodological recommendations were formulated for professionals involved in municipal governance to assist in the development and implementation of socio-economic development strategies.

Keywords: municipal district; management; socio-economic development; strategy; strategic goals and performance indicators

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INTRODUCTION

Long-term planning serves as an important function of municipal and regional governance, as it allows for assessing the potential of a federal subject, municipality, or district and determining prospects for socio-economic development. This is particularly relevant in the context of creating comfortable living conditions for the population through the promotion of high-quality economic growth and the strengthening of environmental security.

The results of long-term planning based on a strategic approach are usually formalized in a document titled “Strategy for Socio-Economic Development” (hereinafter referred to as the Strategy), with a planning horizon that typically does not exceed 15 years, depending on available potential, strategic objectives, and financial resources. At present, regional and municipal authorities possess relevant experience in this area, as well as the necessary legal and methodological frameworks.

Furthermore, both theoretical and applied aspects of strategic planning and management remain a central focus for scholars and practitioners, as evidenced by numerous publications. For instance, A.V. Vilensky [1], R.A. Popov and A.S. Puzanov [2], and M.I. Agabalaev and M.I. Gasanov [3] have evaluated and critiqued the organization of strategic planning at the local level. A.V. Merkulov [4] examined the managerial aspect of such planning from the perspective of socio-economic development. N.A. Komarovskiy and L.N. Baranova [5], as well as A. Ya. Trotskovskiy and A.V. Velichko [6], explored competitiveness and territorial assessment in the context of Strategy development. D.A. Abashev and V.V. Yanovsky [7] analyzed new trends in regional strategic planning. A.M. Sedd and S.O. Nim [8], along with E.V. Chistopolskaya [9], established assessment criteria based on ESG principles¹ and the ranking of socio-economic development of municipal entities within the region. L.K. Agaeva [10], F.U. Nazarova [11], and E.S. Kulikova [12] emphasized the development of

long-term plans and strategies for rural agglomerations, which typically correspond territorially to municipal districts.

Overall, while agreeing with the conclusions drawn by the authors of the cited studies, we consider it necessary to draw attention to the insufficiently explored issues regarding the application of standard methodologies for developing long-term strategies. It is important to take into account the outcomes of strategy implementation through the use of long-term planning tools within the municipal management system, including changes in indicators for achieving strategic goals due to transformations in the legal and regulatory framework governing spatial development and municipal governance.

The authors aimed to develop scientific and methodological recommendations for applying standard methodologies alongside customized solutions in the formulation of the aforementioned strategy as an integral component of municipal district management. To achieve this goal, the following tasks were addressed: identifying the characteristics of the territory as an object of strategic planning; analyzing the stages of strategy development and identifying the limitations of applying standard methodologies; and formulating proposals for substantiating individualized solutions that overcome these limitations.

The theoretical contribution of the study lies in further refining the methodology of strategic planning at the local level, taking into account the type of municipality, population size, institutional and sectoral structure of its economy, as well as its role in the socio-economic development of the federal subject. The practical significance involves justifying the advisability of supplementing standard municipal strategy methodologies with customized solutions to overcome informational constraints, as well as developing flagship projects to enhance the district's financial autonomy and reduce its dependence on regional and federal subsidies.

RESEARCH METHODOLOGY

The process of developing a Strategy for a territory — whether a federal subject, municipality,

¹ The acronym ESG (Environmental, Social, Governance) stands for Environmental, Social, Governance. It is a set of rules and approaches to business that promote sustainable development.

or municipal district — is governed by legal and regulatory documents at the federal, regional, and municipal levels, including methodological guidelines. For the purposes of this study, the information base included data from Rosstat and monitoring of the socio-economic development of the municipal district over the previous five years; reports on the Implementation Plan of measures in accordance with the current municipal district Strategy; and operational data on the status of individual sectors, areas of activity, enterprises, and organizations.

RESEARCH RESULTS

Preparatory Stage of Developing the Socio-Economic Development Strategy

Let us consider the process of developing a Strategy using the example of the Dankovsky Municipal District in the Lipetsk Region. The decision to create the document “Socio-Economic Development Strategy of the Dankovsky Municipal District of the Lipetsk Region until 2030” (hereinafter referred to as Dankovsky District Strategy 2030) was made in early 2024. A working group, which included representatives of the local administration and staff from the Financial University under the Government of the Russian Federation, determined that the development of the Dankovsky District Strategy 2030 would be carried out in two stages. The first stage involves diagnosing the socio-economic status and competitiveness of the district within the Lipetsk Region for the period 2018–2023. The second stage, taking into account the main provisions of the Socio-Economic Development Strategy of the Lipetsk Region until 2030² (hereinafter Lipetsk Region Strategy 2030), the Long-Term Socio-Economic Development Plan of the Dankov Rural Agglomeration (Dankov and surrounding territories) until 2030, and the results of the first

stage, involves forming the draft of the Dankovsky District Strategy 2030.

During the first stage, two important considerations needed to be addressed. First, the existing Socio-Economic Development Strategy of the Dankovsky Municipal District until 2024³ (hereinafter Dankovsky District Strategy 2024) was adopted three years ago, and at that time its main provisions were relevant. Therefore, to identify and summarize the current key socio-economic challenges of the territory, a combination of analytical and graphical methods was applied to characterize its present state. Second, the development of the Lipetsk Region Strategy 2030 was carried out within a unified methodology for analyzing socio-economic development trends and assessing regional competitiveness (including that of the Dankovsky Municipal District). The assessment of the region’s competitiveness was conducted across seven areas of interregional competition, taking into account the AV RCI⁴ Regional Competitiveness Index, positions within key Russian regional rankings that consider various factors (including investment attractiveness and ESG criteria, as well as innovation development and implementation), and the results of a SWOT analysis.⁵

Following the example of the Lipetsk Region Strategy 2030, the draft Dankovsky District Strategy 2030 updates and adapts the SWOT analysis results matrix from the Dankovsky District Strategy 2024 to the seven areas of competition for both the economy and social sector (see Fig. 1).

³ Strategy for the socio-economic development of the Dankovsky municipal district for the period up to 2024 (as amended by the decision of the Dankovsky District Council of Deputies of the Lipetsk Region dated December 23, 2020, No. 21) URL: <https://admdankov.ru/strategiya-sotsialno-ekonomicheskogo-razvitiya-dankovskogo-munitsipalnogo-rayona/?ysclid=mcna0mbyny903205268>

⁴ AV RCI Regional Competitiveness Index, AV Group. URL: <https://av-group.ru/post/306>

⁵ Law of the Lipetsk Region dated October 25, 2022 No. 207-OZ “Strategy for the Socio-Economic Development of the Lipetsk Region for the Period up to 2030”. URL: <https://docs.cntd.ru/document/406267509>

² Law of the Lipetsk Region dated October 25, 2022 No. 207-OZ “Strategy for the Socio-Economic Development of the Lipetsk Region for the Period up to 2030”. URL: <https://docs.cntd.ru/document/406267509>

Strengths (S) G5^a, G3: Availability of natural and labor resources. G1: Existence of conditions for further development of the industrial complex. G5: Presence of chernozem (fertile soils) and favorable conditions for crop and livestock production. G7: Established practice of attracting investments. G6: Availability of conditions to reduce territorial development asymmetry within the district. G6: Well-developed social infrastructure. G2: Public consensus in the district. G6: High transport accessibility.	Weaknesses (W) G1: Mono-sectoral economic structure. G1: Production of low value-added goods. G3: Aging workforce. G7: Subsidized budget; dependence on the regional center. G3: Challenging demographic situation: natural population decline and increasing share of elderly population, leading to a sharp rise in social burden. G3: Low migration inflow. G3: Declining labor potential and shortage of qualified personnel.
Opportunities (O) G3: Involvement of formally unemployed labor resources in productive activities. G1: Development of high value-added production. G5: Inclusion of unused agricultural land in crop rotation. G4: Development of small businesses. G6: Development of the real sector of the economy considering territorial potential. G1: Development of the paid social services market. G6: Development of housing provision mechanisms, including mortgage lending.	Threats (T) G7: Financial resource deficit. G6: Deterioration of the environmental situation. G3: Complex demographic situation: aging population with a sharp increase in social burden. G3: Rising income inequality, leading to the outflow of personnel from the social sector.

Fig. 1. SWOT analysis matrix results for the economy and social sector, considering competitive dimensions

Source: Compiled by the author based on the "Strategy for the socio-economic development of the Dankovsky municipal district for the period up to 2024" (as amended by the decision of the Dankovsky District Council of Deputies of the Lipetsk Region dated 12/23/2020 No. 21). URL: <https://admdankov.ru/strategiya-sotsialno-ekonomicheskogo-razvitiya-dankovskogo-munitsipalnogo-rayona/> (accessed on 17.01.2025).

Note: a – Competitive dimensions: **G1.** Markets; **G2.** Institutions; **G3.** Human capital; **G4.** Innovation and information; **G5.** Natural resources and sustainable development; **G6.** Space and physical capital; **G7.** Investment and financial capital.

Analytical Stage of Developing the Socio-Economic Development Strategy

The competitiveness diagnosis of the Dankovsky District has been supplemented with the results of comparative and cluster analyses.

Considering that in the Lipetsk Region Strategy 2030, three districts adjacent to Dankovsky are classified as part of the second-tier agglomeration (following the Lipetsk–Yelets agglomeration), it is appropriate, for the purpose of assessing

competitiveness within this agglomeration, to compare the relative share of indicators of these districts against the regional averages (see *Table 1*).

According to the data in *Table 1*, the Dankovsky District generally occupies a middle position among the other districts included in the second-tier agglomeration and leads only in grain harvest and meat production.

For a more detailed study of the competitiveness of the territory under consideration, a cluster analysis was applied, comprising five stages (see *Fig. 2*).

Figure 3 shows the distribution of districts in the Lipetsk Region in relative space based on their economic indicators. The districts are grouped into three clusters (highlighted by color) according to the similarity of these indicators in

multidimensional space. Those included in the third cluster exhibit high variation but differ significantly from the other two clusters, and therefore represent a separate group. This is further confirmed by the results of the cluster analysis performed in the R environment.

According to the calculation results (*Figure 4*), the total variation of all indicators in the distribution accounts for 67%, which indicates a fairly high quality of the analysis. The group of districts in the second cluster, which includes Dankovsky, occupies either a leading position or holds advantages in terms of agricultural production, demographic, and social development indicators.

Thus, based on the results of the strategic diagnosis and competitiveness assessment, it was determined that the Dankovsky Municipal

Table 1

Share of Indicators from Municipalities Adjacent to Dankovsky District within Lipetsk region, %

Name of the indicator	Dankovsky district	Lebedyansky district	Chaplyginsky district	Lev-Tolstoy district
Turnover of organizations across all activities	1.5	3.5	1.4	0.6
Volume of shipped goods of own production, works performed, and services provided by own resources across all activities	1.6	4.0	1.1	0.7
Investments in fixed capital	2.7	3.7	1.1	2.6
Retail trade turnover	1.9	2.6	1.8	0.8
Freight turnover of motor transport across all activities	2.3	2.1	3.7	4.3
Gross grain harvest (weight after processing)	6.5	4.2	7.3	4.3
Meat production (cattle and poultry slaughter weight)	9.4	1.3	1.3	14.4
Milk production	2.0	5.3	4.8	1.6

Source: Compiled by the author based on data Socio-economic situation of Dankovsky district January-December 2023. Lipetsk: Lipetskstat, 2024. 21:11–18

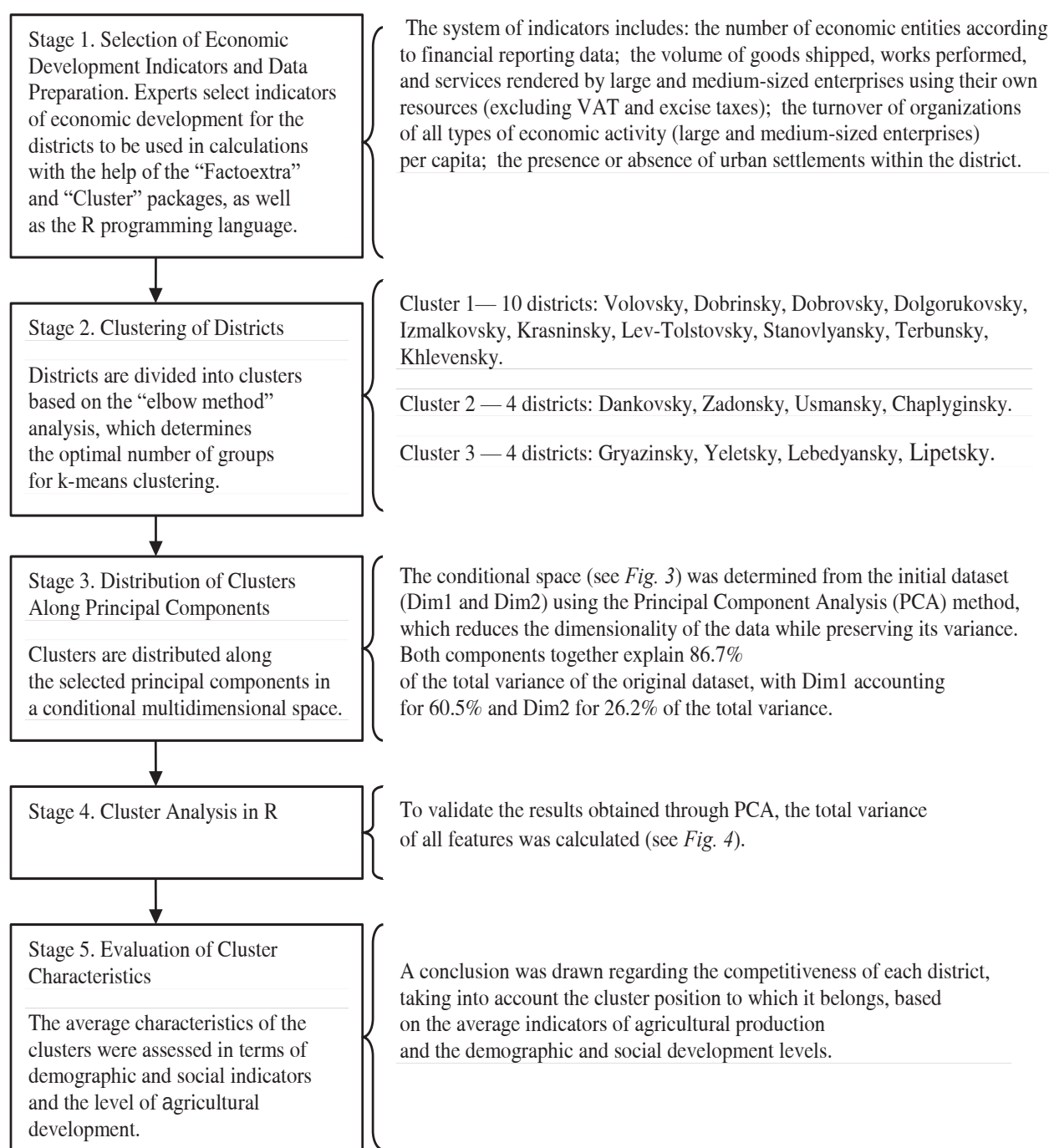


Fig. 2. Stages of Cluster Analysis for Competitiveness Assessment of Dankovsky district

Source: Compiled by the authors.

District is a rural agglomeration with a relatively high natural resource potential for the dynamic development of agro-industrial and tourism-recreation enterprises. This potential is supported by the historical and cultural heritage and traditions of Dankov and its surrounding territories.

Final Stage of Developing the Socio-Economic Development Strategy

During the second stage of drafting the Dankovsky District Strategy 2030, key priorities, the main strategic goal, and five additional strategic goals for the socio-economic development

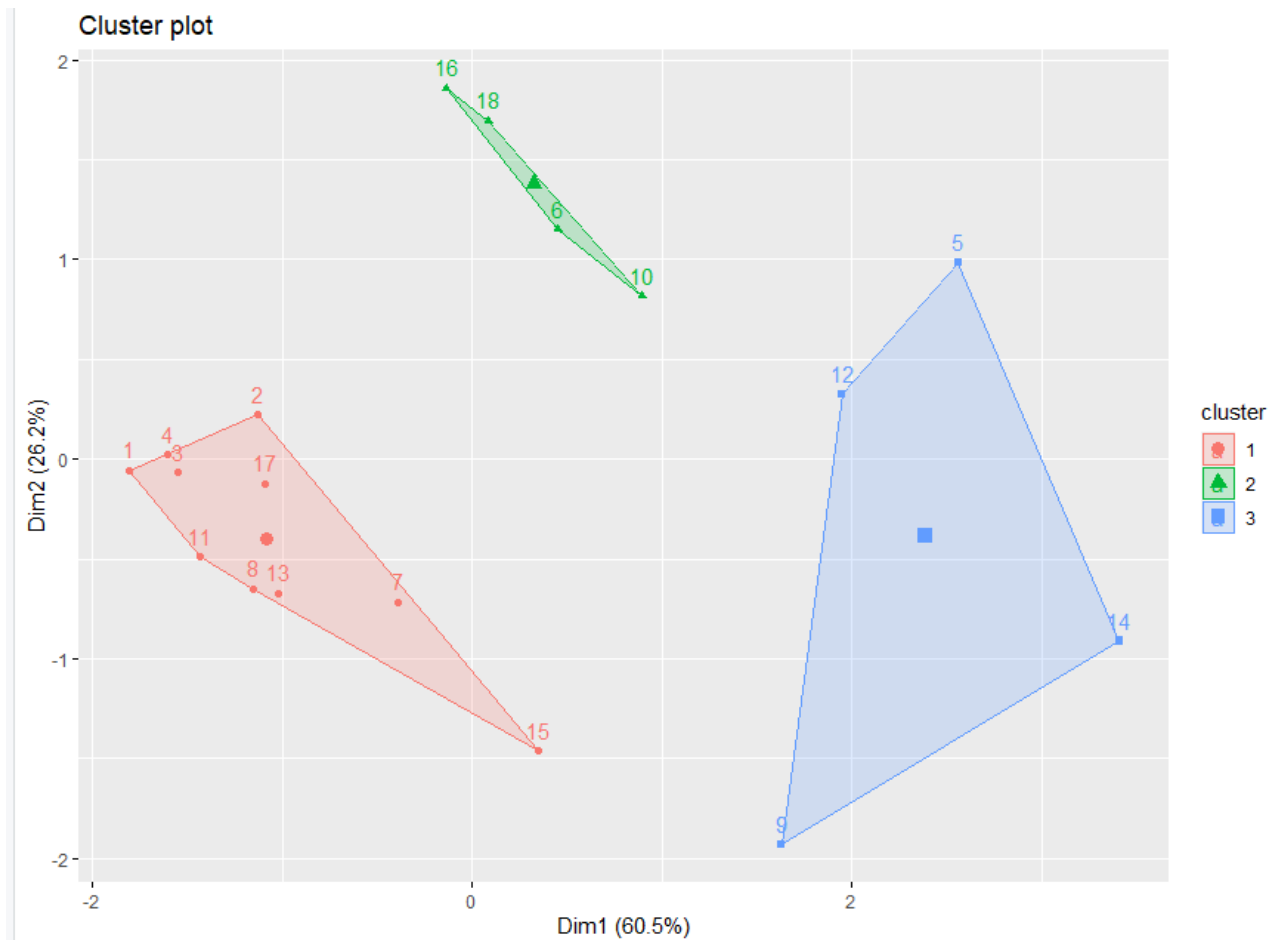


Fig. 3. Cluster Distribution by Principal Components

Source: Compiled by the authors.

```

K-means clustering with 3 clusters of sizes 10, 4, 4

Cluster means:
      x1      x2      x3      x4
1 -0.6368928 -0.5835886 -0.3572928 -0.6871843
2  0.3426322 -0.1641920 -0.3504032  1.3743685
3  1.2495998  1.6231634  1.2436352  0.3435921

Clustering vector:
[1] 1 1 1 1 3 2 1 1 3 2 1 3 1 3 1 2 1 2

within cluster sum of squares by cluster:
[1]  8.370123  2.132081 11.969431
(between_SS / total_SS =  67.0 %)

Available components:
[1] "cluster"      "centers"      "totss"        "withinss"     "tot.withinss" "betweenss"    "size"
[8] "iter"         "ifault"

```

Fig. 4. Results of Cluster Analysis Conducted in R Environment

Source: Compiled by the authors.

Table 2

Matrix-based Goal Setting System

Directions of competition	Strategic goals Lipetsk region (LO)	Strategic goals of Dankovsky municipal district (DMD)
G1. Markets	SG-4_LO	SG-4_DMD
G2. Institutions	SG-5_LO SG-3_LO	SG-4_DMD SG-5_DMD
G3. Human Capital	SG-1_LO SG-2_LO	SG-1_DMD SG-2_DMD
G4. Innovation and Information	SG-5_LO	SG-5_DMD
G5. Natural Resources and Sustainable Development	SG-3_LO	SG-4_DMD
G6. Space and Real Capital	SG-3_LO	SG-3_DMD
G7. Investment and Financial Capital	SG-3_LO SG-4_LO	SG-4_DMD

Source: Compiled by the authors.

of the administrative entity were determined, following the approach used in the Lipetsk Region Strategy 2030 (see Fig. 5). The relationship between the five strategic goals and the areas of competition of the Dankovsky District is presented in a matrix goal-setting system (Table 2). In the “Target Vision” section of the Dankovsky District Strategy 2030, achievement indicators are specified for each of these goals, along with the expected outcomes in local economic, social, and spatial development. Following the model of the Lipetsk Region Strategy 2030, these indicators characterize the current state, competitive advantages, key issues, strategic challenges, and risks, while defining the overall goal, specific objectives, and projected performance measures.

Particular attention was given to justifying the system of municipal flagship projects (MFPs) as part of the strategy implementation mechanism. This system includes three projects: MFP “Dankovskie Slobodki” — focusing on the recreational and tourism potential of the Dankovsky Municipal District, MFP “Dankovskie Gostintsy: Appetizing, Tasty, and Healthy” — aimed at developing gastro-

nomic and souvenir production, MFP “Strengthening Environmental Security of the Dankovsky Municipal District” — focused on environmental protection. These projects are designed to leverage the district’s potential in tourism, souvenir production, and environmental conservation. The study was guided by the sustainable development goals of the town and surrounding areas, emphasizing quality of life, openness, and ecological safety. It was demonstrated that further steps to enhance the tourism sector and its infrastructure, as well as activities aimed at environmental protection, will not only create preconditions for increasing the attractiveness of Dankov and nearby territories to visitors but also contribute to creating comfortable living conditions for the local population. At the same time, tourism is intended to address educational and cultural objectives, including the preservation and promotion of the historical heritage and traditions of this ancient Russian town and its suburbs (MFP “Dankovskie Slobodki”). Meanwhile, infrastructure development and consideration of the socio-economic characteristics of the territory allow, alongside traditional forms of tourism,

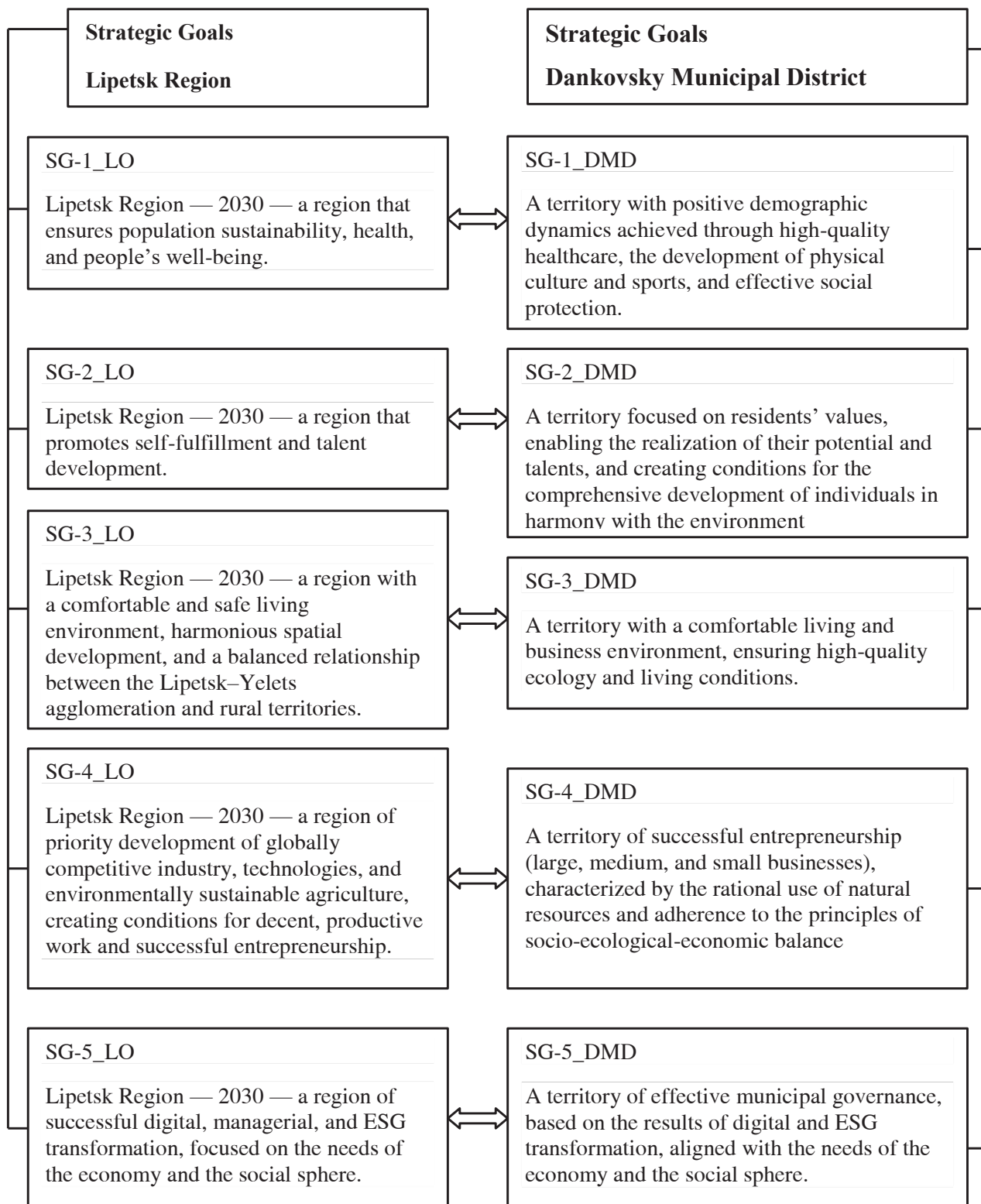


Fig. 5. Alignment of Strategic Goals of Lipetsk Region and Dankovsky Municipal District

Source: Compiled by the author on the basis of the Law of Lipetsk region #207-OZ dated 25.10.2022 "Strategy for the Socio-Economic Development of the Lipetsk Region for the Period up to 2030" URL: <http://publication.pravo.gov.ru/Document/View/4800202211020006> (accessed on 17.01.2025).

the organization of culinary tours and themed excursions at food and processing enterprises (MFP “Dankovskie Gostintsy”). Addressing ecological issues related to the Don River and local lakes will enable the promotion of tourism types such as water-based and wellness tourism. In justifying the MFPs, the results of cluster and SWOT analyses, as well as expert evaluations of the district’s competitiveness growth potential, were used to enhance residents’ quality of life.

The Dankovsky District Strategy 2030 covers a six-year period (2025–2030) and is structured into two three-year phases, for which corresponding scenarios (inertial and baseline) are developed based on socio-economic forecasts for the Russian Federation and the Lipetsk Region Strategy 2030, reflecting the district’s dependency on subsidies.

Implementation of the Dankovsky District Strategy 2030 requires appropriate financing. In this context, it is important to consider the specific features of long-term planning for rural agglomerations [10–12], since the Dankov rural agglomeration coincides with the territory of the Dankovsky Municipal District.⁶ When justifying the MFPs, the activities outlined in the Long-Term Socio-Economic Development Plan of the Dankov Rural Agglomeration until 2030 should be taken into account, including utilities, street reconstruction and lighting, road repair, landscaping, culture, education, sports, and construction, along with the sources of funding for these activities (federal, regional, local budgets, and extrabudgetary funds).

It is also important to note that, in addition to standard solutions, customized measures were required in forming the strategy. These were related to the specifics of the information base, particularly the content of the Dankovsky District

Strategy 2024,⁷ which itself was based on the Socio-Economic Development Strategy of the Dankovsky Municipal District. Between 2010 and 2020, this strategy was revised in accordance with decisions of the Council of Deputies of the Dankovsky Municipal District of the Lipetsk Region, reflecting changes in federal and regional legal and regulatory documents governing the development of municipal socio-economic development strategies. These revisions included: setting development priorities for the district (2010); creating SWOT matrices by economic complexes and sectors of activity (2011–2012); planning the spatial development of the district until 2024 (2018); and developing municipal programs (2020).

Changes affected both the strategic goals and the indicators for their achievement. It should be noted that the Dankovsky District Strategy 2024 includes sets of both strategic goals (last revised in 2018) and development priorities approved in 2010. For each set, indicators were developed, the achievement of which must be assessed in the process of drafting the Dankovsky District Strategy 2030. In 2020, however, an Action Plan for the Implementation of the Socio-Economic Development Strategy of the Dankovsky District 2024 for 2021–2024⁸ (hereinafter Action Plan 2024) was approved, and annual reports by the district administration were prepared in accordance with this document. Since the strategic goals and objectives of the Action Plan 2024 correspond to those in the Dankovsky District Strategy 2024, the working group, after consultations with experts, adopted the structure of these reports to assess the fulfillment of the Strategy based on

⁶ Order of the Lipetsk Region Department of Agriculture No. 42 of February 20, 2020 “On approval of the list of rural agglomerations in the Lipetsk Region. URL: <https://base.garant.ru/73652186/>

⁷ Strategy for the socio-economic development of the Dankov municipal district (adopted by the decision of the Dankov District Council of Deputies of the Lipetsk Region No. 38 of July 16, 2008). URL: <https://admdankov.ru/strategiya-sotsialno-ekonomicheskogo-razvitiya-dankovskogo-munitsipalnogo-rayona/?ysclid=mcna0mbyny903205268>

⁸ Strategies for the socio-economic development of the Dankovsky district 2024 for 2021–2024 (Appendix to the resolution of the administration of the Dankovsky municipal district No. 832 of December 22, 2020). URL: https://admdankov.ru/upload/files/documents/post_plan_meropr.pdf

the relevant indicators. To avoid such conflicts in the future, it is advisable to organize continuous monitoring of changes to the strategy, followed by the formation of a corresponding information base. When justifying decisions regarding strategy adjustments, it is necessary to evaluate their impact on the indicators of the goal affected by the decision, compile a comparative table, and place it in the database.

Thus, in addressing the research objectives, results were obtained that contain elements of scientific novelty, in particular:

- the specific characteristics of the municipal district as an object of socio-economic development strategic planning were identified, including its demographic, economic, and social features, the level of financial autonomy of local government bodies, and its high financial dependence on regional and federal budgets;
- based on the analysis, it was determined that the limitations of the standard methodology for developing a municipal socio-economic development strategy are related to the imperfection of the information base required for conducting strategic diagnostics and assessing the district's competitiveness;
- the study proposed the application of cluster analysis of municipal districts within the region, the integration of information technologies into the process of monitoring and adjusting the implemented strategy to justify customized decisions, as well as the use of tools to enhance the financial autonomy of local government bodies and reduce their dependence on regional and federal budgets through the development and implementation of municipal flagship projects (MFPs).

CONCLUSION

In summary, it should be emphasized that a standard methodology for developing a local-level Strategy must include specific recommendations for the working group. This methodology should take into account the type of municipal-

ity and its role in the economic development of the region, the size of its population, and its institutional, sectoral, and spatial characteristics. Such an approach will help avoid issues related to global trends — such as digitalization, climate change, breakthrough technologies, and the implementation of high-cost innovation projects — in municipalities whose economic structure is dominated by small and medium-sized enterprises in the agro-industrial and construction sectors, and whose population does not exceed 100,000 people. In addition, the working group should clearly define the tasks to be addressed at the local level — whether independently, jointly with neighboring districts, or within the framework of the regional strategy — including the sources of project funding necessary for achieving these tasks. The appendix to the standard methodology should contain examples of how to formulate goals and objectives, as well as criteria for selecting and justifying key performance indicators (KPIs).

The development of the document “Strategy for the Socio-Economic Development of a Municipal District” implies the use of both the standard methodology and individualized approaches, which may be required in cases of contradictory or incomplete data that are unsuitable for strategic diagnostics.

One way to mitigate data inaccuracies is to establish an information database containing decisions of local self-government bodies regarding amendments to the strategy made during its implementation. Federal-level⁹ regula-

⁹ Order of the Government of the Russian Federation No. 4146-r of December 28, 2024, approving the “Spatial Development Strategy of the Russian Federation for the Period up to 2030 with a Forecast up to 2036.” URL: https://www.economy.gov.ru/material/directions/regionalnoe_razvitie/strategicheskoe_planirovanie_prostranstvennogo_razvitiya/strategiya_prostranstvennogo_razvitiya_rossii_do_2030_goda_c_prognozom_do_2036_goda/; Federal Law No. 33-FZ of March 20, 2025 “On the General Principles of the Organization of Local Self-Government within the Unified System of Public Authority.” URL: https://www.consultant.ru/document/cons_doc_LAW_501319/

tory documents adopted in late 2024 and early 2025 also emphasize the need to create such a data repository, as a region may revise both the structure of local self-government and the

priorities of spatial development. The structure, content, and regular updating of this information database should become a subject of further research.

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A.S. Ivanenko — analysis of questionnaires, selection of sources, analysis of theoretical basis on the research theme.

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ORIGINAL PAPER



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Types, Effects and Conditions for the Use of Digital Intellectual Assets in Industry

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ABSTRACT

Intelligent industrial production represents the future of the global industry and is among national priorities, as it enables the achievement of higher-order competitive advantages based on the effective use of all components of intellectual capital and the adoption of new types of assets that emerge through the implementation of digital technologies — digital intellectual assets (DIA). The **purpose** of this study is to identify the types of DIA, their potential, the effects of their use, and the conditions for their application in industry. The **methodological basis** of the research includes methods of classification, comparative and legal analysis, generalization, and systematization. The **results** include a classification of DIA according to their civil law status; an outline of the advantages of their use as tools for the intellectualization of industrial companies across various sectors; identification of the economic and social effects of implementing these assets in the context of intellectual capital components (human, organizational, and market); and the specification of the necessary conditions for achieving these effects. The findings and conclusions may be useful for the management of Russian industrial companies in developing and improving digitalization strategies aimed at enhancing competitiveness and achieving technological independence.

Keywords: digital intellectual assets; industry; digital rights; results of intellectual activity; effects

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INTRODUCTION

The Concept¹ for Technological Development of the Russian Federation for the Period up to 2030 and the Strategy² for Scientific and Technological Development of the Russian Federation set out objectives and processes that involve, in particular, a sharp acceleration in the development and dissemination of fundamentally new technologies, including digital ones, which are radically transforming markets and production systems. This requires both an improvement in the process of enhancing the intellectualization of Russian industrial production — aimed at developing the intellectual capital of industrial companies (human, organizational, and market)— and the availability of relevant competencies in the implementation of digital technologies, as well as the adoption and effective use of new forms of property: digital intellectual assets (hereinafter — DIAs).

The issues of industrial intellectualization, including the implementation of the “smart manufacturing” concept, have been examined by many Russian and international researchers [1–5]. The Smart Manufacturing project ranks first in the updated Strategy for the Digital Transformation of the Manufacturing Industry until 2030.³ Artificial intelligence (hereinafter — AI) is the core tool of smart manufacturing, and its use in industry is discussed in works [6–9]. The importance of this technology is also recognized at the state level in the National Strategy for the Development of Artificial Intelligence for the Period up to 2030.⁴

In our view, the concept of intellectual manufacturing should be understood more broadly — not only as a means of increasing a company’s productivity and competitiveness through the introduction of digital technologies that enable “smart manufacturing,” but also in the context of developing all components of intellectual capital (human, organizational, and structural). In this regard, the key role is played not so much by the technologies themselves — whose functioning is based on results of intellectual activity (hereinafter — RIA) in digital form — but by their derivatives: digital rights to RIAs and their use. These offer authors and companies new opportunities, such as accelerating knowledge exchange and simplifying the commercialization of their developments. At present, both Russian and foreign scholars mostly focus on digital assets based on blockchain technologies [10–13]. However, the classification and use by industrial companies of non-financial digital assets associated with RIAs largely remain insufficiently explored.

The purpose of this study is to develop a classification of DIAs according to their civil-law status, as well as to identify the opportunities, effects, and conditions for their use in industry.

The information base for this study comprises regulatory documents, works by Russian and foreign researchers on the issues addressed in the article, thematic publications in the media, and data from open sources.

RESEARCH METHODOLOGY

The study employed regulatory and comparative analysis, as well as methods of classification, generalization, systematization, and synthesis.

Current trends and requirements for the digitalization and intellectualization of industrial production, as well as the civil-law status of DIAs, are defined in the following regulatory documents:

1. Presidential Address to the Federal Assembly of 29 February 2024;⁵

¹ Order of the Government of the Russian Federation No. 1315-r of 20 May 2023 “On the Approval of the Technological Development Concept for the Period up to 2030”. URL: <https://www.garant.ru/products/ipo/prime/doc/406831204/>

² Decree of the President of the Russian Federation No. 145 of 28 February 2024 “On the Strategy for Scientific and Technological Development of the Russian Federation”. URL: <https://www.garant.ru/products/ipo/prime/doc/408518353/>

³ Order of the Government of the Russian Federation No. 3113-r of 7 November 2023 “On the Approval of the Strategic Direction for the Digital Transformation of Manufacturing Industries” URL: <http://publication.pravo.gov.ru/document/0001202311090050>.

⁴ Decree of the President of the Russian Federation No. 490 of 10 October 2019 “On the Development of Artificial Intelligence in the Russian Federation” (as amended). URL: <https://base.garant.ru/72838946/> (<https://base.garant.ru/72838946/>)

⁵ Address of the President to the Federal Assembly of 29 February 2024 URL: <http://www.kremlin.ru/events/president/transcripts/messages/73585>

2. Order of the Government of the Russian Federation No. 1632-r of 28 July 2017 “On the Approval of the Digital Economy of the Russian Federation Program”;⁶

3. Order of the Government of the Russian Federation No. 1315-r of 20 May 2023 “On the Approval of the Concept for Technological Development for the Period up to 2030”;⁷

4. Decree of the President of the Russian Federation No. 145 of 28 February 2024 “On the Strategy for Scientific and Technological Development of the Russian Federation”;⁸

5. Federal Law No. 259-FZ of 2 August 2019 “On Attracting Investments Using Investment Platforms and on Amendments to Certain Legislative Acts of the Russian Federation”;⁹

6. Federal Law No. 259-FZ of 31 July 2020 “On Digital Financial Assets, Digital Currency, and on Amendments to Certain Legislative Acts of the Russian Federation” (as amended);¹⁰

7. Civil Code of the Russian Federation (Part I and Part IV).

To visualize the research results, graphical and tabular methods of data presentation were used.

⁶ Order of the Government of the Russian Federation No. 1632-r of 28 July 2017 “On the Approval of the Programme ‘Digital Economy of the Russian Federation’”. URL: <http://static.government.ru/media/files/9gFM4FHj4PsB79I5v7yLVuPgu4bvR7M0.pdf> (accessed: 21.05.2025).

⁷ Order of the Government of the Russian Federation No. 1315-r of 20 May 2023 “On the Approval of the Technological Development Concept for the Period up to 2030”. URL: <https://www.garant.ru/products/ipo/prime/doc/406831204/>

⁸ Decree of the President of the Russian Federation No. 145 of 28 February 2024 “On the Strategy for Scientific and Technological Development of the Russian Federation”. URL: <https://www.garant.ru/products/ipo/prime/doc/408518353/>

⁹ Federal Law “On Raising Investments Using Investment Platforms and on Amendments to Certain Legislative Acts of the Russian Federation” No. 259-FZ of 2 August 2019 (latest version). URL: https://www.consultant.ru/document/cons_doc_LAW_330652/

¹⁰ Federal Law “On Digital Financial Assets, Digital Currency and on Amendments to Certain Legislative Acts of the Russian Federation” No. 259-FZ of 31 July 2020 (latest version). URL: https://www.consultant.ru/document/cons_doc_LAW_358753/

RESULTS

Classification of Digital Intellectual Assets and Their Application in Industry

In the authors’ view, DIAs are, on the one hand, identifiable (i.e., separable from the business) intangible assets (hereinafter — IAs) of a company in digital form, and on the other, digital assets, i.e., objects of digital rights [14]. Therefore, to determine the types of DIAs, it is necessary to examine the specifics of digital RIAs and digital rights to RIAs/ the use of RIAs.

RIAs as IAs represent exclusive rights to intellectual property objects, protected by law in accordance with Article 1225 of the Civil Code of the Russian Federation.¹¹

It is proposed to classify as digital RIAs only those results of intellectual activity that exist and have value exclusively in electronic form. Traditionally, these include computer programs and databases.

However, with the development of information and digital technologies, new objects have emerged which, although not included in the list of intellectual property objects, may nevertheless be classified as such following appropriate identification. These include, in particular, 3D models, domain names, big data, websites, digital art objects, and others.

In accordance with paragraph 1 of Article 141.1 of the Civil Code of the Russian Federation, “digital rights shall mean obligations and other rights designated as such by law, the content and conditions of which are determined in accordance with the rules of an information system that meets the statutory criteria. The exercise and disposal of a digital right, including its transfer, pledge, encumbrance by other means, or restriction of disposal of a digital right, shall be possible only within

¹¹ Civil Code of the Russian Federation (Part Four) of 18.12.2006 No. 230-FZ (as amended on 22.07.2024), Art. 1225. URL: https://www.consultant.ru/document/cons_doc_LAW_64629/2a4870fda21fdffc70bade7ef80135143050f0b1/

the information system without recourse to a third party.¹²

At present, in Russia, digital rights include digital financial assets,¹³ utilitarian digital rights¹⁴ — including rights to RIAs/the use of RIAs— as well as hybrid digital rights (hereinafter — HDRs) that combine both digital financial assets and utilitarian digital rights (hereinafter — UDRs). HDRs and UDRs constitute two forms of digital assets related to the management of RIAs.

UDRs may be created for all of the above-mentioned types of RIAs, presented in any form, including electronic (digital), but only if the right to the RIA or a transaction involving such a right is not subject to state registration. For instance, an assignment agreement for an RIA, implying a change of ownership, is subject to mandatory registration with Rospatent and therefore cannot be executed as a UDR. Similarly, UDRs cannot be created for RIAs that are objects of patent law (inventions, utility models, and industrial designs) or trademarks, as these rights are subject to mandatory registration with Rospatent. However, rights to use patented RIAs or trademarks may be converted into UDRs and, serving as an alternative to licensing agreements, offer several advantages over the latter, including:

- automation and simplification of licensing processes: UDRs can significantly reduce the bureaucratic procedures involved in concluding and executing licensing agreements;
- transparency and security: owing to blockchain technology (commonly used for UDRs), immutability of records and transparency of all

transactions involving RIA rights are ensured;

- acceleration of rights circulation: tokens allow for faster and more efficient transfer of rights to use RIAs between market participants.

UDRs represent, above all, a new mechanism for attracting investment in technology development. For example, an oil and gas corporation seeking to finance the development of horizontal drilling technology may conclude an electronic agreement with an investment platform operator, who creates, issues, and lists UDRs on the platform granting the right to use this technology. Contractors of the corporation may then register on the platform and purchase these UDRs; however, the technology itself remains the property of the developer and must be patented to protect its rights. The issuer assumes obligations towards investors, while the guarantor is the operator of the platform on which the UDRs were issued.

Digital rights to RIAs / to the use of RIAs may be applied across various industrial sectors:

1. Mechanical Engineering

Application: Digital rights to patents and technical solutions enable industrial companies to purchase licensed rights to use engineering developments or to commercialize their RIAs without complex bureaucratic procedures.

Example: Agricultural machinery manufacturers obtain UDRs to use a built-in proprietary fuel-saving system without the need for a traditional licensing agreement.

2. Aviation and Shipbuilding

Application: Licensing via UDRs for software used in digital twins of aircraft and vessels; control and protection of intellectual rights during technology transfer.

Example: A shipyard acquires UDRs to use software code for the automatic design of a ship's hull lines.

3. Chemical and Pharmaceutical Industries

Application: Licensing unique chemical formulas via UDRs; automated access management to know-how.

Example: A pharmaceutical company issues

¹² Civil Code of the Russian Federation, Article 141.1. Digital Rights (as amended on 08.08.2024, with changes as of 31.10.2024). URL: https://www.consultant.ru/document/cons_doc_LAW_5142/8568bf88dfcdd96ec39cede2444c36c998fbde3/.

¹³ Federal Law "On Digital Financial Assets, Digital Currency, and on Amendments to Certain Legislative Acts of the Russian Federation" of 31.07.2020 No. 259-FZ (latest edition). URL: https://www.consultant.ru/document/cons_doc_LAW_358753/

¹⁴ Federal Law of 02.08.2019 No. 259-FZ "On Attracting Investments Using Investment Platforms and on Amendments to Certain Legislative Acts of the Russian Federation." URL: https://www.consultant.ru/document/cons_doc_LAW_330652.

UDRs granting counterparties temporary rights to manufacture a specific medicinal product.

4. Energy and Fuel & Energy Complex (FEC)

Application: Transfer of rights to use patented oil and gas extraction technologies; UDRs for energy grid management algorithms or digital well models.

Example: An oil and gas corporation uses tokens to transfer rights to contractors to access a spatial database of deposits.

5. IT and Industrial Software

Application: Sale of industrial software licences through hybrid digital rights; management of subscriptions to industrial cloud services.

Example: An industrial IoT platform sells access to predictive analytics algorithms for industrial equipment via UDRs.

Thus, DIAs can be divided into the following two classes:

1. Rights to digital RIAs that exist only in electronic form (computer programs, databases, 3D models, big data, domain names, etc.).

2. Digital rights to RIAs or to the use of RIAs, including:

- 2.1. utilitarian digital rights to RIAs or to the use of RIAs on an investment platform, including tokenized UDRs on a blockchain;

- 2.2. hybrid digital rights to RIAs or to the use of RIAs in a distributed ledger-based information system, including tokenized UDRs on a blockchain.

DIAs of the first class include digital RIAs created using information or digital technologies and which have value solely in electronic form. Disposal of rights to RIAs may be carried out in various ways:

1. Traditional:

- a) through licensing (exclusive, non-exclusive, and cross-licensing), which grants the right to use the RIA without a change of the rights holder;

- b) through assignment agreements, which require mandatory registration with Rospatent, as ownership of the RIA changes.

2. Non-traditional:

- a) through UDRs, including UDR-tokens granting access to digital RIAs or the right to use them;

- b) through HDRs, i.e. tokenization on a block-

chain of rights to RIAs / to the use of RIAs with income-generation potential;

- c) through NFT-tokens,¹⁵ i.e. fixation of rights to an RIA and the unique RIA itself (provided the digital asset does not exceed the maximum permissible token size).

The second class of DIAs comprises digital rights to RIAs / to the use of RIAs (UDRs, HDRs). In this case, the RIAs themselves may be traditional (included in the list under Article 1225 of the Civil Code of the Russian Federation) or exist solely in digital form.

Disposal of digital rights to RIAs may be carried out exclusively through non-traditional mechanisms — via UDRs or smart contracts (for tokenized rights). We propose applying the globally recognized token classification by economic function (as introduced by the Swiss Financial Market Supervisory Authority, FINMA, and the United States Securities and Exchange Commission, SEC), according to which there are payment tokens, asset tokens, and utility tokens. Payment tokens are not used for DIAs. UDRs exist only under Russian jurisdiction, but their analogue may be considered utility tokens, with the adjustment that UDRs are additionally regarded as investments. Accordingly, the analogue of the Russian HDR is the asset token, provided that the underlying assets are rights to RIAs.

In the future — subject to regulatory development — utilitarian and hybrid digital rights to RIAs may be issued in the form of NFT-tokens, which in the first case grant a unique right to use an RIA and essentially constitute UDRs; and in the second combine ownership of intellectual property (an RIA) with the ability to commercially exploit it, thus functioning as HDRs. An NFT-token for an RIA is not a DFA, as it does not entail financial obligations.

For example, an industrial company issues an

¹⁵ NFT (Non-Fungible Token) is a non-interchangeable token that verifies a unique ownership right to a digital asset, including a digital IP object (for example, a company's digital logo).

NFT for a licence to use a patented technology. The holder of the NFT-token may use such technology at their facilities. To prevent the creation of additional NFTs for the same technology, a restriction may be incorporated at the token-purchase stage, analogous to the mechanism of an exclusive licence. The current correlation of rights across different token types is presented in *Table 1*.

The final classification of DIAs is presented in *Fig. 1*.

Effects and Conditions for the Use of DIAs in the Intellectualization of Industrial Production

The conditions under which industrial companies employ digital RIAs and digital rights to RIAs/use of RIAs represent the potential opportunities for their application to achieve the expected outcomes of production intellectualization. These outcomes include increased labour productivity, enhanced competitiveness and production efficiency, revenue growth, improved product quality, personnel development, technological leadership, and other similar results.

Thus, the focus is on the conditions required

for transforming the intellectual capabilities of industrial companies — necessary for the application of DIAs — into intellectual capital. Intellectual capital consists of the results generated through the use of DIAs and, according to one of the founders of the theory of intellectual capital, L. Edvinsson [15], comprises three structural components (*Fig. 2*).

Let us examine which economic and social effects may be achieved from the use of different classes of DIAs as a tool for the intellectualization of industrial production, with respect to each structural component of intellectual capital (*Tables 2 and 3*).

The list of economic and social effects resulting from the use of DIAs for the intellectualization of industrial production is not exhaustive and may expand as DIAs continue to evolve.

Let us consider the conditions that must be established to achieve the above-mentioned effects and to enable the implementation of DIAs in the operations of industrial companies. In this context, “conditions” refer to the organizational, legal, and resource support required for this process.

1. Organizational and legal support for the

Table 1

Comparative Characteristics of Various Tokens

Criteria	NFT	Utility token	Asset-token
What does it provide?	Proof of ownership	Right to use an RIA	Ownership + commercial use of an RIA
Can it be sold?	Yes	Yes, if permitted	Yes
Does it grant usage rights?	No	Yes	Yes
Can it generate profit?	No	No	Yes
Example	NFT for a 3D engine design	Token granting the right to use software	Token for a patent with a licence

Source: Compiled by the authors.

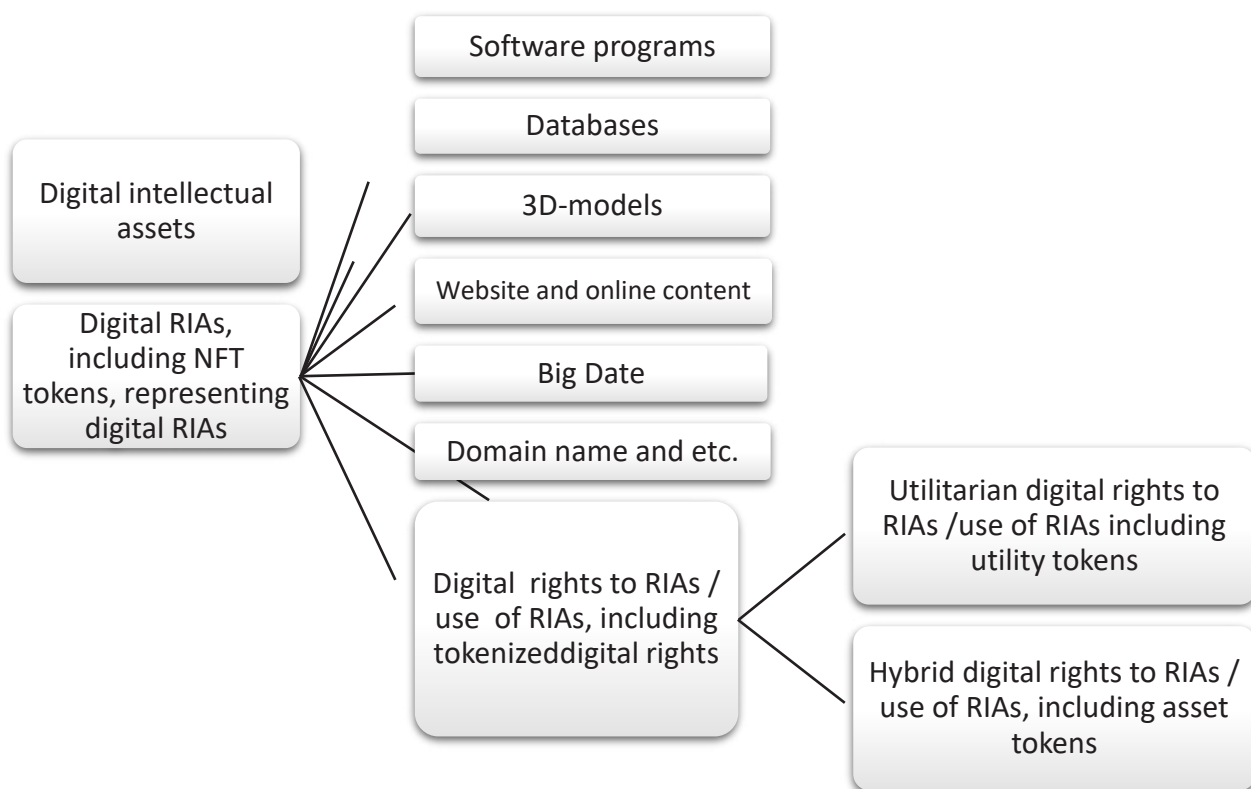


Fig 1. Classification of Digital Intellectual Assets

Source: Compiled by the authors.

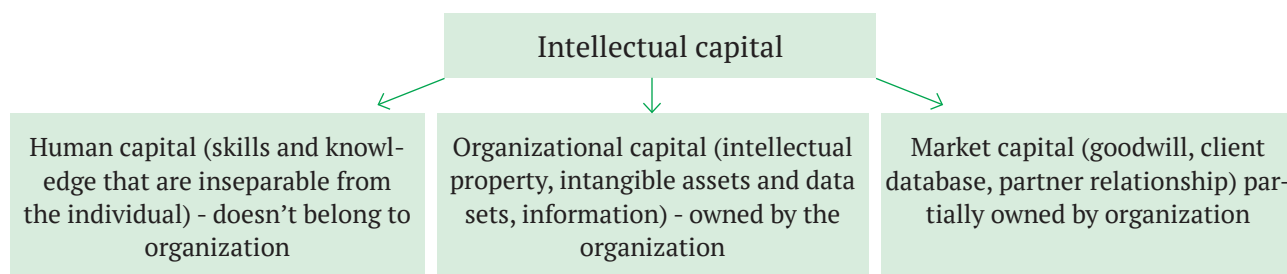


Fig 2. Structure of Intellectual Capital According to L. Edvinsson

Source: Compiled by the authors according to [15].

implementation of DIAs aimed at the intellectualization of industrial production involves, on the one hand, improving the regulatory framework in the field of DIAs and developing government support measures for industrial intellectualization as a whole. On the other hand, it requires the development of internal regulations, corporate standards, and the organizational structure of an industrial company, all of which should be oriented towards enhancing the efficiency of

business process digitalization and intellectualization.

The key directions for the development of Russian legislation in the field of digital assets (including DIAs) are presented in Fig. 3.

Organizational measures for government support may include:

- developing the infrastructure of a unified digital space, including the creation of state digital platforms for managing intellectual

Table 2

Economic Effects of Using DIA as a Tool for Intellectualization of Industry by Components of Intellectual Capital

IC components	Digital RIAs	Digital rights to RIAs (use of RIAs)
Human Capital	Increased employee income from managing and monetizing rights to RIAs	Expanded opportunities for commercializing own developments through new licensing formats
Organizational Capital	1. Growth of company revenues from internal use and commercialization of RIAs 2. Increased productivity through the digitalization of business processes based on RIAs	1. Companies can create new revenue models, e.g., licensing via smart contracts. 2. Expanded opportunities to attract additional investment in development through utility tokens. 3. Transparency of digital registries enables tracking of authorship and ownership of RIAs, reducing losses from counterfeiting and missed profits.
Market Capital	1. RIAs facilitate data exchange and scientific-technological cooperation between companies, increasing production efficiency. 2. New RIAs improve competitiveness and profitability through the development of customer-centric business models	1. Tokenization of RIA rights simplifies their sale, leasing, and transfer to third parties, reducing transaction costs. 2. Easy transfer of RIA rights via smart contracts supports faster adoption of advanced solutions in industrial production and increases the company's investment attractiveness.

Source: Compiled by the authors.

Table 3

Social Effects of Using DIA as a Tool for Intellectualization of Industry by Components of Intellectual Capital

IC components	Digital DIAs	Digital rights to RIAs (use of RIAs)
Human Capital	1. Development of innovative digital competencies among personnel. 2. Development of new forms of corporate training based on digital educational technologies.	1. Emergence of new professions and jobs related to the management of digital rights, data analytics, and cybersecurity. 2. New mechanisms for copyright protection.
Organizational Capital	1. Broader access to innovations and technical documentation through digital platforms. 2. Integration of RIAs into production processes reduces paperwork and supports environmental monitoring.	1. Simplified procedures for registering IP rights motivate companies to engage in innovative activity. 2. New forms of IP protection and commercialization foster the company's innovative development.
Market Capital	1. Enables dissemination of scientific discoveries and developments through open access, facilitating knowledge transfer. 2. New RIAs strengthen the company's business reputation as a technological leader. 3. Facilitates interaction with stakeholders within a unified digital industrial ecosystem.	1. Companies gain the ability to collaborate securely with partners worldwide by concluding smart contracts and remotely licensing joint developments. 2. Ensures transparency and controlled dissemination of RIAs under state regulation.

Source: Compiled by the authors.

property (national registries of patents, digital licenses, etc.);

- establishing innovative technology parks and competence centers for the implementation of digital RIAs in industry;
- creating sector-specific infrastructure for the commercialization of digital RIAs, including through the tokenization of digital rights to RIAs / use of RIAs;
- ensuring the participation of Russian companies in international distributed ledger systems for digital rights to RIAs / use of RIAs;
- concluding agreements with foreign partners on the mutual recognition of digital RIAs, among other measures.

Organizational and legal support for the effective digitalization and intellectualization of

business processes at the enterprise level should include the areas presented in *Fig. 4*.

2. Resource support for the implementation and use of DIAs aimed at the intellectualization of industrial production includes four fundamental components: financial, human, material-technical, and informational-service.

When considering the industrial sector as a whole, government support can undoubtedly play a key role in creating the necessary conditions:

1. Financial:

- allocation of grants to industrial companies engaged in the development and implementation of digital RIAs;
- provision of government subsidies, preferential lending programs, tax incentives, and

Harmonization of the taxation procedure for tokenized assets with the taxation of hybrid digital rights; establishment of VAT and personal income tax rules for transactions related to the issuance and execution of UDR and HDR, including RIA rights .

Creation of regulatory conditions for the tokenization of digital non-financial assets, including title NFT tokens, as well as development of procedures for accounting corporate investments in DFA and UDR, including RIAs

Establishment of legal conditions allowing clients to conduct transactions with digital rights through the existing financial infrastructure, including financial intermediaries.

Legal support for the execution of smart contracts on the platforms of information system operators (investment platforms) where DFA and UDR are issued; standardization of basic requirements for such smart contracts.

Harmonization of legislation governing the circulation and accounting of digital rights, including RIDs, with the legislation on the circulation and accounting of exclusive property rights in IP, including IA.

Fig 3. Main Directions for Improving Legislation in the Field of Digital (Intellectual) Assets

Source: Compiled by the authors.

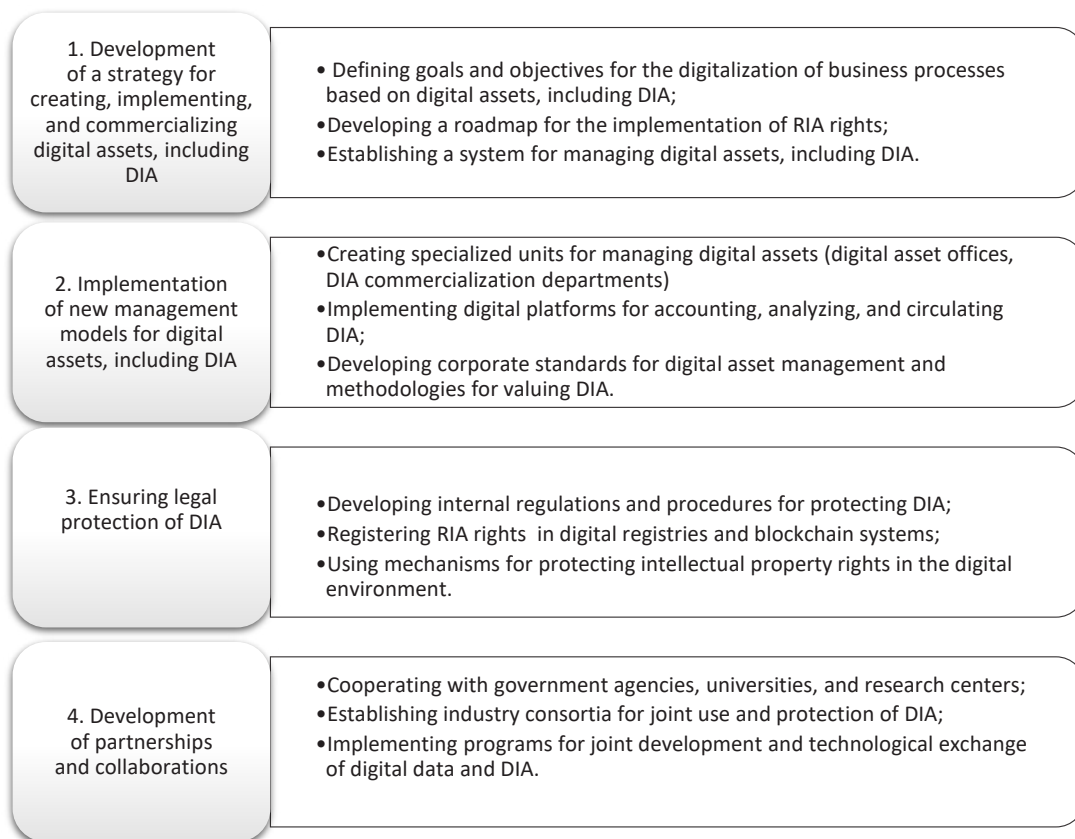


Fig 4. Organizational and Legal Conditions Created within a Company for the Use of Digital Assets, including DIA

Source: Compiled by the authors.

investment funds for innovative companies implementing DIAs.

2. Human Resources:

- introduction of educational programs on the creation and management of DIAs at universities and colleges, along with specialized training and professional retraining of personnel;
- development of collaboration between business and universities to facilitate knowledge exchange in the field of DIAs.

3. Material-Technical: This component supports the implementation of the organizational government measures described above, aimed at creating and developing infrastructure for working with digital intellectual assets, including:

- development of government platforms for buying, selling, and licensing digital RIAs, integrated with payment systems and IP management mechanisms;

- development of smart contracts for automatic transfer of rights and royalties;
- creation of an ecosystem for technology transfer (intellectual property exchanges).

4. Informational-Service:

- organization of government forums and exhibitions on digital intellectual assets in industry;
- publication of methodological materials and manuals for enterprises on DIA classes;
- development of an informational portal for businesses, including news, case studies, and successful examples of DIA implementation;
- establishment of government competence centers and analytical platforms on management, legal protection, and valuation of digital intellectual assets;
- ensuring cybersecurity for state-business interaction within the framework of the unified digital space.

1. Financial resources	• Allocating budgets and seeking extra-budgetary funding for the development, implementation, and commercialization strategy of digital intellectual assets (DIA); • Promoting venture and corporate investment in DIA.
2. Human resources	• Enhancing staff qualifications in the development, implementation, and commercialization of DIA; • Developing corporate training and retraining programs in collaboration with educational institutions.
3. Material and technical resources	• Developing and implementing corporate platforms for managing DIA; • Using blockchain technologies to ensure transparency and protect rights to RIAs; • Automating processes for licensing, rights transfer, and accounting of RIAs.
4. Information and service resources	• Developing cyber protection systems for intellectual assets; • Monitoring digital rights through smart contracts and secure registries; • Tracking unauthorized use of DIA; • Participating in various DIA-related forums and industrial exhibitions.

Fig 5. Resource Conditions for the Use of DIA in the Company

Source: Compiled by the authors.

Resource support for the implementation and use of DIAs as instruments for industrial intellectualization at the company level also requires a set of measures across these four components (Fig. 5).

Further research on DIAs as instruments for the intellectualization of industrial production could focus on specifying all the organizational, legal, and resource-related conditions, as well as the outcomes of DIA implementation, using concrete examples from Russian companies.

CONCLUSION

The conducted study allows the following conclusions:

1. Industrial intellectualization is understood not only as a process aimed at implementing digital technologies, primarily based on artificial intelligence, but also as the development of all elements of a company's intellectual capital through new opportunities arising from the use of DIAs.

2. DIAs are proposed to be classified according to their civil-law status in terms of exclusive rights to digital RIAs that exist solely in electronic form (e.g., computer programs, databases, 3D models, domain names, etc.) and digital rights to RIAs / the use of RIAs, including UDRs and HDRs. Based on the proposed classification, possible methods for the commercialization of DIAs are examined.

3. The economic and social effects of applying DIAs as tools for the intellectualization of industrial production are revealed. It is established that the use of DIAs allows industrial companies to reduce costs, accelerate the adoption of innovations, increase investment attractiveness, and protect intellectual property. From a social perspective, this leads to the creation of new professions, greater customer-centricity in the economy, enhanced trust in the business environment, improved corporate reputation, and broader access to advanced technologies for economic actors and

society as a whole. At both the macro and micro levels, the organizational, legal, and resource-related conditions necessary for leveraging DIAs to achieve socio-economic effects in industrial intellectualization have been identified.

The results obtained by the authors may be useful to the management of industrial (and other) companies when developing their own digitalization strategies that take advantage of the benefits offered by DIAs.

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The System of Categories in the Digital Economy: Evolution of Approaches

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ABSTRACT

The **purpose** of this study is to systematize the categories of the digital economy (digitalization, digital transformation, digital maturity, and digital potential) through the classification and aggregation of research approaches to their study, as well as to apply these categories to the characterization of social development in specific territories. The research employed **scientific methods** such as comparative and systems analysis, synthesis, formalization and analogy, inductive reasoning, interpretation, and theoretical modeling. The information base consisted of more than 100 scholarly publications indexed in the Russian Science Citation Index (RSCI) and in international scientometric databases, which ensured the comprehensiveness of the study. The **results** include the identification of classification groups of authors' approaches to defining the terms "digital economy", "digitalization", "digital transformation", and "digital maturity"; the specification of their key characteristics; and the development of integrated or combined definitions of these concepts in relation to the socio-economic development of regions. The study also systematizes these terms in relation to one another and to the digital economy as a whole. As initial conditions for digitalization and digital transformation of a socio-economic system, the research considers the digital profile of a territory, along with the specific nature of its digital needs and resources. The findings can be used for managerial purposes (in the field of digital development of the economy and the social sphere), as well as for shaping and structuring the conceptual foundations of the digital economy. **Keywords:** digital economy; digitalization; digital transformation; digital maturity; digital potential; regional digital profile; social sphere

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INTRODUCTION

The categorical apparatus of the digital economy has undergone significant changes since the emergence of the term. A variety of contextually related concepts have appeared, including digitalization, digital transformation (DT), digital maturity, digital development, and digital potential. Most of these concepts were initially focused on technological and economic aspects, primarily used in the business context, addressing issues such as the transformation of business processes, business models, human resources policies, organizational structure and culture, and methods of producing goods and services based on digital technologies [1].

Subsequently, these digital economy categories began to be interpreted more broadly, not only in relation to the entire economic ecosystem but also in the social sphere and public administration. The founders of the digital economy associated the term with the coverage of the social sphere and all aspects of human life. In this sense, there was a divergence in interpretations of key digital economy concepts, with a distinction between business-oriented aspects and the broader category of “digital economy,” which encompasses the socio-economic system as a whole.

In recent years, researchers and practitioners have begun to emphasize the importance of digitalization and DT in the social sphere for improving population well-being and fostering the positive development of its digital component (i.e., the formation of digital quality of life). This goal is achieved by assessing the digital potential of territories and attaining their digital maturity as the level of realization of this potential [2–4]. Regional DT strategies with specific indicators of results have emerged, initiating a scientific discourse on territorial digital potential in the social sphere, as well as the factors shaping and developing it.

The aim of this article is to structure approaches to defining digital economy categories (digitalization, digital transformation, digital matu-

rity, and digital potential) based on the study of domestic and international sources, as well as to apply these categories to characterize the social development of territories.

RESEARCH METHODOLOGY

To compile systematic lists of definitions for the main categories of the digital economy, a keyword search was conducted in the Russian Science Citation Index (RSCI), international databases, and on the Internet. The definitions were classified, comparatively analyzed, and synthesized within selected classification groups. Content analysis of the definitions allowed for the identification of key terms, while qualitative analysis highlighted their essential characteristics and potential applications in the social sphere.

RESEARCH RESULTS

Evolution of Approaches to the Term “Digital Economy”

Let us consider the evolution of approaches to the term “digital economy” (*Table 1*).

The analysis of the presented definitions allows us to conclude that in the works of the authors who coined the term, in the majority of foreign studies, in a significant part of domestic research, as well as in legislative acts and other official documents, the digital economy is considered not only within the framework of economic activity but also taking into account its social component and the impact of ICT on human life. The following **characteristics of the “digital economy” category** can be highlighted:

1. It encompasses not only the activities of economic agents, virtual markets, and business operations but also all spheres of human life, including the social domain.
2. The key resource is digital data and modern methods of its processing, such as big data analysis.
3. ICT (and less frequently, information, digital, or electronic technologies) are considered the technological foundation of the digital economy,

Table 1

Approaches to Defining the Category “Digital Economy”

Author	Approach to definition	Characteristics of definition
Foreign Approaches		
Negroponte N., Tapscott D.	Technological capability to reduce transaction costs through the use of Internet communication tools. Envisions comprehensive digitalization of human life and economic activity	Lays the foundations not only for the digital economy but also for the digital society, digitalization of the social sphere, and quality of life
Approved Definitions by International Organizations and States		
World Bank	A system of economic, social, and cultural relations based on the use of digital information and communication technologies	Covers all types of societal relations based on the use of ICT
OECD	Markets based on digital technologies for e-commerce	Focuses on virtual markets, digital technologies, and e-commerce
Other Foreign Approaches (mainly economic)		
Oxford Dictionary	Economy based on digital technologies, electronic transactions, and Internet usage	Reflects the use of digital technologies and electronic transactions via the Internet
The Economist, IBM	Economy based on high-quality ICT infrastructure with the ability to mobilize ICT for the benefit of consumers, businesses, and government	Emphasizes ICT infrastructure and its capabilities for society
Domestic Research Approaches		
Technological Approaches		
Skoryatina E.A., Sobolev R.K.	Result of the transformational effect of new general-purpose technologies in the field of information and communication	Focus on ICT
Economic Approaches		
A.V. Keshelava, V.G. Budanov, V.Yu. Rumyantsev et al.	Economy aimed at maximizing satisfaction of all participants' needs through the use of information, ICT, financial technologies, and infrastructure	Central focus on ICT and information used to meet economic interests of various actors
Mal'tsev A.Yu.	Economy overcoming limitations – digital products can be copied, distributed, improved, do not wear out, and are not limited by marketplaces (size, assortment, location, etc.)	Demonstrates that the digital economy overcomes barriers present in the physical world for selling and consuming goods and services

Table 1 (continued)

Author	Approach to definition	Characteristics of definition
Extended Approaches (covering economy and social sphere)		
Yudina T.N.	Concept associated with intensive ICT development, second-generation informatization (4th technological paradigm), affecting all spheres of human life (economic, social, political, cultural, etc.)	ICT occupies a central role; digital economy is considered to extend to other spheres of life (social, cultural)
Sudarushkina, I.V., Stefanova N.A.	Result of transformational effects of new general-purpose technologies in information and communication, affecting all sectors of the economy and social activity	ICT occupies a central role in economy and social sphere
Baranov D.N.	Penetration of digital technologies into all aspects of economic and social life, enabling communication, coordination, and information exchange in real-time via the Internet and ICT, and allowing economic operations regardless of the geographic location of economic agents	Highlights key features: information as a resource, ICT as technology, speed of data transformation, overcoming geographic barriers, coverage of economic and social life
Legislative Definitions		
Draft Program "Development of the Digital Economy in Russia: Program until 2035"	A set of social relations arising from the use of electronic technologies, electronic infrastructure and services, big data analysis technologies, and forecasting to optimize production, distribution, exchange, consumption, and enhance socio-economic development	Emphasizes electronic technologies, infrastructure, and services, as well as the goal of socio-economic development
Strategy for the Development of the Information Society in the Russian Federation 2017–2030 (approved)	Economic activity in which the key production factor is digital data, the processing of large volumes of information, and the use of analysis results to significantly improve efficiency of various types of production, technologies, equipment, storage, sales, and delivery of goods and services	Defines digital economy as a type of economic activity; emphasizes "digital data" and "data processing and analysis"; does not mention ICT or electronic technologies

Source: Compiled by the author based on [5, 6]; Development of the digital economy in Russia. Program until 2035. URL: <http://spkurdyumov.ru/uploads/2017/05/strategy.pdf> (accessed on 19.03.2025); Strategies for the development of the information society in the Russian Federation for 2017–2030. URL: <http://www.garant.ru/products/ipo/prime/doc/71570570/> (accessed on 19.03.2025) and others.

particularly the use of the Internet as infrastructure and software as a functional tool.

4. The benefits of the digital economy include reduced transaction costs, increased enterprise productivity, enhanced satisfaction of clients (citizens, businesses, and the government), and overcoming geographic, temporal, and other barriers.

Considering the characteristics of the current stage of development in the Russian Federation,

the following definition of the digital economy can be proposed:

Digital economy is economic activity and associated social processes related to the collection, processing, and transfer of large volumes of data within the framework of digital infrastructure development and the application of end-to-end digital technologies, aimed at increasing economic efficiency, improving quality of life, and

overcoming barriers in traditional markets and social institutions.

The basic categories of digital development in the economy and social sphere are digitalization, digital transformation, and digital maturity. Despite active research over the past two decades, the development of conceptual frameworks, methodological approaches by international organizations, and strategic documents at both federal and regional levels in Russia and other countries, significant inconsistencies in the definitions of these concepts remain in the global academic community.

Development of Approaches to Defining the Term “Digitalization”

The broadest semantic range is found in definitions of the category “digitalization.” Over the past 20 years, scholars from philosophical, technological, economic, and interdisciplinary fields have substantively enriched this definition as it became more relevant and prioritized.

The idea of achieving informational completeness and openness regarding the population’s needs was already expressed by utopian philosophers, rationalist thinkers, and natural scientists of the Middle Ages (T. More, T. Campanella, F. Bacon). These ideas were further developed by futurists of the 20th century, along with concepts of a dynamic cybernetic society of the future and AI-based economies (E. Toffler, J. Naisbitt, and others).

The concept of the digital economy was first explicitly discussed in 1995 by N. Negroponte, a researcher at the Massachusetts Institute of Technology (MIT), who introduced the notion of the smallest units of the material and digital worlds — bits (by analogy with atoms). Negroponte hypothesized that everything made of atoms could, in principle, be recreated from bits, thereby laying the foundation of digitalization (he is most often credited as the originator of this term) [7].

Initially, the term “digitalization” was synonymous with “digitization” (i.e., converting data into digital format). However, its meaning has

since expanded to encompass the application of digital technologies across various sectors of the economy and public life (“digitalization”). Today, a third interpretation has emerged: digitalization is understood as a global vector of socio-economic development.

The evolution of approaches to this concept is presented in *Table 2*, where they are grouped by semantic meaning (philosophical, technological, economic, extended, trending, and combined) and by the chronology of their emergence. In the right-hand column of *Table 2*, the author of this article summarizes the essence of each approach and provides its characterization (in terms of completeness and alignment with the categorical position in the evolution of definitions). Below the table, the key characteristics of the main groups of research approaches are summarized, and the author proposes their own interpretation, integrating all significant meanings of the category.

The development of research approaches to defining the term “digitalization” began with a technological focus, then expanded to include economic aspects, followed by a multi-faceted perspective incorporating the social sphere, and finally evolved into a trend-based understanding, which views digitalization as a global vector of development across all spheres of human life.

As a result, modern combined interpretations emerged, integrating these various aspects in different combinations. However, none of them fully reflect all stages of the concept’s evolution or incorporate all possible meanings.

The main characteristics of digitalization, based on an analysis of research approaches, can be summarized as follows:

1. **Technological foundation:** Digitalization is based on digital technologies, which are a subset of innovative and information technologies, expressed in virtual form and implemented through software.
2. **Comprehensive scope:** Digitalization affects all areas of human life. Originally, the term was applied primarily to the economy, and its

Table 2

Approaches to Defining Digitalization

Author	Approach to defining digitalization	Characteristics of the definition
Philosophical approaches		
Thomas More, Tommaso Campanella, Francis Bacon	Ideas about the necessity of possessing complete information regarding the needs and capabilities of members of society and its distribution	Conceptual foundation of digitalization as a tool to ensure informational completeness in social life
Nicholas Negroponte	Introduced the term in 1995 in Being Digital – described bits as the fundamental particles of the material and digital world, analogous to atoms	Philosophical basis of digitalization as the “bitization” of the world and the possibility of recreating any material object in the digital environment
Technological approaches		
Breuer M.A., Parekh H., Bingham A., Fomichyova T.V., Kataeva V.I.	Digitization of data, converting it from analog to digital format	Approaches equating “Digitization” and “Digitalization,” reducing the meaning to the first category (“digitization”)
Katrin E.V., Gudkov I.V., Puzyrev N.A..	Process of creating, implementing, and applying digital systems and technologies, transforming the interaction tools of the state, society, and individuals	Digital technologies and systems for transforming the interactions of key economic and social actors
Strok O.A.	Digitization of all information and material resources, formation of networked interaction platforms to obtain predictable and guaranteed responses to any managerial action using automation	Digitized resources and network platforms, automation tools used to increase management efficiency (extended version of “digitization” including transformational processes)
Higher School of Economics (HSE))	Replacement of analog (physical) data collection and processing systems with technological systems that generate, transmit, process digital signals about their state; transferring functions and activities previously performed by humans and organizations into digital format	Transition from analog to digitization; combination of two main technological approaches
Economic approaches		
Butenko E.D.	Implementation of digital technologies in traditional economic sectors and increasing the technological level of regional enterprises	Use of digital technologies to enhance the technological level of business development
Kuznetsova T.F.	Transformation of individual enterprises and sectors into new process models based on ICT	Use of digital and information technologies to transform enterprises and industries

Table 2 (continued)

Author	Approach to defining digitalization	Characteristics of the definition
Gartner	Use of digital transformation (DT) to change business models and provide new revenue opportunities; transition to digital business	Changing business models and creating new opportunities for entrepreneurial activity in digital format
Brookings Institution researchers	Use of DT and information to transform business operations	Digital transformation of business operations
Oxford English Dictionary	Adaptation and increased use of digital or computer technologies in economic activities of enterprises, households, sectors, or national economies	Use of digital technologies by economic actors at various levels
McKinsey	Actions using digital technologies aimed at increasing productivity and accelerating economic growth	Digital technologies for productivity and overall economic growth
T.Yu. Kudryavtseva, K.S. Kozhina	Process involving the use of digital technologies and digitized data to transform business processes, business models, and business operations	Digital transformation of business processes and models
Frolov K.V., Babkin A.V., Frolov A.K.	Use of software whose architecture includes process and functional components minimizing human involvement (communication, administrative, predictive, security) with extended interaction capabilities	Software for business processes, decision-making, and expanding capabilities via predictive and network functions; reducing human involvement
M.I. Makeenko, E.L. Vartanova, T.Kh. Kerimov	Comprehensive solution covering multiple spheres, replacing informatization and computerization, permeating all major life events; use of innovative and digital technologies by all economic actors	New stage after informatization and computerization across all life and economic participants using innovative and online technologies
Extended approaches		
Klaus Schwab	Expansion of digitalization's influence on economic and social processes; forming global management priorities under the Fourth Industrial Revolution (Industry 4.0) paradigm	Broad definition of digitalization beyond economic limits, in the global context of Industry 4.0
Khomyakova S.S.	Change in processes with active DT implementation across various spheres of life (social, economic, etc.)	Digital transformation of all economic and social processes
Gobble P.	Use of DT and digitized information to create and gather value in new ways	Creation of value based on digital technologies

Table 2 (continued)

Author	Approach to defining digitalization	Characteristics of the definition
Kondratyeva M.N.	Transition to DT across all spheres of life to efficiently perform operations and previously non-existent activities	Transition to digital technologies in all areas of life for automation of current and new operations
Leimeister J.M., R. Wachal	All social changes and their outcomes based on DT	Set of consequences of applying digital technologies for society
Billon M., Lera-Lopez F., Marco R., Konyukova O.L., Letunov S.A.	Integration of DT into all spheres of life, economic sectors, and social areas needing it	Meeting the demand for implementing digital technologies in all areas of economy and social life
Rosatom Digital Solutions	Implementation of DT to automate and optimize various processes – from daily life to public administration	Automation of economic and social processes via digital technologies
Katrin E.V.	Processing valuable and efficient information into user-friendly digital data	Data processing across all areas of life and activity for presentation in an accessible format
Trending approaches		
Zagrebina V.V., Serova E.A.	New social reality gradually replacing analog objects, systems, and processes in economy, culture, and individual life	Global transition from analog to digital systems
Meshcheryakova N.N., Rogotneva E.N.	System-activity process for creating a digital society and civilizational progress; transition from post-industrial to digital society	Transition from post-industrial to digital society, Industry 4.0
Danilova L.N., Ledovskaya T.V., Solynin N.E., Khodyrev A.M., Nikulina T.V., Starichenko E.B.	New era based on big data and technologies enhancing production efficiency and scale through successful individualization in any area of human activity	New era marked by increased efficiency in economy and other areas using big data and related technologies enabling individualized approaches
D.D. Yusupaliev	Set of modern processes and tools, a qualitatively new stage of telecom and IT development transforming all spheres of contemporary life	New stage in telecom and IT development transforming all aspects of human life

Table 2 (continued)

Author	Approach to defining digitalization	Characteristics of the definition
Modern combined approaches		
Gadetsky V.G., Koryakina A.A., Yedzaeva M.O., Chizhik A.P., Konkov A.E., Khomyakova S.S.	Broad sense: "trend of effective global development"; narrow sense: "conversion of information into digital form," "strategy for integrating digital technologies into everyday life"	Digitalization as a trend and digitization; digitalization as trend and process applied to all areas of life (the second meaning is more comprehensive))
Gerasimova T.A., Moskvitina N.V.	Implementation and use of innovative technologies, digital economy principles in socio-economic life, accompanied by full automation, robotics, and AI; creation and use of modern systems, technologies, and tools to improve management efficiency and service quality	Digitalization as implementation of advanced innovative technologies in the economy and social sphere to improve management efficiency. The two meanings are largely overlapping
Gayvoronskaya Y.V., Miroshnichenko O.I., Mamichev A.Yu.	1) Transition from analog to digital information; 2) "digitization of information"; 3) broad set of economic, managerial, social processes related to widespread adoption of digital, computer, information, electronic, network (telecommunication) technologies, and AI systems	Digitalization as transition from analog to digital, digitization, and implementation of various technologies and systems. The first two meanings are interrelated and can be considered together. The third includes all digital technologies without distinguishing their essence
Solenaya O.A., Yakovleva A.A	Series of sequential actions in various life spheres to improve quality and efficiency via digital technologies; process, approach, set of actions, comprehensive solution, data digitization, and concept – transformative change requiring strategy and foreign experience consideration	Comprehensive approach combining meanings, where the essence of digitalization is diluted; the second part refers more to digital transformation
Plotnikov V.A.	Process of implementing digital technologies for generation, processing, transmission, storage, and visualization of data in all areas of human activity; current stage of informatization distinguished by use of DT, generation, processing, transmission, storage, and visualization of information	Digitalization as implementation of digital technologies across all areas of life and stage of informatization
L.V. Silakova, A. Andronik, A.D. Kiselev	1) Digitization – converting information (data) into digital format; 2) Digitalization – process of applying digital technologies to improve specific operational processes in an organization	Digitalization as digitization and implementation of digital technologies in organizational activities

Source: Compiled by the author on the basis of [7–11]; Digitalization in Russia: History, Objectives, Stages of Development, and Typical Problems. URL: <https://digitalrosatom.ru/blog/188> (accessed on 19.02.2025).

benefits were first recognized and implemented in business.

3. Original meaning: Initially, digitalization referred to “digitization” — the conversion of analog data and systems into digital format. This definition is still used by some governmental bodies in Russia and adopted by leading research centers, such as the Higher School of Economics (HSE).

4. Broad interpretation: In a wider sense, digitalization can be understood as a process, integration, implementation, concept, mechanism, trend, or global vector.

5. Sectoral relevance: Many definitions correctly emphasize that digitalization responds to the needs of economic sectors and the social sphere for the implementation of digital technologies.

6. Practical effects: The beneficial outcomes of digitalization include increased efficiency of processes and operations, as well as enhanced performance of all participants in the socio-economic system.

7. Distinct from automation: Digitalization is not identical to automation. It differs by the higher level and qualitative characteristics of the technologies applied, as well as their systemic and comprehensive nature. At the same time, digital technologies produced through digitalization represent a more radical shift, capable of fundamentally transforming existing models and processes of socio-economic actors, and should be considered separately.

Thus, it seems reasonable to develop a new combined approach that accounts for the evolution and significant aspects of digitalization:

Digitalization is:

- the digitization of data — converting it from analog to digital format to increase the efficiency of information collection, processing, storage, and transfer (**technological approach**);
- the process of implementing digital technologies (as the virtual expression of innovative and information technologies, realized through software) in the economy and social sphere, in accordance with the emerging demand and resources of participants in the socio-economic

ecosystem, to enhance the efficiency of its functioning (**socio-economic approach**);

- a process defining a new global development vector for the economy and social sphere of countries worldwide, based on the new technological paradigm (Industry 4.0), implying the widespread integration of digital technologies and systems to improve economic efficiency and quality of life (**trend-based approach**).

RESEARCH APPROACHES TO DEFINING DIGITAL TRANSFORMATION

Let us now examine the research approaches to defining digital transformation (*Table 3*).

The analysis allowed the classification of approaches as follows: technological approaches (largely do not distinguish between “digitalization” and “digital transformation,” treating both as the conversion of data and operations into digital form), instrumental business approaches (focus on transforming business models and business processes to achieve key economic objectives of the company), economic-managerial approaches (based on the transformation of management processes; applicable to any economic system), combined approaches (integrate instrumental business and economic-managerial approaches; include multiple interpretations of “digital transformation”), universal approaches (applicable not only to the economy but also to the social sphere).

It should be emphasized that the majority of approaches are designed for business, some for economic systems, a few in a universal format (without specifying a sphere), and only one explicitly mentions applicability to the social sphere. At the same time, state strategic guidelines target the digital transformation of both the social sphere and the economy.

Based on this, the following key **characteristics of digital transformation** in a universal socio-economic format can be formulated:

1. Associated with qualitative transformation of key aspects of socio-economic system development (processes, models, mechanisms, etc.)

Table 3

Approaches to Defining the Category “Digital Transformation”

Author	Approach to defining digital transformation	Characteristics of the definition
Technological approaches		
Bonačić V., Souček B., Čuljat K.	Conversion of analog signals into digital form and their subsequent processing	Digitalization in the sense of “digitization”
Berghaus S., Back A.	Digitization of processes with a focus on efficiency, as well as digital innovations aimed at enhancing existing physical products	Process digitization and creation of innovations based on digital technologies
Instrumental business approaches (modernization, transformation of business processes and business models)		
Oracle Corporation	Conversion of all existing business processes (e.g., operations, sales channels, supply chains) into digital form	Translation of business processes into a digital format
Boston Consulting Group, Schwertner K.	Implementation of digital technologies across all business aspects and enterprise segments to fundamentally change the company's business model	Comprehensive digitalization considering all aspects of business
Andal-Ancion A., Cartwright P.A., Yip G.S.	Transformation and automation of business processes using digital technologies	Focused on qualitative and radical changes in business processes
IBM, McKinsey, Citrix, Terrasoft, Dropbox, Rufus Leonard, Deloitte, Bloomberg, Bekkhus R., Pavola et al., Fischer M., Gong C., Ribiere V.	Change, transformation, and modernization of business models and processes through digital technology to: - meet customer expectations, - increase profit, - ensure fast, effective, and secure operations, - enhance individual employee productivity, - raise company innovation level, - attract talent, - adapt to changes, - improve administrative efficiency, - enhance stakeholder communication and interaction, - increase stakeholder value	Focused on addressing economic goals of the enterprise by transforming business models and processes through digital technologies
Kudryavtseva T. U. Kozhina K.S. Petrushka I., Yemelyanov O., Petrushka T., Koleshchuk O.	Execution of multiple digitalization projects involving customized strategic company transformation over the long term; implies full business restructuring based on digital technologies	Digital transformation as “multiple” digitalization, implying complete business restructuring
Frolov K.V. Babkin A.V. Frolov A.K.	Process of updating corporate software solutions, where process-supporting components and external interaction functions are performed by software services	Development of the corporate sector and its processes through software services and solutions
Niyazova U.M.	The main factor driving enterprise development, ensuring the construction of a digital business model and increased efficiency through digital technology	Key factor in enterprise development

Table 3 (continued)

Author	Approach to defining digital transformation	Characteristics of the definition
Economic and managerial approaches		
Ruzina E.I.	Process of changing strategy, processes, and business model, including digitalization (in terms of using digital technologies)	Part of strategy, includes digitalization
Strock O.A.	Transformation of the management system through the revision of strategy, models, operations, external communications, products, marketing, and goals, enabled by adopting digital technologies in enterprise business processes	Management system transformation
Combined economic approaches		
Silakova L.V., Andronik A., Kiselev A.D.	- Implementation of various digital technologies at all enterprise levels, from operational to strategic. Initially a synonym for digitalization, later focused on changing business models and processes through digital technology. - Transformation of existing or creation of new business models through digital technologies (with emphasis on data management), accompanied by business process changes and increased competitiveness and efficiency	- Covers all enterprise levels - Aims to change business models and processes - Ensures data management efficiency and competitiveness growth - Applicable for describing enterprise activities
Savey L., Daradkeh I.I., Gouveia L.B., Mazzone D.M.	Deliberate and continuous digital evolution affecting people, organizations, management practices, and business models; enhances capabilities of companies and employees, providing tools to become more active, mobile, and productive. Broader concept than digitalization	Global interpretation of digital transformation; evolutionary approach involving all participants of the economic system; linked to the concept of "digitalization"»
Universal approaches (applicable to the social sphere)		
Kolesnikov Yu.A.	Deep changes in management and regulatory mechanisms (modernization) for uniform, often repetitive operations requiring big data processing	Qualitative changes in management mechanisms based on big data processing
Ustinova L.N.	Creation of innovative products; identification of new technological solutions using advanced information technologies; ensuring sustainable development through digital technologies	Provision of product and/or technological innovation and sustainable development via digital technologies
Khalin V.G., Chernova G.V.	Process of gradual changes – from implementation of digital technologies to transformation of an entire sector	Evolutionary approach, without specifying the sector of transformation
K. Ebert and K. Duarte	- Implementation of new technologies to increase productivity, create value, and improve social welfare - Changes in the management system through reforms in strategy, models, operations, products, marketing, and goals, supported by digital technology	The only approach indicating application in the social sphere

Source: Compiled by the author based on data [12–16].

through the application of digital technologies, including the creation of fundamentally new elements and products.

2. Comprehensive in nature — simultaneously affects multiple segments, hierarchical levels, and functional aspects of the socio-economic system and its participants.

3. Aimed at significantly improving efficiency of the system and its components (technological, infrastructural, organizational-managerial, human resources, financial, social, etc.).

4. Includes digitalization as a partial process, representing the transformation of individual elements through the adoption of digital technologies.

5. Forms part of the strategy for managing and developing the socio-economic system, enabling regulation and control of complex and large-scale changes in its subsystems through digital technology implementation and digitalization of its individual elements.

We define **digital transformation of the economy and social sphere** as an evolutionary process of complex qualitative changes in the elements of the socio-economic system, achieved through the cumulative benefits of implementing digital technologies (digitalization) across all segments of business activity and public life. This process is aimed at economic growth and improving quality of life — that is, increasing the overall efficiency of the socio-economic system as well as the performance of its individual components.

Approaches to defining digital maturity

Next, we consider research approaches to defining **digital maturity** as an indicator of the realization of a territory's digital potential (*Table 4*).

Digital maturity, according to the presented approaches, can be defined as the two-way transition of organizational processes and resources into digital form; readiness for digital transformation, reflecting digital capabilities and potential; the set of factors determining the effectiveness of digital transformation and adaptation to digital

changes; and the result of digital transformation, allowing assessment of quantitative and qualitative indicators of this process and their compliance with target values. Most existing definitions of digital maturity are applicable to enterprises, less often to economic systems, and in some cases — to evaluating the conditions and outcomes of digital transformation in the economy and social sphere.

By synthesizing the definitions presented and applying them to regional socio-economic systems, encompassing the development of the social sphere, we propose the following interpretation of digital maturity:

Digital maturity of the economy and social sphere of a territory is the set of prerequisites (conditions) and results of the digital transformation of the socio-economic ecosystem and its elements, determining the quantitative and qualitative characteristics (digital experience) of the application of Industry 4.0 technologies to address the region's socio-economic tasks, adapt to changing conditions in the digital environment, and ensure economic growth and improvement in the quality of life of the population.

Systematization of Digital Economy Categories

The analysis and classification of the terms “digital economy,” “digitalization,” and “digital transformation” allow not only a deeper understanding of their essence (including in the context of socio-economic development of the state) but also the comparison of their meanings with each other. This comparison plays an important role in determining their interrelations and systematization. In recent years, in relation to the digital economy of states and the constituent entities of the Russian Federation, essential interpretations of categories such as “digital potential,” “digital profile,” “digital resources,” and “digital needs” have also been developed.

The difference between the current and prospective levels of digital development at each stage (the achieved level of digital maturity) determines **the digital potential of a region** [28] — a concept

Table 4

Approaches to Defining Digital Maturity

Author	Approach to defining digital maturity	Characteristics of the definition
Technological approaches		
Westerman G., Bonnet D., McAfee A.	Integration of organizational operations and human capital into digital processes and vice versa	Transformation of company operations and resources into digital format and back – more suitable under the definition of digitalization (in the sense of “digitization”)
Aslanova I.V., Kulichkina A.I.	Integration and implementation of organizational processes and resources into digital form and vice versa	
Decree of the President of the Russian Federation No. 1014, 28.11.2024	Level of use of domestic information technology solutions in a region, including evaluation indicators across five sectors: healthcare, education, urban infrastructure and construction, public transport, and public administration	Narrow understanding of digital maturity as the result of successful import substitution of ICT solutions; indicator of technological sovereignty. Advantages: not limited to economic framework; extends to social sphere
Being ready for digital transformation		
Dedyayeva L.M., Yarunichev A.I.	Indicator of an organization’s ability to produce products using digital technologies; key success factor for companies initiating digital transformation	Digital technologies as a production and competitiveness factor
Kane G.	Systematic preparation of the enterprise to adapt to continuous digital changes	Adaptation to digital transformations through permanent readiness
Kuzin D.V.	Key indicator of readiness of the state and organizations to implement digital solutions in their processes	Extended context – from business level to the state
Kvint V.L., Babkin A.V., Shkarupeta E.V.	Level of readiness to implement Industry 4.0 and 5.0 technologies	Specifies a concrete list of new-generation technologies
Digital capabilities / digital potential		
Westerman G.	Level of development of digital capabilities	Resource-based approach – assumes conditions for digital change exist
Soroka D.O., Gorkaltsev V.S., Karlova T.V.	Concept allowing a company to assess its digital capabilities; indicator of enterprise digital development	Connection to digital development (rare definition)

Table 4 (continued)

Author	Approach to defining digital maturity	Characteristics of the definition
Galimov T.S., Galimova M.P., Savenko O.V., Gilev G.A.	Potential for survival, resilience, and development in the new digital environment; digitalization potential for creating greater value for consumers and stakeholders via DT-driven design, creation, distribution, and flexible value chains	Adaptation potential to a changing digital environment; digitalization potential for achieving company goals (can be replaced by digital transformation potential without significant change in meaning)
Organizational property / set of success factors for digital transformation (across all stages of implementing digital technologies)		
Bannyh G.A., Kostina S.N.	Organizational property determining the success of the digital transformation process	Persistent organizational characteristic ensuring digital transformation success (achievement factor)
Rossmann A.	Set of digital transformation factors in companies	Complex of conditions for digital transformation
Kuzin D.V.	Level of systemic understanding of DT processes, aspects, competencies when developing strategies, business models, partner interaction systems, etc.	Digital maturity as the understanding of digital transformation processes and their necessity, analogous to human maturity
Adaptation to digital changes		
Deloitte	Gradual and targeted organizational learning process defining response to changes in the digital competitive environment	Process of learning and responding to digital changes; outcome depends on maturity level but is not identical to it
Gartner Consulting	Ability to identify, create, participate in, offer, monetize, and adapt in the digital era	Set of organizational actions for adaptation in the digital environment; more a consequence of digital maturity than its essence
Result of digital transformation		
Dominguez A.	Final stage of company digital transformation, enabling improved operations and increased customer satisfaction	Final stage, goal of digital transformation; like any goal, must be specific, measurable, and time-bound
Polyakova T.A., Minbaleev A.V.	Comprehensive characteristic of achieved organizational results in DT based on quantitative and qualitative parameters	Quantitative and qualitative parameters of digital transformation results

Table 4 (continued)

Author	Approach to defining digital maturity	Characteristics of the definition
Decree No. 474, 21.07.2020 "On the national development goals of the Russian Federation until 2030"	Criterion for achieving the national goal – digital transformation	Indicator of achievement of set quantitative and qualitative goals of digital transformation at national and regional levels within a given time frame (measurable in %)
Being ready for digital transformation and its result		
Khachatryan G.A., Mukhina I.V.	Set of company characteristics enabling assessment of its state before and after digital transformation	Level of quantitative and qualitative digital development indicators before and after DT
Dedyaeva L.M., Yarunichev A.I.	Endpoint of digital transformations in the economy; measure of readiness to implement DT tasks	Establishing the final goal of digital transformations as a discrete process along with readiness measure
Babkin A.V., Shkarupeta E.V., Gileva T.A., Polozhentseva Y.S., Chen L.	Degree of penetration of digital technologies into all systems and business processes, and the level of readiness to integrate the enterprise into the new Industry 4.0 technological framework	First part describes digitalization process; second indicates global context of enterprise digital transformation (alignment with new technological framework)
Bannyh G.A., Kostina S.N.	Organization's readiness to start digital transformation (analogous to biological maturity) or final stage of DT (similar to psychological stability of an adult)	Analogy to biological and psychological human maturity; reveals two key understandings (conditions vs. results, similar to socialization of an individual)

Source: Compiled by the author based on data [17–27].

for which definitions and assessment methodologies are currently insufficient. In turn, the capabilities of the socio-economic ecosystem for digital transformation, aimed at increasing its efficiency, are based on the **digital resources** of the territory (financial, innovation-technological, human, organizational, infrastructural, etc.), which provide opportunities for implementing digital technologies. The indicators of digital transformation, aimed at achieving a specified level of digital maturity, are determined by the **digital needs** of the region's economic sectors and social sphere, reflecting the necessity and demand for digital technologies, and can be both explicit and latent. The terms "digital resources" and "digital

needs" are proposed by the author of this study to define the level of digital potential of a region and to develop quantitative and qualitative methods for its assessment [29].

The variation of regional differences in digitalization and digital transformation (DT) of economic sectors and the social sphere, as well as the specifics of the region's digital needs and resources, is reflected in the **digital profile of the region** [30]. In this context, digital transformation — a continuous long-term process, yet discrete from the perspective of managing immediate (or even distant) changes — represents the movement from the current to the target level of digital maturity, implying the realization of the digital potential of

the region's economic sectors and social sphere. Methodologies for measuring a region's digital resources, digital needs, and digital potential, taking into account its digital profile, constitute a possible direction for future research, particularly for regions of Russia with their diverse socio-economic characteristics.

The system of digital economy categories can be represented as three blocks: Conditions block — digital profile, digital needs, and digital resources; Processes and results block — digitalization, digital transformation, digital development, digital maturity; Scaling results block — integration of digital ecosystems, digital ecosystems of territo-

rial units, digital ecosystems of enterprises and sectors (see *Figure*).

In the proposed diagram, all categories of the digital economy and the digital development of a region's social sphere are grouped, with the cause-and-effect relationships of processes and results of digital development being interlinked. The most general category is “digital development”, due to the applicability of this term for interpreting many other categories.

The aggregation and systematization of definitions of key digital economy categories allows for a more structured and comprehensive approach to its development, enabling effective management

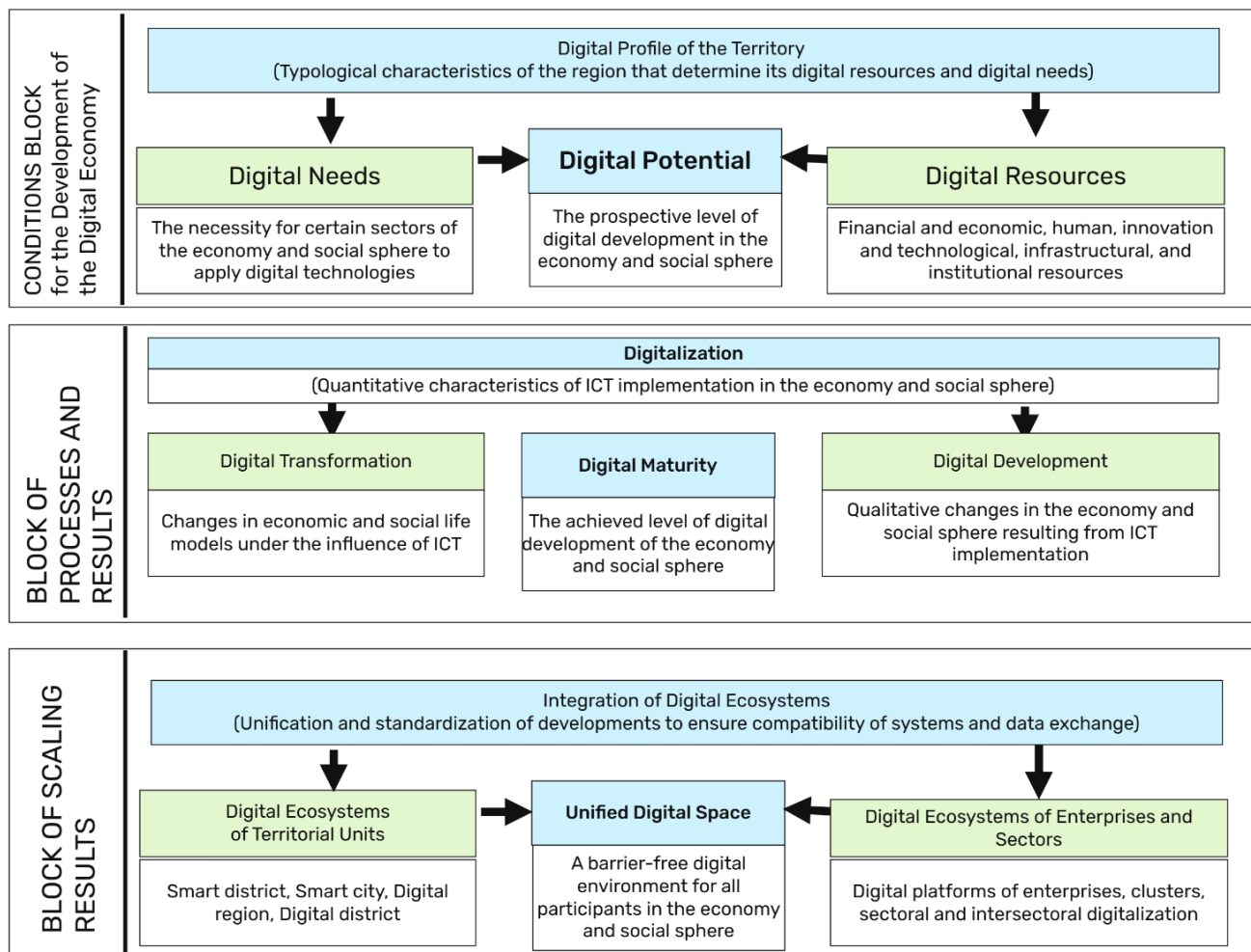


Fig. The System of Categories in the Digital Economy

Source: Compiled by the author.

of digitalization, digital transformation (DT), and digital potential at both national and regional levels, as well as providing indicators of digital maturity. Digitalization and DT of socio-economic systems at the territorial level are more effective than at the national level due to the high degree of regional differentiation and digital inequality (in terms of available digital resources and current digital needs). Therefore, DT strategies are developed directly within each region, in accordance with its digital profile and individually established indicators of digital maturity.

The last block of the system (see *figure*) — the scaling results block — requires additional study and consideration, as its elements contain not so much conceptual constructs as concrete technological solutions aimed at forming a unified digital space for the region and the country. Among these are digital ecosystems of territorial units (smart city, smart district, digital region, digital district), as well as digital ecosystems of enterprises and sectors (enterprise digital platforms, outcomes of cluster, territorial, and sectoral digitalization). The development of the concept of a “digital region”, whose implementation is necessary to create a unified digital space across territories first at the municipal, then regional, and finally national levels, has been the subject of separate studies by the author of this article.

CONCLUSIONS

The analysis and systematization of key categories of the digital economy carried out in this study have made it possible to develop general-

ized or combined definitions of digitalization, digital transformation, and digital maturity of the economy and social sphere of a territory, as well as its economic potential.

1. The digital economy encompasses not only economic activity but also the associated social processes, based on the formation of digital infrastructure and the application of end-to-end digital technologies.

2. Three basic approaches can be applied to the definition of digitalization: technological (digitization of data, i.e., conversion from analog to digital format), socio-economic (implementation of digital technologies in economic sectors and the social sphere), trend-based (representing a new era of development).

Digital transformation implies the comprehensive implementation of digital technologies aimed at qualitative changes in the socio-economic system. Digital maturity of the economy and social sphere of a territory represents both the prerequisites (conditions) and the result of digital transformation of the socio-economic ecosystem and its elements.

The results of this work will be useful for researchers for further terminological analysis, expanding the system of digital economy categories, and unifying their interpretation. They will also benefit authorities by supporting the implementation of digital technologies at the level of economic entities and socio-economic systems, as well as the development of methodological frameworks for forming digital profiles of territories and assessing their digital needs and resources.

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Clarifying the Principles of Sustainable Development of an Organization in the Context of an Emerging Economy

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ABSTRACT

The **aim** of this study is to clarify and justify the principles of sustainable organizational development at the current stage of Russia's economic evolution. Using such **methods** like systematic analysis of academic literature and empirical data, as well as confirmatory factor analysis (CFA), the researchers identified and validated five fundamental principles forming the basis of corporate sustainable development: long-term orientation, integrated ESG management, multi-stakeholder value, crisis resilience, and adaptive innovation. Key aspects of implementing these principles were also outlined. The **findings** of the study can be applied by organizations in the development of long-term strategies, risk minimization, enhancement of competitiveness, and the establishment of balanced stakeholder relationships. They also offer a foundation for designing corporate policies aimed at achieving sustainable development goals.

Keywords: sustainable development; ESG-policy; long-term strategy; multi-stakeholder approach; crisis resilience; adaptive innovation; corporate social responsibility

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INTRODUCTION

In the contemporary economic paradigm, the concept of sustainable development, first articulated at the United Nations Conference in Rio de Janeiro (1992¹), has become a key reference point for both public and corporate governance. Its relevance is driven by the need for economic systems to adapt to the increasing dynamism of the external environment. This environment is characterized not only by traditional challenges but also by qualitatively new sources of uncertainty, such as global pandemics (e.g., COVID-19). In general, organizational sustainable development (SD) is understood as an organization's ability to maintain long-term viability while ensuring sustainable growth and minimizing negative environmental impact [1].

The methodological foundation for implementing this concept lies in a system of management principles, according to which: first, a normative and value-based framework for the organization is formed, determining strategic priorities and parameters for managerial decision-making; second, in conditions of high external volatility, the resilience of the management paradigm is ensured (principles act as a stabilizing factor amid changing operational objectives); and third, institutional prerequisites are created for fostering an organizational culture oriented toward long-term effectiveness.

Under current socio-economic conditions, enterprises face the need to rethink the principles of sustainable development. However, as shown by the authors' analysis, existing approaches to formulating these principles are fragmented, unsystematic, and lack a clear methodological foundation. Moreover, they are often inconsistent with modern sustainable development standards, which

¹ Rio Declaration on Environment and Development. Adopted by the United Nations Conference on Environment and Development, Rio de Janeiro, 3–14.06.1992. URL: https://www.un.org/ru/documents/decl_conv/declarations/riodecl.shtml

limits their practical applicability. The principles have typically been developed for stable economic conditions and do not account for crisis turbulence or the specificities of emerging economies. Nevertheless, their study is of both theoretical and practical interest and provides a methodological basis for developing a new generation of management systems capable of addressing the challenges of contemporary economic realities.

To develop and substantiate organizational sustainable development principles, the following tasks were undertaken:

- conducting a systematic literature review on the topic;
- identifying key principles of sustainable development;
- theoretical and empirical validation of these principles;
- formulating practical recommendations for the implementation of sustainable development principles.

RESEARCH METHODOLOGY

The research was conducted in the following stages:

1. Bibliographic analysis of sources on the research topic;
2. Refinement of organizational sustainable development (SD) principles in the context of emerging economies and the criteria for their evaluation;
3. Empirical validation of SD principles through a survey;
4. Formulation of practical recommendations for their implementation.

Through systematic analysis, publications ensuring representativeness were identified, including articles in SCOPUS- and RSCI-indexed journals, as well as K1-level journals of the Higher Attestation Commission (VAK), whose authors systematize organizational SD principles. The search was conducted by article title and the following keywords in both Russian and English: corporate sustainability principles, organizational sustainability principles, organizational sustainable development principles,

corporate sustainable development principles, firm sustainable development principles, and business sustainable development principles. A schematic representation of the research methodology is presented in *Fig. 1*.

The chronological scope of the study (1980–present) was scientifically justified based on key milestones in the development of sustainable development (SD) policy. The methodological reference point is the United Nations Conference on the Human Environment in Stockholm (1972²), where the historic Stockholm Declaration was adopted, laying the normative and legal foundations of the modern environmental paradigm. This forum represented a conceptual breakthrough, marking the transition from fragmented environmental protection measures to a systemic understanding of environmental security as a global challenge.

The scientific publications identified through keyword searches were carefully examined for their relevance to the research topic. Ultimately, 22 articles published between 2013 and 2025 were included in the systematic review.

The formulated principles were assessed for convergence with the international GRI³ standard for sustainable development and the Russian RSPP⁴ ESG index. For empirical validation of the evaluation criteria, a 15-item online questionnaire was specifically developed to measure latent constructs (three indicators per each of the five latent constructs).

The sample was formed using stratified random sampling (emails sent to an open database as well as to contacts affiliated with UrGEU), taking into account both industry sector and company size. In

² Declaration on the Environment from 16.06.1972. URL: <https://docs.cntd.ru/document/901880141> (accessed on 03.11.2024).

³ GRI Global Sustainability Standards. URL: <https://www.globalreporting.org/standards/>. According to a study by the international consulting corporation KPMG, 78% of companies from the G250 list used GRI standards for reporting in 2023.

⁴ RSPP ESG indices and ratings in the field of sustainable development. URL: https://rspp.ru/sustainable_development/indexes/. RSPP's sustainable development indices are internationally recognized.

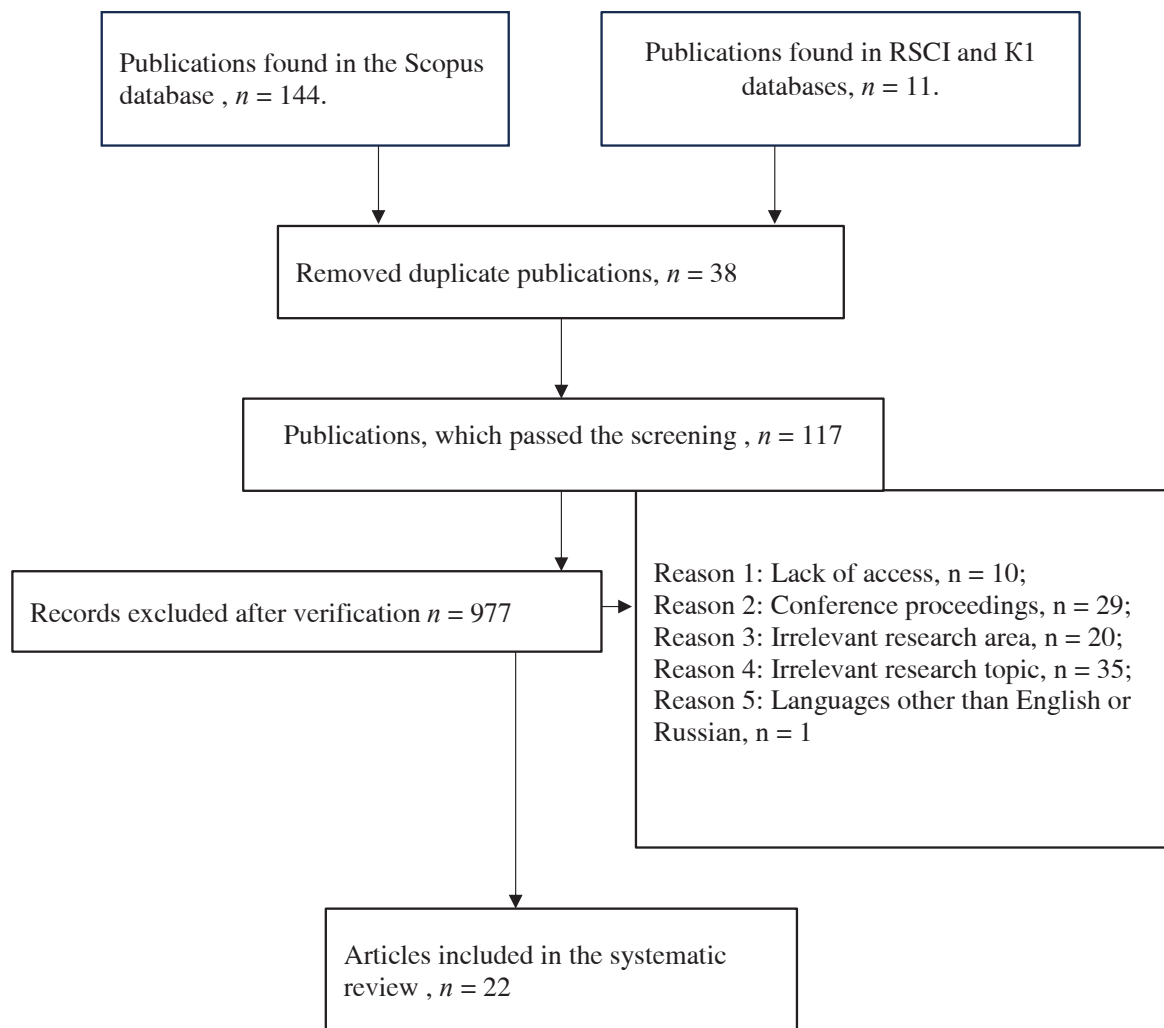


Fig. 1. Systematic Review Flowchart

Source: Compiled by the authors.

Table 1

Industry Affiliation of Respondent Organizations

Industry	Number of respondents, person	Share, %
Industry, including:	167	58.19
• Mining and Metallurgy	80	27.87
• Fuel and Energy	79	27.53
• Chemical	8	2.79
Telecommunications	39	13.59
Financial	31	10.80
Retail Trade	17	5.92
Construction	16	5.57
Agriculture	9	3.14
Transport	8	2.79

Source: Compiled by the authors.

total, 480 invitations to participate in the survey were sent. Data collection took place from November 2024 to March 2025. Multi-stage engagement methods were employed to maximize response rates, including personalized reminders via social media and repeated email communications. Respondent selection was based on professional competence corresponding to their position.

A total of 287 managers (59.8%) involved in sustainable development activities completed the questionnaire. Guarantees of anonymity helped reduce the social desirability bias. The industry distribution of respondent organizations is presented in *Table 1*.

Confirmatory factor analysis (CFA) was applied for rigorous verification of hypotheses regarding the factor structure [2] and was conducted in Mplus 8.11 using the Robust Maximum Likelihood (MLR) method. This approach allowed for adjustments for potential deviations from normality in the data distribution.

The development of a system of managerial tools for implementing sustainable development (SD) principles was carried out through a synthesis of theoretical methods and the analysis of corporate practices. The use of structural-functional modeling enabled the design of instruments that align strategic, tactical, and operational aspects of management.

RESEARCH FINDINGS

Literature Review and Bibliographic Analysis

The results of the study indicate that a substantial body of research relies on the concept of “sustainable development principles.” However, it is often unclear whether these refer specifically to ESG principles (encompassing social, environmental, and corporate governance dimensions) or to sustainable development itself as a basis for managerial decision-making [3].

Analysis of different authors’ approaches to formulating SD principles shows that starting points vary widely. According to Normative theory, sustainable development principles include: (1) satisfying the basic needs of all currently living people; (2) ensuring equal standards of satisfaction for the global

population; (3) careful and prudent use of natural resources; and (4) preserving the ability of future generations to meet their fundamental needs. This list primarily pertains to macro-level sustainable development concerns.

A.G. Mnakatsanyan and A.G. Kharin [4] argue that effective modern business management requires identifying and evaluating the relationships between a firm’s financial and economic indicators and the degree of its adherence to extended sustainability principles: social, environmental, and economic, including the intangible aspects of business interaction with society and the environment. However, the specific set of these principles is not clearly defined.

N.A. Najm et al., in examining the relationship between SD principles and organizational commitments, identify three classical dimensions — social, environmental, and economic — further specified through measures such as pollution reduction, recycling, renewable resources, “green” innovations, and ethical sustainability, without providing a methodological justification for these principles [5]. A clear overemphasis on the environmental dimension is observed, with insufficient elaboration of economic and corporate aspects of SD. Moreover, the social dimension is largely reduced to ethical sustainability, significantly limiting its substantive content. In our view, this approach does not allow for the development of a comprehensive SD business model that accounts for the full spectrum of relevant factors.

Within the scholarly discourse conducted by M.J. Muñoz-Torres and colleagues, sustainable development is examined through four key principles that form the methodological foundation for its implementation across disciplines: the multidimensionality of sustainability and balance among its aspects; the intergenerational perspective; a stakeholder-oriented approach; and the life cycle concept [6].

In one of the earliest studies relevant to the present article, Indian researchers, based on theoretical analysis in the context of designing an organizational life cycle management system, formulated principles aimed at realizing organizational potential,

strengthening connections within internal and external environments, and promoting sustainability [7].

One of the few empirical studies indicated that the most critical principles for industrial business development, independent of company size and ensuring sustainable development, are business ethics, team management, collaboration networks, and customer relationship management (i.e., recording and maintaining customer data through an appropriate system) [8].

A.V. Kolobov, when formulating sustainable development principles, referred to GOST R 54598.1–2015 “Sustainable Development Management” and an SD evaluation system based on 11 principles: values, strategy, goal-setting, engagement, organizational structure, customer orientation, accounting system, occupational safety, business system infrastructure, the role of the CEO, and business system configuration [9].

The achievement of SD objectives is possible through the implementation of ESG policies [10], which has led to the identification of corresponding management principles — so-called ESG principles — encompassing: the environmental aspect (consideration of environmental impacts, including carbon footprint reduction, efficient resource use, and climate risk management); the social aspect (attention to human rights, labor conditions, diversity and inclusion, and engagement with local communities); and the governance aspect (ensuring transparency, accountability, ethical management, and anti-corruption measures) [11, 12].

Table 2 presents the results of the bibliographic analysis. A detailed description of the reviewed studies is provided in the *Appendix* (see *Table*).

The review of sources addressing existing sustainable development (SD) principles reveals several significant methodological shortcomings. First, a substantial portion of the literature (40% of the sample reviewed) relies on a declarative approach, treating SD as an abstract principle without specifying mechanisms for its implementation. Second, 32% of the studies exhibit methodological inaccuracies, namely the unjustified conflation of the ESG approach with

SD principles, resulting in a substitution of concepts. Third, even in works proposing structured groups of principles (18% of cases), comprehensiveness is lacking, manifested in fragmented approaches and insufficient consideration of interconnections between sustainability components.

Moreover, many studies display an imbalance in evaluating environmental, social, and economic aspects, often emphasizing one component at the expense of others. Finally, almost all of the reviewed sources fail to account for contemporary challenges such as crisis turbulence and digital transformation, significantly reducing their practical relevance.

Comparison of CSR and ESG Principles and Evaluation Criteria for Implementing SD Principles

When corporate social responsibility⁵ (CSR) is adopted as a basis for achieving sustainable development goals, many authors assert the necessity of adhering to CSR principles, equating them with SD principles [13, 14]. However, CSR principles are systematized and formulated in GOST R ISO 26000–2012 “Guidance on Social Responsibility” and form the foundation for implementing corporate responsibility management; in general, they are not a matter of debate [15].

The interrelationship between sustainable development, ESG policies, and CSR has been described by the authors of the present article previously [14]. CSR is a concept implemented at the organizational level, guiding companies toward active engagement and interaction with stakeholders through the creation of institutional conditions and value generation [16]. ESG policies allow for the operationalization of CSR outcomes to achieve sustainable development goals (SDGs) [17]. Consequently, CSR principles, ESG policies, and SD principles should be aligned, as illustrated in *Fig. 2*—CSR principles are arranged horizontally, while ESG principles are displayed vertically.

⁵ GOST R ISO 26000–2012. Guidelines for social responsibility. Moscow: Standartinform; 2013. 48 p.

Table 2

Results of Bibliographic Analysis on Sustainable Development Principles

Characteristics of principles	Number of works	Main disadvantages
SD as a principle	7	Lack of operationalization; impractical for implementation
Specific groups of principles identified	2	Fragmented approaches; absence of a coherent system; inconsistency with modern standards
ESG as sustainable development principles	7	Methodological conflation of concepts; neglect of systemic interconnections
Highly specialized principles	6	Imbalance in the consideration of SD components; lack of comprehensiveness

Source: Compiled by the authors.

In our view, sustainable development (SD) principles should encompass both sets of approaches. They are intended to provide a comprehensive vision of the interconnections between a company's environmental, economic, and social dimensions, incorporate mechanisms for adaptation to conditions of uncertainty, and offer tools for the transformation of managerial practices. The rationale for the selection of SD principles is illustrated in *Fig. 3*.

Theoretical analysis of the literature, review of sustainable development standards, and consideration of contemporary challenges enabled the formulation of sustainable development principles (integrating both the ESG approach and CSR). For each principle, assessment directions and evaluation criteria have been defined (*Table 3*).

Table 3 demonstrates that a *long-term orientation* enhances both the competitiveness and resilience of organizations in volatile external environments. As shown by R. G. Eccles and colleagues, integrating this principle into corporate governance minimizes risks, optimizes capital allocation, and strengthens stakeholder trust, thereby supporting sustainable growth. Companies implementing long-term SD strategies achieve higher financial and operational performance through efficient resource utilization and the accumulation of reputational capital [18]. This aligns with the findings of [19], which report a negative correlation between the level of corporate social responsibility (CSR) and the volatility of an organization's market value.

Integrating ESG into corporate governance has become a critical strategic element, ensuring not only alignment with global trends but also long-term financial sustainability [20], risk reduction [21], reputation enhancement [18], and a focus on innovation-driven development [22, 23]. M. Khan et al. [20] demonstrated that "material" ESG factors — those significant to a specific industry — directly impact asset returns (ROA). A. G. Hoepner and colleagues found that ESG integration reduces systemic risks by improving corporate governance [21].

Financial institutions that actively implement ESG practices tend to exhibit higher returns compared with industry peers, indicating that ESG integration into management processes not only mitigates risks but also creates additional value through increased investor and client trust. Accordingly, corporations developing ESG strategies generally enjoy higher market capitalization [20].

A key aspect of the integrated approach is transparency and the management of reputational risks. Companies adhering to GRI standards and openly disclosing both positive and negative aspects of their operations are perceived as more trustworthy by stakeholders [24]. ESG-oriented enterprises attract qualified personnel [18], generate more patents [23], and more frequently implement environmentally friendly technologies [22, 25]. Thus, integrated ESG management is not merely a cost factor; on the contrary, it contributes to resource optimization and the strengthening of competitive advantages.

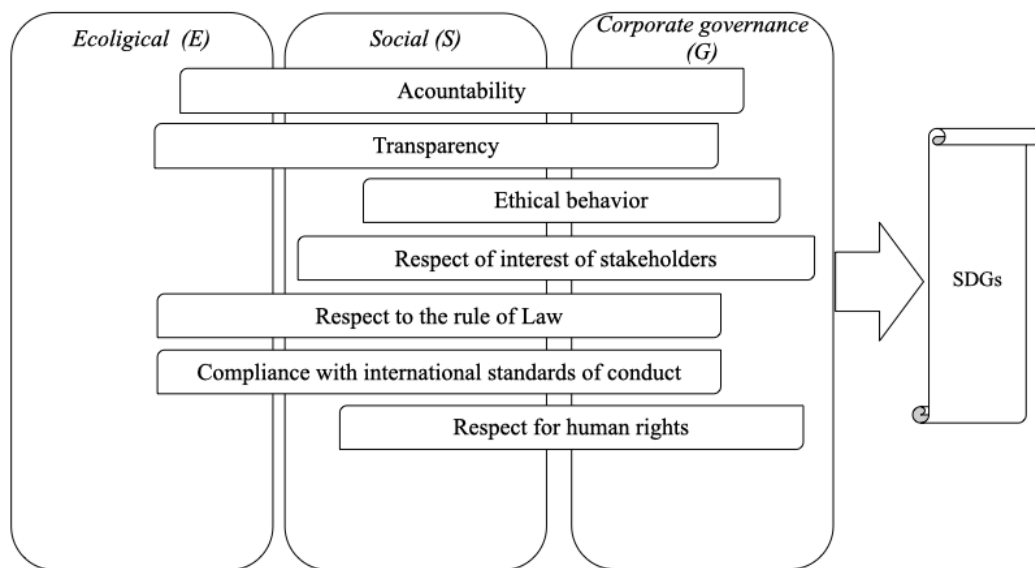


Fig. 2. Alignment of CSR and ESG Principles in Achieving the SDGs

Source: Compiled by the authors.

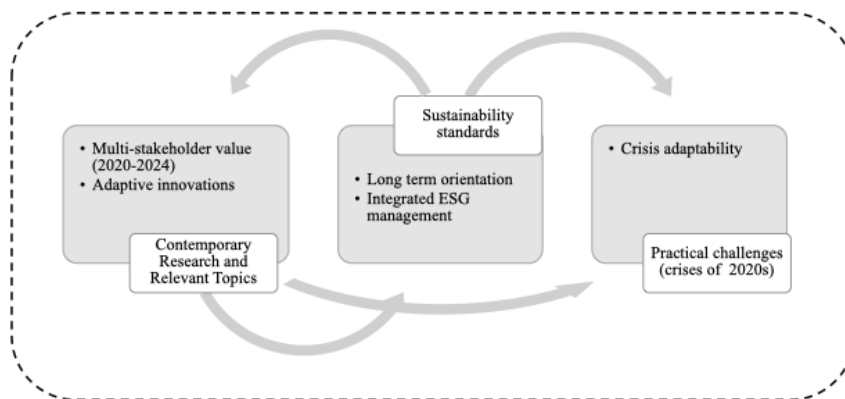


Fig. 3. Логика выделения принципов устойчивого развития / Logic behind the Identification of Sustainable Development Principles

Source: Compiled by the authors.

The contemporary paradigm of corporate governance is evolving from a narrow focus on shareholder value toward a comprehensive model of *creating value for all stakeholders* [26]. This shift is driven by a growing body of empirical evidence demonstrating the strategic advantages of a multi-stakeholder approach.

Companies that effectively manage relationships with key stakeholders possess sustainable competitive advantages [27]. Balancing stakeholder interests generates synergistic effects.

Researchers have identified a direct correlation between employee satisfaction (a key stakeholder) and the long-term market capitalization of companies [27], as well as the finding that organizations practicing stakeholder engagement are 23% less susceptible to crises [28]. It is not merely the establishment of a stakeholder management system that is important, but the design and implementation of mechanisms through the adoption of a value-based approach [29, 30]. Consequently, creating multi-stakeholder value is no longer an

Table 3

Criteria for Evaluating the Implementation of Sustainable Development Principles

Principle	Criteria	Directions and methods of evaluation	Justification for the choice of principle and criteria
Long-term orientation and organizational sustainability	- Presence of an SD strategy with a horizon of at least 10 years; - investments in low-carbon technologies (CAPEX share for decarbonization); - long-term profitability indicators (ROE, ROIC^a considering ESG risks); - linkage of top management remuneration to ESG goals	- Analysis of strategic documents; - calculation of investment dynamics in "green" projects; - scenario modeling (impact of climate risks on project NPV); - evaluation of remuneration policies	A long-term strategy reflects a systematic approach to sustainable development. Investments in "green" technologies demonstrate alignment with global environmental trends. Financial indicators adjusted for ESG risks reflect the resilience of the business model
Integrated ESG management	- Integration of ESG factors into corporate governance; - transparency of ESG disclosures (according to GRI/SASB/TCFD standards, etc.); - effectiveness of environmental and social programs (emission reductions, injury rates); - biodiversity management	- Assessment of the presence of an ESG committee in the Board of Directors; - content analysis of reports; benchmarking against international and Russian ratings; - evaluation of KPIs for carbon footprint reduction (Scope 1–3^b); - assessment of ecosystem impact	ESG integration into management reduces non-financial risks. International reporting standards ensure transparency and comparability of data. Environmental indicators reflect actual progress
Creation of multi-stakeholder value	- Stakeholder satisfaction (local communities, investors, regulators); - contribution to regional development (taxes, jobs, social programs); - balance of interests (ratio of profit to SD reinvestment); - SME support programs	- Stakeholder satisfaction surveys; - assessment of contribution to regional development; - evaluation of partnership with local businesses	Stakeholder satisfaction ensures a social license to operate. Regional contributions demonstrate corporate responsibility. Balancing profit and reinvestment shows long-term orientation
Adaptability and resilience to crises	- Presence of a risk management system (including climate risks); - financial resilience (liquidity, debt load under shocks); - adaptability of operational processes	- Stakeholder surveys (NPS^c metric); - analysis of socio-economic impact (employment multiplier); - assessment of value-added distribution (WEF Stakeholder Capitalism Metrics methodology)	Stress tests identify vulnerabilities in the business model. Financial indicators reflect a buffer of resilience. Operational flexibility ensures stability under uncertainty
Adaptive innovation	- Share of R&D budget allocated to sustainable technologies; - number of patents in "green" energy (hydrogen, renewables, CCUS^d); - speed of innovation implementation (time-to-market for ESG projects); - use of secondary raw materials (%)	- Stress-testing based on IMF/IPCC scenarios; - analysis of financial stability ratios (Debt/EBITDA, Quick Ratio); - evaluation of adaptation speed (e.g., shift to remote work during the pandemic)	R&D investments indicate development priorities. Patents demonstrate technological potential. Speed of implementation shows the effectiveness of the innovation process

Source: Compiled by the authors.

Note: ^a – ROE/ROIC – return on equity and invested capital indicators; ^b – Scope 1–3 – classification of greenhouse gas emissions according to the GHG Protocol; ^c – NPS (Net Promoter Score) – Stakeholder Loyalty Index; ^d – CCUS – carbon capture, use and storage technologies.

ethical choice but has become an imperative of modern management. Companies that ignore this principle face reduced investment appeal, higher operational risks, and the loss of competitive positions.

The implementation of the principle of *adaptability and resilience to crises* is a critical element of organizational sustainability management. Research in strategic management and corporate sustainability indicates that an organization's ability to adapt to unexpected shocks while maintaining long-term viability correlates with its competitive advantages and financial stability [31].

Adaptability is closely linked to the theory of dynamic capabilities [32], which posits that firms capable of rapidly restructuring their business models, reallocating resources, and implementing innovations in response to environmental changes exhibit higher resilience to crises. Empirical studies confirm that companies with well-developed dynamic capabilities not only cope better with economic shocks but also leverage them as opportunities for growth [33]. Notably, adaptation is highlighted as a key element in resilience management [34]. In 2018, researchers proposed a resilience model based on a combination of strategic flexibility and operational robustness [35].

We argue that the organizational implementation of this principle requires the development of crisis scenarios and stress-testing of business models, investments in digital technologies and innovations, and the cultivation of an organizational culture that supports continuous learning and flexibility.

The final principle formulated in this study—*adaptive innovations*—is central to managerial actions aimed at sustainable development. It entails a company's capacity not only to generate innovations but also to rapidly adapt them to changing external conditions, thereby minimizing risks and maximizing long-term resilience [36]. The concept of adaptive innovations is grounded in a synthesis of eco-innovation theory, dynamic capabilities, and sustainability frameworks. However,

innovation alone is no longer sufficient; it must be “flexible”, capable of transforming in response to emerging challenges such as regulatory shifts or market shocks [37].

A critical aspect of adaptive innovations is the speed of the innovation process. Enterprises that can accelerate development and implementation cycles gain a competitive advantage in volatile environments, while firms with high innovation activity demonstrate superior financial resilience due to risk diversification and the creation of new market niches [36].

Research by an international team of authors shows that business models based on the circular economy require continuous adaptation of innovation strategies to minimize resource losses [38]. Adaptive innovation management is particularly important in complex socio-ecological systems.

Within the scope of this study, adaptive innovations are defined as the continuous and flexible updating of product, technological, and organizational solutions aimed at sustaining a company's development under conditions of instability. Unlike radical innovations, adaptive innovations do not necessitate abandoning breakthrough developments; rather, they reflect a firm's ability to swiftly transform its innovation processes in response to external changes — market shocks, regulatory shifts, or crisis events — as supported by research in dynamic capabilities [32, 33] and eco-innovation [36, 38].

We contend that for a deeper and more effective implementation of these principles, it is essential to clearly define the criteria for their evaluation, develop optimal management models, and continue designing mechanisms to stimulate sustainable development.

Comparison of Sustainable Development Principles with GRI Standards and the RSPP ESG Index: An Empirical Analysis

The next stage of the study involved evaluating the convergence of the formulated principles with international sustainability standards, specifically

Table 4

Comparison of Sustainable Development Principles with GRI Standards and RSPP ESG Index

Nº	Developed principle	Degree of convergence*
1.	Long-term Orientation	0.92
2.	Integrated ESG Management	0.89
3.	Multi-stakeholder Value	0.85
4.	Resilience to Crises	0.81
5.	Adaptive Innovations	0.78

Source: Compiled by the authors.

Note: * – The degree of convergence is calculated as the ratio of the number of matching indicators to the total number of relevant indicators in the standard.

the GRI⁶ Standards (according to KPMG, 78% of companies from the G250 list in 2023 used them for reporting) and the Russian RSPP⁷ ESG Index.

The analysis demonstrated that the management principles developed in this study not only enable maximum alignment with widely recognized sustainability standards but also provide a foundation for their improvement. Furthermore, they address areas that are not fully covered by existing standards yet are critical for achieving sustainable development.

The final expert assessment of the degree of convergence between the organization's sustainable development principles and the standards is presented in *Table 4*.

For the empirical validation, a standardized questionnaire was used to measure latent constructs, with three questions formulated for each principle: Long-term Orientation (LT1, LT2, LT3); Integrated ESG Management (ESG1, ESG2, ESG3); Multi-stakeholder Value (MSV1, MSV2, MSV3); Resilience to Crises (RES 1, RES 2, RES 3); and Adaptive Innovations (INN 1, INN 2, INN 3).

⁶ GRI Standards. URL: <https://www.globalreporting.org/standards/>

⁷ RSPP ESG indices and ratings in the field of sustainable development. RSPP (official website). URL: https://rspp.ru/sustainable_development/indexes/. RSPP's sustainable development indices have received international recognition.

To minimize systematic errors, the following measures were implemented:

- control of systematic bias through respondent anonymity guarantees;
- temporal separation of the measurement of predictors and criteria;
- use of both positively and negatively worded questions.
- completeness of responses was verified, with 92% of respondents providing full data.

Harman's single-factor test indicated that one factor accounted for 28.7% of the variance, which is below the critical threshold of 50%.

To assess relationships among observed variables and check for potential multicollinearity, a correlation matrix was constructed (*Table 5*). Pearson correlation coefficients ranged from 0.12 to 0.68, indicating no excessively high correlations (≥ 0.85) that could signal multicollinearity issues [2]. The strongest correlations were observed among indicators within the same latent constructs, consistent with theoretical expectations.

To assess the internal consistency of the scales, Cronbach's α coefficient and composite reliability (CR) were used (*Table 6*). It was found that all constructs demonstrated high reliability ($\alpha > 0.80$; $CR > 0.85$), exceeding the recommended threshold of 0.70.

AVE values greater than 0.5 confirm convergent validity. Thus, based on the correlation analysis,

Table 5

Correlation Matrix of Observed Variables

Indicator	LT1 ^a	LT2	LT3	ESG1 ^b	ESG2	ESG3	MSV1 ^c	MSV2	MSV3	RES1 ^d	RES2	RES3	INN1 ^e	INN2	INN3
LT1	1.00														
LT2	0.58	1.00													
LT3	0.52	0.61	1.00												
ESG1	0.22	0.18	0.25	1.00											
ESG2	0.19	0.24	0.21	0.63	1.00										
ESG3	0.15	0.17	0.23	0.59	0.68	1.00									
MSV1	0.31	0.28	0.25	0.34	0.29	0.27	1.00								
MSV2	0.27	0.30	0.22	0.31	0.33	0.25	0.65	1.00							
MSV3	0.24	0.26	0.19	0.28	0.30	0.22	0.61	0.58	1.00						
RES 1	0.12	0.15	0.18	0.41	0.38	0.35	0.22	0.20	0.18	1.00					
RES 2	0.14	0.17	0.20	0.39	0.42	0.38	0.25	0.23	0.20	0.67	1.00				
RES 3	0.16	0.19	0.22	0.37	0.40	0.36	0.24	0.21	0.19	0.64	0.62	1.00			
INN 1	0.20	0.23	0.25	0.18	0.21	0.19	0.32	0.30	0.28	0.15	0.17	0.14	1.00		
INN 2	0.18	0.21	0.23	0.16	0.19	0.17	0.29	0.27	0.25	0.13	0.15	0.12	0.66	1.00	
INN 3	0.15	0.19	0.21	0.14	0.17	0.15	0.27	0.25	0.23	0.11	0.13	0.10	0.63	0.59	1.00

Source: Compiled by the authors. Примечание / Note: a – (LT1–(LT13) – долгосрочная ориентация / long-term orientation; b – (ESG1–3) – интегрированное управление ESG / integrated ESG management; c – (MSV1– MSV3) – мультистейкхолдерская ценность / multi-stakeholder value; d – (RES 1– RES 3) – устойчивость к кризисам / crisis resilience; e – (INN 1– INN 3) – адаптивные инновации / adaptive innovation.

Table 6

Scale Reliability Indicators

Principle	Cronbach's α	Composite Reliability (CR)	Average Variance Extracted (AVE)
Long-term orientation	0.87	0.89	0.62
ESG Integrated ESG management	0.85	0.88	0.58
Multi-stakeholder value	0.83	0.86	0.55
Resilience to crises	0.82	0.85	0.53
Adaptive innovations	0.81	0.84	0.52

Source: Compiled by the authors.

no signs of multicollinearity were detected. All scales demonstrate high internal consistency, allowing for the execution of confirmatory factor analysis. AVE values above 0.5 indicate that the indicators adequately reflect their latent constructs. The highest reliability was observed for the “Long-term orientation” scale.

Confirmatory factor analysis was conducted in Mplus 8.11 using the Robust Maximum Likelihood (MLR) method, which allowed for correction of potential deviations from normality in the data distribution. The initial model included:

- 5 latent constructs (freely correlated with each other);

Table 7

CFA Model Fit Indices

Fit Criteria	Value	Index Acceptance	Compliance
χ^2 (df)	210.15 (80)	—	—
χ^2/df	2.63	< 3	Yes
RMSEA [90% CI]	0.052 [0.043–0.061]	< 0.06	Yes
SRMR	0.039	< 0.08	Yes
CFI	0.971	> 0.95	Yes
TLI	0.963	> 0.95	Yes

Source: Compiled by the authors.

- 15 observed variables (3 indicators per construct).

Model fit was evaluated using:

Absolute fit indices:

- $\chi^2/\text{df} < 3$;
- RMSEA (Root Mean Square Error of Approximation) < 0.06 (90% CI);
- SRMR (Standardized Root Mean Square Residual) < 0.08.

Incremental fit indices:

- CFI (Comparative Fit Index) > 0.95;
- TLI (Tucker-Lewis Index) > 0.95.

The results of the model evaluation are presented in *Table 7*.

The model demonstrates a good fit to the data:

- all key indices meet the strict criteria;
- the low SRMR value (0.039) indicates minimal discrepancies between the observed and implied covariance matrices.

Convergent validity is presented in *Table 8*.

Key Findings:

1. All factor loadings are statistically significant ($p < 0.001$) and exceed 0.60.
2. Composite Reliability (CR) for all constructs is greater than 0.80, confirming high internal consistency.
3. Average Variance Extracted (AVE) exceeds 0.50 for all scales, indicating satisfactory convergent validity.

Discriminant validity is presented in *Table 9*.

Discriminant Validity Criteria:

1. Fornell-Larcker Criterion: The square root of the AVE for each construct exceeds its correlations with all other constructs, confirming discriminant validity.

2. HTMT (Heterotrait-Monotrait) Ratio⁸: All values are below 0.85; the highest correlation is 0.62 (between Integrated ESG and Resilience), which supports discriminant validity.

Alternative Model Testing: To verify the uniqueness of the proposed five-factor structure, alternative models were tested (see *Table 10*).

The results of the comparison of the models show that the 5-factor model is significantly better ($p < 0.001$) than both the 4-factor model and the 1-factor model, thereby confirming the assumption regarding the significance of the identified management principles.

Case-Based Hypothesis Testing of Sustainability Principles

The formulated sustainability principles were empirically tested using three companies with varying levels of sustainability performance.

⁸ Discriminant validity according to Henseler, Jörg, Christian M. Ringle, and Marko Sarstedt. A new criterion for assessing discriminant validity in variance-based structural equation modeling. 43(2015):115–135

Table 8

Factor Loadings and Convergent Validity Indicators

Construct	Indicator	Standardized load ^a	CR	AVE
Long-term Orientation	LT1	0.84***	0.89	0.62
	LT2	0.78***		
	LT3	0.73***		
Integrated ESG	ESG1	0.81***	0.88	0.58
	ESG2	0.75***		
	ESG3	0.72***		
Multi-stakeholder Value	MSV1	0.79***	0.86	0.55
	MSV2	0.71***		
	MSV3	0.70***		
Crisis Resilience	RES 1	0.77***	0.85	0.53
	RES 2	0.69***		
	RES 3	0.68***		
Adaptive Innovations	INN 1	0.76***	0.84	0.52
	INN 2	0.67***		
	INN 3	0.66***		

Source: Compiled by the authors.

Note: a – for all column values the reliability index (p-value) < 0.001, which corresponds to the highest degree of significance

Table 9

Discriminant Validity Check: $\sqrt{AVE}$ vs. Inter-construct Correlations

Construct	1	2	3	4	5
1. Long-term Orientation	0.79				
2. Integrated ESG	0.31	0.76			
3. Multi-stakeholder Value	0.28	0.35	0.74		
4. Resilience	0.22	0.41	0.27	0.73	
5. Adaptive Innovations	0.25	0.19	0.32	0.16	0.72

Source: Compiled by the authors.

Table 10

Model Comparison (χ^2 test Difference Test)

Model	χ^2 (df)	$\Delta\chi^2$ (Δ df)	p-value	CFI	RMSEA
1. Original (5-factor)	210.15 (80)	—	—	0.971	0.052
2. 4-factor (ESG + Resilience combined)	285.47 (84)	75.32 (4)	< 0.001	0.932	0.068
3. 1-factor (general factor)	498.61 (90)	288.46 (10)	< 0.001	0.841	0.112

Source: Compiled by the authors.

Table 11

Sample Characteristics for the Analysis of Sustainability Principle Implementation

Organization	ESG-ranking RAEX	ECG-rating	Degree of sustainability
PJSC MMC Norilsk Nickel	2 (1/4/1)	—	high
ALROSA PJSC	4 (11/2/16)	—	high
PJSC Polyus	5 (2/13/12)	—	high
OMK JSC	—	AA – 97 (15/35/47)	medium
KRASCVETMET OJSC	—	A – 84 (12/28/44)	medium

Source: Compiled by the authors.

Table 12

Integrated Evaluation of Principle Implementability Across Surveyed Organizations

Company	Longevity	ESG	Stakeholders	Sustainability	Innovation	Total
PJSC MMC Norilsk Nickel	4.50	4.80	4.50	4.80	4.00	4.52
ALROSA PJSC	3.80	4.40	4.25	4.25	3.75	4.09
PJSC Polyus	4.60	4.80	4.50	4.80	3.25	4.39
OMK JSC	3.80	3.80	3.50	4.00	3.25	3.67
KRASCVETMET OJSC	2.80	3.60	3.50	3.20	4.25	3.47

Source: Compiled by the authors.

The focus was on firms within the “Mining and Metallurgy” sub-sector. Two primary sources were used to assess corporate sustainability: the RAEX ESG ranking and the ECG (Environmental, Corporate Governance) rating.⁹ The analysis relied on publicly available data from institutional sustainability reports.

The top companies in the RAEX ESG ranking for the “Mining and Metallurgy” sub-sector are Norilsk Nickel, ALROSA, Polyus, and Polymetal (see Table 11). These organizations served as benchmark cases for evaluating the implementation and impact of the proposed sustainability principles.

For a comprehensive assessment of the implementation of sustainable development principles, methods included the analysis of sustainability

⁹ ECG rating of responsible business URL: <https://экг-рейтинг.рф>

reports and expert evaluations (interviews with heads of departments responsible for sustainability within the organization).

Each indicator was rated on a five-point scale, where:

1 point indicates minimal compliance or absence of a system;

2 points indicate an initial level of implementation;

3 points indicate an average level of compliance with industry standards;

4 points indicate above-average performance, representing best industry practices;

5 points indicate industry leadership and innovative approaches.

The results are presented in *Table 12*.

Based on the data in *Table 12*, several important conclusions can be drawn regarding the validity of the selected evaluation criteria and their significance within corporate governance systems.

Companies with higher sustainability ratings (“Polyus” and “Norilsk Nickel”) demonstrate a systematic approach to managing ESG factors, reflected in:

- the integration of sustainable development into corporate governance (existence of ESG committees, inclusion of ESG metrics in executive KPIs);
- active digital transformation and innovation (high scores for R&D and “green” patents);
- effective management of environmental risks (carbon footprint reduction, emissions monitoring).

Conversely, companies with lower ratings (OMK JSC, KRASCVETMET) face structural challenges, including:

- limited influence of ESG on operational activities;
- insufficient transparency in reporting;
- low adaptability to external challenges (suboptimal liquidity, slow transition to low-carbon technologies).

The study indicates that the identified sustainable development principles are relevant and can

be considered fundamental, as they reflect key aspects of sustainability recognized at the global level. Their implementation directly affects companies’ competitiveness and financial resilience. High-performing companies like “Polyus” and “Norilsk Nickel” not only reduce regulatory and reputational risks but also attract ESG-focused investors, as evidenced by their leadership in industry rankings.

For OMK JSC and KRASCVETMET, it is critically important to:

- revise corporate governance systems to integrate ESG factors into strategic decision-making;
- enhance reporting transparency, particularly regarding environmental and social impacts;
- develop adaptive mechanisms (digitalization, liquidity management) to increase resilience to crises.

The final stage of the study involved the development of tools for implementing sustainable development principles, with key requirements including measurability (availability of quantitative metrics), scalability (applicability to organizations of different sizes), integrability (alignment with overall management strategy), and flexibility (adaptation to industry specifics) (see *Figure 4*).

The implementation of sustainable development (SD) principles requires a systemic approach that integrates strategic, tactical, and operational levels of management within a clear temporal framework. At the initial stage (1–3 months), a methodological foundation is established: strategic level: development of an ESG strategy aligned with international standards; tactical level: creation of a dynamic stakeholder map based on ISO 26000 methodology; operational level: ESG audits of business units conducted according to ISO 14001. The subsequent phase (4–6 months) focuses on deeper integration of sustainability principles: strategic level: introduction of a balanced scorecard (BSC) system incorporating ESG components; tactical level: enrichment with a

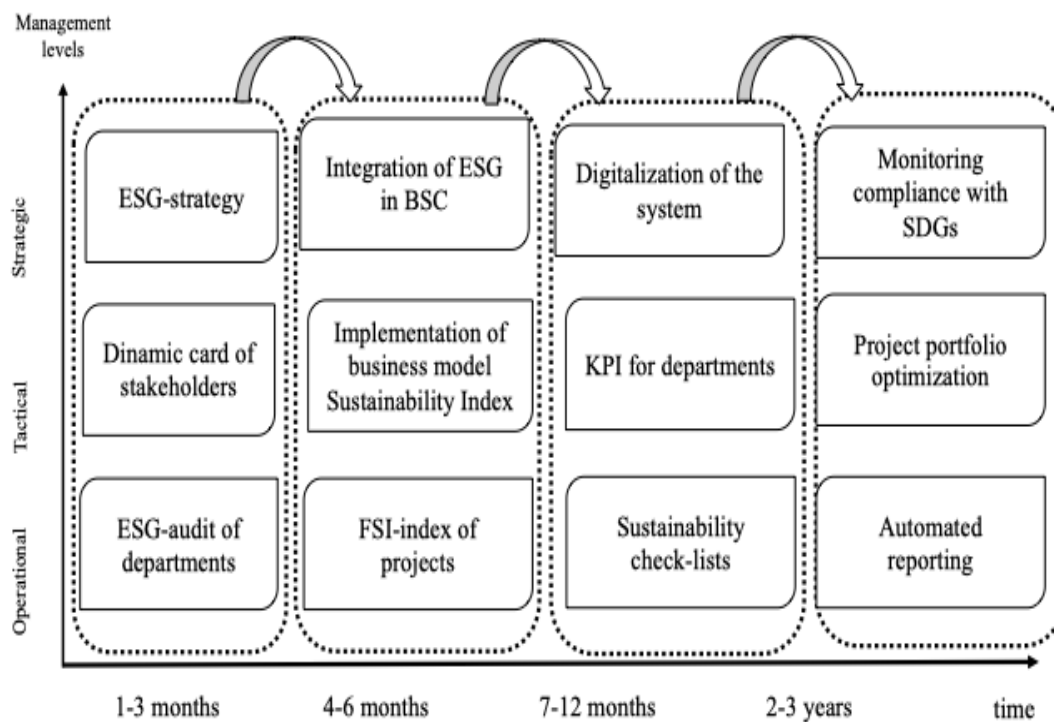


Fig. 4. Integrated Framework for Implementing Sustainable Development Principles

Source: Compiled by the authors.

business model sustainability index; operational level: ranking of innovation projects using the Flexible Sustainable Innovation (FSI) index. During the mature implementation stage (7–12 months), processes are operationalized: strategic level: transformation through digital ESG dashboards; tactical level: implementation of sustainability KPIs for departments; operational level: application of sustainability checklists. The final stage (2–3 years) ensures full institutionalization of the principles: strategic level: monitoring of Sustainable Development Goals (SDGs); tactical level: optimization of the project portfolio; operational level: automation of reporting in ERP systems. This multi-level, time-phased synchronization of tools enables a systematic transformation of the organization toward sustainable development.

CONCLUSION

This study identified five interrelated principles of sustainable corporate governance. Primar-

ily, long-term strategic orientation, integrated ESG management, and the generation of multi-stakeholder value were highlighted. Additionally, resilience to exogenous shocks and adaptive innovation processes were recognized as critical.

Confirmatory factor analysis not only confirmed the statistical significance of these principles but also revealed their systemic interconnections. As a result, practical tools for implementing SD principles in organizations were developed, which is particularly relevant in contemporary economic conditions.

Certain methodological limitations should be noted. In particular, an expansion of the geographic sample and the application of longitudinal approaches are required.

The developed toolkit provides new opportunities for assessing corporate sustainability; however, for broader application, it is necessary, first, to conduct additional validation and, sec-

ond, to consider industry-specific factors. Ultimately, the results lay a foundation not only for the creation of a comprehensive SD system for organizations but also for future research in this field — including in-depth analysis of practical implementation of the identified princi-

ples in Russian institutional contexts, the study of industry-specific influences on implementation processes, and the development and optimization of managerial tools aimed at effective integration of these principles into corporate strategy.

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APPLICATION

Table

Summary of Reviewed Sources on Sustainable Governance Principles

First author, year	Country of publication	Characteristics of management principles	Comments
A. Płachciak, 2008	Poland	Sustainable development is considered as a principle	No specification of sustainable development principles
M. Merad, 2013	The Netherlands	Sustainable development is considered as a principle	No specification of sustainable development principles
K. Sriram, 2023	Great Britain	Principles related to potential realization; principles aimed at strengthening internal and external connections; principles related to sustainability	Fragmented, lack of integrity, inconsistent with current trends
M.F.L. de Almeida, 2017	Great Britain	Sustainable development is considered as a principle	No specification of sustainable development principles
E. Escrig-Olmedo, 2019	Switzerland	Balance between sustainability elements; balance between the needs of different generations; consideration of stakeholder interests; comprehensive assessment of environmental, economic, and social impacts throughout the product or system life cycle	Abstract in nature, difficult to transform into concrete practical solutions
A.B. Kolobov 2020	Russia	Values, strategy, goal-setting, engagement, organizational structure, client orientation, accounting system, occupational safety, infrastructure	More focused on corporate governance
V. Glonti, 2020	Montenegro	Principles of corporate social responsibility according to ISO 26000 are viewed as sustainable development principles	Narrow understanding of principles
M.V. Malchyk, 2020	India	Sustainable development is considered as a principle	No specification of sustainable development principles
S. Hankammer, 2021	Great Britain	Identification of key stakeholders and principles for considering their interests (society, customers, environment, employees, management, community)	Narrow understanding of principles
O. Suriyo, 2021	Great Britain	Business ethics, team management, collaboration network, customer relationship management	Narrow understanding of principles

Table (continued)

First author, year	Country of publication	Characteristics of management principles	Comments
V. Litvinenko, 2022	Great Britain	ESG principles (environmental, social, governance) are viewed as sustainable development principles	Conceptual substitution is methodologically incorrect
L.I. Khoruzhy, 2022	USA	ESG principles (environmental, social, governance) are viewed as sustainable development principles	Conceptual substitution is methodologically incorrect
M.V. Bugaeva, 2023	Switzerland	ESG principles (environmental, social, governance) are viewed as sustainable development principles	Conceptual substitution is methodologically incorrect
I.V. Kushnareva, 2023	Switzerland	ESG principles (environmental, social, governance) are viewed as sustainable development principles	Conceptual substitution is methodologically incorrect
N. Klimovskikh, 2023	Brazil	Identification of HR management principles oriented toward sustainable development	Narrow understanding of principles
C.E. Tourbina, 2023	Switzerland	Sustainable development is considered as a principle	No specification of sustainable development principles
N.A. Najm, 2023	Germany	Pollution reduction, recycling, renewable resources, green innovations, and ethical sustainability	Narrow understanding of principles (mainly focused on the environmental aspect)
T.N. Litvinova, 2023	Switzerland	ESG principles (environmental, social, governance) are viewed as sustainable development principles	Conceptual substitution is methodologically incorrect
G.V. Stankevich, 2023	Switzerland	ESG principles (environmental, social, governance) are viewed as sustainable development principles	Conceptual substitution is methodologically incorrect
K. Bagratuni, 2023	Switzerland	Sustainable development is considered as a principle	No specification of sustainable development principles
M.U. Tariq, 2024	USA	ESG principles (environmental, social, governance) are viewed as sustainable development principles	Conceptual substitution is methodologically incorrect
F. Weder, 2025	Great Britain	Sustainable development is considered as a principle	No specification of sustainable development principles

Source: Compiled by the authors.

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Artificial Intelligence in Public Administration: Partnership or Symbiosis?

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ABSTRACT

This study aims to analyze the role of artificial intelligence (AI) in the transformation of the public and municipal administration (PMA) system. The article explores key areas of AI integration into the public sector, along with real-world examples of AI applications in government agencies in both Russia and abroad. It introduces a classifier of AI solutions for PMA, including potential pilot platforms and international counterparts. The article emphasizes that AI functions not merely as a tool but as a full-fledged partner capable of fundamentally reshaping governance approaches. The study concludes that institutional and technological readiness is essential for the large-scale implementation of AI in public administration. The research employs methods of international case analysis and comparative evaluation of AI implementation practices. The findings may be valuable to public administration professionals, digital solution developers, and government bodies planning to introduce AI technologies.

Keywords: artificial intelligence; public administration; public and municipal governance; digital transformation; pilot projects; benchmark projects

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INTRODUCTION

Contemporary challenges posed to public administration requires the adoption of advanced digital technologies, among which artificial intelligence (AI) is of a paramount position. The rapid development of the information society and global digitalization makes the role of AI increasingly significant in the system of state and municipal governance. It expands new opportunities for enhancing its efficiency, optimisation of administrative processes, and interaction between the state, society, and business. AI facilitates accelerates decision-making, enhances its validation and transparency, and minimises the impact of the human factor on administrative activities.

This issue becomes of particular significance within the framework of implementation of the National Strategy for the Development of Artificial Intelligence in the Russian Federation until 2030, approved by The Presidential Decree No. 490 of October 10, 2019.¹ The strategy formulated by The Presidential Decree No. 124 of February 15, 2024 determines the key directions for the implementation of AI into economy, social sphere, and public administration. The document stresses the need of a widespread use of such technologies for improving the efficiency of public bodies.² Thus, the implementation of AI is regarded as one of the essential directions for the digital transformation of public administration.

These concepts are under active discussion in academic literature, as well as in the proceedings of conferences and roundtable debates in Russia and worldwide. The role of AI in decision-making processes and the formation of new models of interaction between the state and society is

regarded in such sources, as well as in strategic initiatives of government bodies. Particular emphasis is made on the ethical aspects of AI application, cybersecurity, and the consequences of automation in the domain of governance.

AI technologies, as an essential element of the digital era, make a transformational impact on social and economic processes, upgrading conventional methods of management. The integration of AI into state and municipal governance not only contributes to facilitating the efficiency of governing entities but also stimulates the development of fundamentally new approaches to solving administrative tasks.

Notably, AI is also involved in the financial sector closely linked to public administration: it can intensify credit scoring, identify fraud in real-time, and facilitate investments in various projects more available to the common people [1]. There exist various definitions of AI. For instance, domestic researchers define it as "...the capability of artificial intelligence systems to perform their functions demonstrating certain intellectual capabilities of a human being" [1].

Within the context of state and municipal governance, it is highly significant to intend the capacity of AI of "human intellectual capabilities". This article presents artificial intelligence as an element of the state and municipal governance system, designed to support and enhance the solution of administrative management tasks. In addition, a key specific feature of AI is the ability to model, replicate, and multiply human cognitive functions, such as analysing big data volumes, recognising patterns and signals, forecasting, planning, and controlling. It is essential to comprehend that AI does not replace managers but it expands their professional potential by performing routine and analytical activities. To illustrate more clearly the manifestations of human capabilities in AI, here is an example in the sphere of municipal governance: AI enables analysing citizens' petitions, identifies covert issues causing dissatisfaction, forecasts growing

¹ The Presidential Decree No. 490 of October 10, 2019 "On the Development of Artificial Intelligence in the Russian Federation" (with amendments and additions). URL: <https://base.garant.ru/72838946/>

² The Presidential Decree No. 124 of February 15, 2024 "On the Development of Artificial Intelligence in the Russian Federation". URL: <http://pravo.gov.ru/proxy/ips/?docbody=&firstDoc=1&lastDoc=1&nd=102608394> (assessed on 03.04.2025).

social discontent, and recommends pre-emptive measures, thus modelling the administrative intuition of an experienced executive based on obtained data and existing algorithms.

IMPLEMENTATION OF AI MECHANISMS IN CONTEMPORARY PUBLIC ADMINISTRATION

The integration of AI into state and municipal governance becomes its essential upgrading element, which facilitates the emergence of new mechanisms to automate workflows and optimise the activities of public authorities. For instance, in 2024, Sevastopol-based AI made 20 per cent (3,500 in absolute terms) of decisions regarding the registration of legal entities and over 50 per cent (over 1,000 registrations) for individual entrepreneurs.³

The article's hypothesis is that the introduction of AI into the system of state governance is obtaining the feature of a partnership between the state and enterprises. This provides the enterprises with an opportunity to vend their AI products and gain profit, while it can optimise routine tasks for the state, refine the accuracy of bureaucratic decisions, save resources, and establish feedback communication with citizens. Such partnership is defined as an interaction between the state and its counterparts (in this case, big-tech enterprises implementing AI), so that they mutually reinforce one another: they exchange resources, co-draft solutions, and share risks.

BENEFITS AND ETHICAL PECULIARITIES OF AI-BASED SYSTEMS USED IN PUBLIC ADMINISTRATION

AI presents immense potential for public administration in general and for state and municipal governance particularly. It is capable of

building comprehensive digital environments (for instance, for city management operations) in addition to enhancing the transparency of decisions in the domain of public services (which serves to combat corruption) and implementing AI chatbots, which has already unfolded in the full swing [2].

AI Alliance⁴ has prepared an omnibus edition "Priority Solutions 2024" which contains factual examples of integrating AI-based systems into state and municipal governance. AI is defined in many of the described cases likewise above in this article. For instance, regarding the activities of the Federal Service for Veterinary and Phytosanitary Supervision (Rosselkhoznadzor), it is pointed out that the implementation of AI increased a key performance indicator: the volume of documents reviewed for analysing data on the turnover of livestock products grew from 0.02 to 100 per cent.⁵ This can be viewed as a classic example of AI support for solving its tasks for public administration.

It is worth pointing out that the introduction of AI into public administration brings not only financial reward, enabling to save vast expenditures due to the automation of so many operations (up to 1.2 trillion USD by 2030). It also generates entirely new modelling systems for state programmes [3]. Moreover, machine learning algorithms allow for analysing big data to forecast socio-economic trends [4]. Previously such work required think-tank analysts or representatives of the expert-academic community, nowadays a certain amount of socio-economic forecasting is performed by AI.

AI application in state and municipal structures is not restricted to the streamlining of ex-

³ The decision related to state registration is made by artificial intelligence // Federal Tax Service. URL: https://www.nalog.gov.ru/rn92/news/activities_fts/15697521/ (assessed on 03.04.2025).

⁴ AI Alliance is a union of leading hi-tech companies focused on the joint development of their competencies and the accelerated implementation of artificial intelligence in education

⁵ 2024: Priority solutions. AI Alliance. URL: https://storage.yandexcloud.net/prod-a-ai-ru-central-1-ai-russia-user-data/media/images/AI_Alliance_Casebook2024.pdf (assessed on 03.04.2025).

isting process, it also becomes a catalyst for generating innovative approaches that fundamentally transform the nature of interaction between the authorities and society. In this regard, media and press monitoring is made to determine actual events and prevailing public opinion on a whole variety of issues [5], which decreases the gap between the state and its citizens and enables a faster response to notable distress of the society. Moreover, AI serves as impartial operator and provider of public services, sufficiently suitable for control functions. For example, “Electronic Prosecutor” system in the Republic of Tatarstan analyses public procurement which avoids corruption risks with an accuracy of 89 per cent [6]. Besides anti-corruption factor, AI can also be used to forecast levels of organised crime. For instance, in Singapore, such forecasts data are 82 per cent accurate [7].

The specific nature of public administration requires large-scale planning and developing state programmes, where human factor can lead to errors caused by physical or psycho-emotional circumstances. To avoid it and enhance the efficiency of public administration, AI-based cognitive programming can be employed, which transfers to AI many functions related to analytics and strategic planning [8].

A highly essential subtlety in AI implementation is that its operation requires specified skills. Thus, civil servants should have skills for working with AI tools [9]. Besides, it is also notable, that contemporary public administration often employs IT systems, which are obsolete to varying degrees, and this can delay the adoption progress of AI [10]. In addition to these problems, one can detect a lack of exchange related to successful or negative experiences of AI application in both the public and private sectors. Besides, the lack of state register of AI solutions hampers executive bodies and private enterprises to learn from mistakes and swiftly identified solutions appropriate to specific conditions, thereby saving resources [11].

It is important to emphasise that rapid AI implementation also brings certain ethical dilemmas, such as determining liability for AI actions that caused negative consequences. In this regard, collaboration between the state and IT companies implies the joint generation of values related to the use of AI [12]. However, a critical success factor in AI-implemented partnership between the state and big tech enterprises makes a sustainable balance between commercial confidentiality and transparency [13].

SUCCESSFUL AI SOLUTIONS APPLIED BY PUBLIC AUTHORITIES

To implement effectively the potential of AI in the public sector, it is necessary to systematise the directions of its application. The *Table* below presents the classifier of AI solutions that can significantly facilitate the accomplishment of professional tasks by state and municipal employees. It is important to point out that this classifier is capable of enhancing decision-making accuracy and the quality of citizen interaction, however, it can only be considered relevant at the time of writing this article.

To enhance its applied potential, each solution is complemented with a pilot and an analogue.

- Pilot refers to a potential or existing platform of a federal or regional authority, agency, or municipality to try out the technology within Russian circumstances, as well as digital platforms where some specific AI solution can be tested or scaled. Pilots demonstrate realistic and technological preparedness for implementation.

- Analogue is an example of a similar technology or concept applied worldwide: ongoing projects, research initiatives, or large-scale programmes in the field of digital public administration implemented among industrialised countries. They are the manifestation of similar AI models, which have already passed the stages of introduction and can serve as a benchmark base for Russia, in view of national specificities.

Table

Classifier of AI Solutions for Public Administration

No.	AI Solution	Description	Pilot	Analog
1.	State digital avatar	A personalised AI assistant integrated in the ecosystem of public services, it consolidates data and provides prompts and notifications.	Gosuslugi platform, the Ministry of Digital Development of Russia is one of its operators and developers.	Estonia: Bürokratt ^a UAE: RAMMAS ^b
2.	AI platform for modelling socio-political scenario	Forecasts the outcome of policy decisions by analysing social and economic data.	State analytic centres, competence centres	UK: Policy Simulation Tool ^c
3.	Agile AI-based management of bureaucratic processes	Optimises internal administrative processes, eliminates redundancies, and accelerates approval procedures.	Ministry of Digital Development, (Russia) and the Government of Moscow	Canada: Agile Government ^d
4.	AI advisor for regulatory experimentation	Identifies outdated regulations, proposes the launch of "regulatory sandboxes" and risk assessments.	State analytical centres, competence centres	UK: FCA Regulatory Sandbox ^e
5.	AI architect for personalised social policy	Generates personalised social support packages tailored to an individual citizen's life style circumstances.	Ministry of Labour and Social Protection (Russia)	Finland: Kela ^f
6.	AI algorithm for regional strategic positioning	Analyses regional competitive advantages and advances strategic development pathways.	Russian regional investment agencies of development	USA: REMI ^g
7.	AI for the audit of public procurement	Automates procedures and ensures continuous, large-scale auditing of public procurement to identify risks of fraud and errors.	Federal executive bodies	Brazil: Alice ^h
8.	Platform for citizen opinion analysis	Analyses citizens' feedback classifies and clusters ideas, problems, and complaints to identify and synthesise emerging trends.	Ministry of Digital Development (Russia)	Belgium: CitizenLab ⁱ
9.	Virtual assistant for immigration services	Assisting applicants with immigration-related enquiries, providing information on services and directing them to relevant sections of the website.	Ministry of Internal Affairs (Russia)	USA: EMMA ^j
10.	AI tool for aggregation of documents	Summarising the content of various documents (letters, speeches, minutes) to facilitate data processing.	Federal executive bodies	UK: Redbox Copilot ^k

Source: Compiled by the author.

Note: **a** – Bürokratt enables citizens or users to use public and information services with virtual assistants through voice-based interaction. Republic of Estonia. Information system authority. URL: <https://www.ria.ee/en/state-information-system/personal-services/burokratt> (assessed on 03.04.2025)

b – Digitalising life in Dubai. Digital Dubai. URL: <https://www.digitaldubai.ae/> (assessed on 03.04.2025)

c – Policy Simulation Model by the Department for Work and Pensions. Nesta. URL: <https://www.nesta.org.uk/feature/smarter-policy-through-simulation/policy-simulation-model-by-the-department-for-work-and-pensions/> (assessed on 03.04.2025)

d – Directive on Automated Decision-making. Government of Canada. URL: <https://www.tbs-sct.canada.ca/pol/doc-eng.aspx?id=32592#appA> (assessed on 03.04.2025)

e – Regulatory sandbox. Financial conduct authority. URL: <https://www.fca.org.uk/firms/innovation/regulatory-sandbox> (assessed on 03.04.2025)

f – Significant opportunities for Kela through AI. Kela, the social institution of Finland. URL: <https://www.solita.fi/work/significant-opportunities-for-kela-through-ai/> (assessed on 03.04.2025)

g – REMI. URL: <https://www.remi.com> (дата обращения: 03.04.2025)

h – Robot Alice – Bid, Contract and Notice Analyser. Observatory of public sector innovation. URL: <https://oecd-opsi.org/innovations/robot-alice-bid-contract-and-notice-analyser/> (assessed on 03.04.2025)

i – Reach residents where they are and turn input into insights – with one platform. Go Vocal, Formerly Citizenlab. URL: <https://www.citizenlab.co/> (assessed on 03.04.2025)

j – Meet Emma, Our Visual Assistant. U.S. Citizenship and Immigration Services. URL: <https://www.uscis.gov/emma> (assessed on 03.04.2025)

k – Redbox. AI.GOV.UK URL: <http://i.gov.uk/projects/redbox-copilot/> (assessed on 03.04.2025).

To bottom-line the abovementioned, notably, the introduction of AI into public and municipal governance is not simply a technical improvement of processes, but a profound institutional transformation that makes an impact on the very philosophy of governance. AI becomes not a supplementary tool, but a full-fledged partner in decision-making, planning, and provision of public services.

CONCLUSION

The results of the conducted analysis confirm that AI technologies already make a tangible impact on the efficiency of state structures, ranging from the automation of routine tasks and enhanced forecasting accuracy to the auditing of public procurement.

The developed classifier of AI solutions presents the variety of intelligent tools for working with state-scale tasks and their fields of practical application. It allows not only for the systematisation of approaches towards AI integration but also for outlining trajectories for the further refinement of digital governance, oriented towards increasing its efficiency, improving citizens' quality of life style, and sustainable development.

Besides, as shown above, a multitude of different AI solutions for the needs of public administration has already been operating abroad. For instance, the USA uses HUD-AI software to distribute housing subsidies, which reduces processing time for applications from three weeks to 48 hours [14]. The development and introduction of AI are carried out in line with the framework of partnerships between the state and large IT companies. AI architects and engineers receive significant funding and an opportunity to accomplish their ideas, while the state gets ready-to-implement AI tools, which not only reduce time spent on routine tasks but also automate analytical processes and strategic planning. The scale of such partnership is steadily expanding. However, the findings of this research suggest, that it is hardly possible to reach a full symbiosis: the integration of AI into state structures is far from being all-round, since public bodies can operate without these technologies, and big tech entities interact primarily with private players. Nevertheless, such partnership is unfolded. Meanwhile the future infrastructure of public administration and its efficiency depend on the intensity of this process. The idea of purchasing ready-made IT solutions from large international digital corporations can become a problem. Although these

technologies may become a less expensive and more functional product than domestic analogues, however, acquiring foreign technologies leads to a certain type of dependency on their manufacturer, which could affect negatively the process in the circumstances of geopolitical turbulence.

In this situation, the Russian system of public administration confronts a fundamental choice: to beat the trail of building its own solutions from the scratch in partnership with domestic IT companies, in view of all the attendant risks concerning time, resources, and uncertainty, or to replicate best practices, adopting already tested approaches, algorithms, and architectures. The first option enables building technological sovereignty, developing internal expertise, and it leads to the formation of solutions corresponding to national priorities. The second option ensures swift implementation, reduced costs, and minimised risks of experimental errors. However, it may make Russia dependent on external logics and administrative paradigms. The chosen approach will determine not only the tempo of digital transformation but also the nature of institutional changes in public administration.

It is also important to understand that, currently, many people perceive the implementation of AI rather like an ideology than a technological modernisation of the state policy. The reason is that certain decision-makers reduce systemic governance problems to technical aspects, although resolving such issues through the most powerful AI systems seems impossible [15].

Analysis of current political and economic challenges indicates that, eventually, in the long term competitive advantages of the state will be determined by its ability not only to implement AI solutions but also to adapt them to rapidly changing circumstances. This requires a comprehensive approach, including the following:

1. Modernisation of management models:
 - Utilising interdepartmental approaches (for instance, establishing specialised AI centres within the Government or specific ministries).

- Providing basic training for civil servants related to the application of AI systems in their working activity.
 - Transitioning to agile regulation (“sandbox” regimes for testing the feasibility of integrating AI into the public sector, with an option for rapid scaling of successful pilots).
2. Investment in infrastructure:
 - Deploying national data centres with sufficient capacity to process sensitive data (e.g., medical or fiscal) to avoid dependency on foreign cloud platforms.
 - Developing cross-functional technologies (quantum computing for cryptography, edge-computing for real-time solutions).
 3. Establishing ethical frameworks for AI application:
 - Mandatory algorithm audits.
 - Public risk reports.
- Thus, AI ceases to be merely a technology. It becomes a strategic resource for a new generation of state administrators, bringing them significant professional advantages and enabling them to improve the efficacy and quality of their work.

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Approaches to Implementing a Knowledge Management System: The Case of United Engine Corporation JSC

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ABSTRACT

This study **aims** to identify the key factors behind the successful implementation of a Knowledge Management System (KMS) based on the experience of United Engine Corporation JSC (UEC JSC), and to develop practical recommendations for introducing KMS at Russian high-tech industrial enterprises. The **relevance** of this research lies in the growing importance of knowledge, experience, and information in today's market economy. The lack of a structured knowledge management system highlights the need for effective tools to foster a knowledge-sharing culture, as well as for mechanisms to locate, store, and distribute knowledge within an organization. The study employed a **methodology** based on the analysis of international and domestic academic literature, reviews of media materials, and an in-depth examination of UEC's internal practices. Key features of the corporation's knowledge management approach were identified, which, while grounded in widely accepted principles, are tailored to the specific operational context of the company. Particular emphasis was placed on the implementation of innovative knowledge management tools designed to enhance the efficiency of the company's information resources. The **findings** indicate that the success of KMS implementation at UEC results from the combined use of traditional approaches – adapted to the organization's specific needs – and modern technologies. The proposed solutions may serve as a foundation for other Russian enterprises seeking to design and implement their own KMS. The UEC case demonstrates that optimizing knowledge management processes can significantly improve an organization's competitiveness. Thus, a knowledge management system becomes not only a tool for increasing internal process efficiency but also a strategic asset in the modern economic environment. **Keywords:** knowledge management system; United Engine Corporation JSC; innovative knowledge management tools; organizational knowledge culture; practical implementation experience

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INTRODUCTION

In the context of digital economy, knowledge has become a strategic asset of companies. The concept of “knowledge” is one of the fundamental and still difficult to define from the perspectives of philosophy, epistemology, cognitive sciences, and other fields of study. Its interpretation requires solution of certain theoretical and methodological difficulties, such as polysemy, ontological complexity, and a dynamic nature, which in turn create multiple approaches to interpreting this term.

In some simplified way, knowledge can be interpreted as information that was selected, structured, and acquired in a specific manner in conformity with established norms, and thus obtaining a social significance recognised by specific social actors and society as a whole [1]. However, the following postulate is important for practical purposes: knowledge presupposes not only initial data but also convictions, moral values, ideas, inventions, judgements, professional competences, theories, rules, attitudes, opinions, concepts, and prior experience [2].

Knowledge management involves its systematic identification, creation, storage, dissemination, as well as dynamic replenishment, accumulation, and use of knowledge, focused on enhancing the efficiency of individuals and enterprises.

The contemporary point of view on knowledge management is essentially focused on its commercial relevance. The market value of knowledge grows in circumstances of global competition, where its effective use becomes a major driver for generating surplus value, reducing costs, enhancing productivity, and gaining market dominance.

The Strategy for Scientific and Technological Development of the Russian Federation until the year of 2035 stipulates that a high rate of mastering new knowledge and producing high-tech products based on one’s own technological platform becomes a key factor, which determines the competitive performance of national economies and the effective strategies of national security. In these circumstances, a considerable reduction of time from acquiring new knowledge, creating technologies and products, up

to their market launch becomes a significant factor for scientific and technological development.¹

The Concept of Technological Development for the period until the year of 2030 stipulates the process of capitalising on knowledge as a new institutional environment for the effective functioning of scientific and educational structures, small technological entities, and professional technology brokers.²

In recent years, Knowledge Management Systems (KMS) in Russia have become the venues of noticeably fast-growing public interest, especially within the high-tech sector of the economy. Companies operating in highly competitive markets and state corporations adopt KMS most actively. Such entities resort increasingly to create centralised databases, corporate portals to share expertise, mentoring and onboarding programmes for new employees. The principal objectives of this activity are to enable access to vital information and enhance operational efficiency by minimising the time of searching for necessary data and facilitating its prompt dissemination within the entity.

However, Russian enterprises encounter certain problems when implementing such systems, related, for instance, to the necessity to adapt them to foreign methodologies and to local conditions and comply with requirements of information protection in strategically specific industries.

The given article analyses the key factors for the successful implementation of a KMS based on the experience of Russia’s United Engine Corporation JSC (UEC JSC) and provides practical recommendations for its use in national high-tech industrial companies.

In the light of practical experience of “UEC” JSC, the authors have developed a model for KMS im-

¹ Strategy for Scientific and Technological Development of the Russian Federation. Approved by Decree of the President of the Russian Federation No. 145 of February 28, 2024. URL: <http://www.kremlin.ru/acts/bank/50358>

² Concept for Technological Development through 2030. Approved by Order of the Government of the Russian Federation No. 1315-r of May 20, 2023. URL: <https://www.garant.ru/products/ipo/prime/doc/406831204/>

plementation, determined stages and features of this process and identified distinctions from conventional approaches.

THEORETICAL ANALYSIS OF APPROACHES FOR IMPLEMENTING KNOWLEDGE MANAGEMENT SYSTEMS

The term “knowledge management”, defined in 1986 by K. Wiig, artificial intelligence specialist, at the conference of the UN International Labour Organisation [3], became popular in the mid-1990s during a surge of interest about knowledge management among both academic and industrial circles. Wiig defines this notion as the management of corporate knowledge to improve activities of corporate performance by means of enabling a company to operate intelligently and correctly [4]. Knowledge management means “understanding, focusing on, and managing the systematic, explicit, and deliberate generation, renewal, and application of knowledge”, since the ultimate objective leads to “maximising effectiveness of enterprises and the returns on ‘knowledge assets’ by means of continuously renewing them” [3].

Knowledge management is explicit and systematic related to the portion of knowledge, which is considered of vital nature, as well as the related processes of generation, collection, organisation, dissemination and implementation of knowledge. This necessitates transforming personal knowledge into corporate knowledge, which is intended for dissemination and introduction within the company [5].

G. von Krogh advances the definition of the given concept as “the process of identification, gathering, and implementation of the collective knowledge in an entity to help the latter obtain a competitive edge” [6].

Knowledge management can be viewed as a discipline that ensures an integrated approach to identifying, collecting, evaluating, retrieving and proliferating all of information assets of an enterprise, and it can be also considered as a field closely related to innovation management and organisational learning [7].

Therefore, successful management of knowledge requires that companies must clarify a set of roles and skills for performing the process of collecting, proliferating and using knowledge [8].

Based on the abovementioned concepts, we can come to conclusion, that there is no universal, widely accepted definition of the term “knowledge management”. The interpretation of this concept can be specific for each entity, depending on its objectives and methods to achieve them. Consequently, companies should develop their own perception of this activity based on their objectives, lifecycle stage, and specific operating terms [9].

In the given article, we suggest to interpret knowledge management as a systematic process, which involves the process of searching for, obtaining, preserving, using, and transferring knowledge, aimed at the continuous improvement of operation for existing or creating new individual or collective knowledge to enhance competitiveness of organisations.

Knowledge is an actual asset of any company. Therefore, like any other asset, it must be managed effectively. Knowledge management systems (KMS) are a set of measures, technologies, and tools designed for the identification, generation, storage, promulgation, and use of knowledge. The principal objectives of a KMS include increasing the consumer value generated by the business, developing and continuously improving the process of non-stop staff training, and optimising change management. The further development of an effective KMS should lead the organisation to the status of a self-learning (smart management) organisation [10].

The methodology of a KMS stems from the theory of systems. A system represents a combination of interacting elements, which contribute to achieving one or more determined goals.³ The components of organisational systems involve people, technologies, and information. Interacting with each other through feedback and management,

³ GOST R ISO/IEC 15288–2005. Information technology. Systems engineering. System life cycle processes. URL: <https://docs.cntd.ru/document/1200045267>

Table 1

D. Albers' Approach

Stage	Content	Explanation
1. Building a Knowledge Management Team	Building a cross-functional team including: Executive Sponsor (project examination for the management); Knowledge Ambassador (implementation support); Knowledge Manager (strategy development); Chief Knowledge Officer (support at all levels); Influence Supervisor (influence on the community of users).	Team members should have business, technical, and social skills, such as communication, leadership, negotiation capability, strategic planning, and competence of knowledge management methodologies and IT. The team may include department heads, architects, and other representatives of the company.
2. Developing the Strategy of Knowledge Management and Business Case	Conducting SWOT and gap analyses to find out: strategic gap (between what the company should do and what it does); a knowledge gap (between what the company should know and what it knows). Determining the knowledge, which is required to develop or obtain.	This stage enables to assess current state of knowledge management within the framework of strategic objectives of the company and identify key areas of improving it. The assessment helps determine the basis for development of knowledge management programme.
3. Conducting Knowledge Assessment and Audit	Distinguishing between notions "knowledge management assessment" and "knowledge audit": Knowledge management assessment reveals organisational factors (culture, leadership, processes, structure and technologies). Knowledge audit focuses on identifying, locating, and analyses of the use of intangible assets (expertise of employees, patents, reputation, etc.).	This stage aims to lay a foundation for an effective knowledge management programme. The assessment helps determine the entity's readiness for system implementation, meanwhile the audit identifies available resources and their use.
4. Conducting an Information Technology (IT) Assessment	Assessing IT assets, IT management processes, and IT investment efficiency. Identifying lacunas in current capabilities and determining the need for changes in IT infrastructure.	This stage ensures that the technological base meets the requirements of the implementation of a KMS. The assessment allows determining the changes in the IT domain necessary for the success of implementation of the project.
5. Developing a Project Plan and Metrics	Developing a plan to elaborate organisational changes in: policy and standards; retribution systems for knowledge sharing; learning through activity and observation; changes in business processes; mentoring and collaborative projects; creating communities based on practice; defining performance metrics (information access, information quality, knowledge flow, etc.).	The project plan includes measures for implementation of a KMS and mechanisms for evaluating its efficiency. Key metrics allow tracking the system's impact on the operation of the entity and adjusting its functioning.

Source: Compiled by authors.

they operate as tools for assessing the quality and timely availability of knowledge management tasks.

T. Davenport and L. Prusak advance the interpretation of the essence of a KMS, thus emphasising that such systems generate the knowledge which are necessary for managerial decision-making [8]. If a KMS is not available, the decision-

making process is complicated due to a lack of relevant information and limited use of individual experience and knowledge of employees. Introduction of a KMS contributes to eradicate these drawbacks primarily by means of the effective application of accumulated information and collective skills.

Table 2

IRIS Approach

Phase	Content	Explanation
1. Analysis and Identification of Target Knowledge.	Determining the knowledge that the KMS will transform into data for decision-making or task accomplishment. This includes identifying conceptual knowledge blocks, describing target knowledge, building an ontological classification.	The aim is to identify key knowledge needed for management. Conceptual blocks are the elements of the entity or its environment, which contain a specific type of knowledge. To describe knowledge, templates, questionnaires and reference models are used.
2. Target Knowledge mining	Defining mechanisms for mining target knowledge, including input variables (documents, knowledge of employees, data), knowledge sources (internal and external components), procedures and methods of calculating.	At this stage, methods are selected to obtain knowledge from available sources. Algorithms combine input variables to obtain target knowledge, which allows structuring the process of their collection.
3. Classification and presentation	Creating a model of the entity's knowledge map for two levels: CIM (Computation Independent Model) and PIM (Platform Independent Model).	The CIM model has conceptual blocks, target knowledge, their interactions, and procedures for obtaining them. The PIM model is the result of transforming the CIM. This ensures a unified representation of knowledge.
4. Processing and storage	Building an executable Platform Specific Model (PSM) to fix the knowledge map on a specific technological platform. Thus, a knowledge portal will provide tools for using the knowledge map.	This stage leads to the technical implementation of the system. PSM helps to obtain and use of knowledge regardless of spatiotemporal constraints. The knowledge portal is the interface for working with the system.
5. Use and Non-Stop Improvement	Building a knowledge portal and introducing mechanisms for its effective use: training users; system evaluation, cultural aspects supporting collaboration.	The aim of the phase is to support and develop the system. It is important to ensure self-sufficient service of the KMS, provide for performance metrics and take into consideration cultural specifics to involve all participants.

Source: Compiled by authors.

It is important to emphasise, that efficient systems allow for the integration of disparate sources of knowledge and make them accessible to all members of the organisation when it is required.

The article presents below two approaches to implementation of a KMS within the framework of theoretical analysis. The first approach was developed by J. Albers [11]. The concept involves a five-step procedure (*Table 1*).

This approach focuses on preparing the company for the implementation of a KMS and it emphasises the importance of assessing the current state, identifying lacunas, and developing a detailed strategy that considers the unique specifics of the entity.

The second approach was advanced by the IRIS Systems Integration and Re-Engineering Research Group (Grupo de Investigación en Integración y Re-Ingeniería de Sistemas, IRIS) in the University Jaume I [12]. It involves five phases (*Table 2*).

The IRIS methodology, based on the principles of systems engineering, envisages a clear division of the process into separate phases, each of them accompanied by specific tasks and methods. Unlike the approach by Albers, it offers a more structured approach to the implementation of a KMS.

Most Russian companies have no structured strategy for building a KMS: only individual projects are put into effect. HR and IT departments are often in charge of knowledge management;

meanwhile specialised services dealing with knowledge management operate extremely rarely. Many companies lack of a separate budget for knowledge management, so that the departments, which perform these functions, share the costs distributed between them [9].

Up to the present time, the technologies of KMS implementation are heterogeneous. Companies, which operate in highly competitive markets as well as state corporations, use such technologies most intensively. High-tech industries, telecommunications, oil and gas sector entities, finance, transport, etc. demonstrate a stronger demand for knowledge management too [9].

MATERIALS AND METHODS

To achieve the objective of the research, the authors conducted a review of international and Russian publications to analyse the concept of “knowledge management” and figure out the main methodological approaches to implementation of KMS in various entities. The methodology of the research was supported by evidence of a system-based approach.

The object of the study was the experience of implementation of KMS at UEC JSC, which makes part of the State Corporation “Rostec” as an integrated framework structure specialised in the development, production, and maintenance service of engines for civil aviation, space programmes, the naval and merchant fleets, and the fuel and energy complex as well.

UEC JSC was chosen for the research due to the following factors:

- the significant dependence of efficiency of the business process in the Corporation on the unique knowledge and competencies of its employees;
- the need for digital transformation of economic activities of the Corporation in the circumstances of import substitution of software;
- the necessity to preserve and transfer strategically important knowledge within the internal perimeter of the Corporation.

In the scope of the research, the following materials were obtained from different sources:

- scientific publications on knowledge management indexed in the databases of RSCI, ScienceDirect, and Google Scholar;
- analytical reports and materials on the activities of UEC JSC and the “KM Alliance” Association available for publication;
- conclusions obtained from the interviews with key employees of departments of the Corporation responsible for KMS implementation.

The authors made research in conformity to established ethical standards: survey participants provided informed consent for data privacy authorization and thus, the results turned out to be objective and accurate.

Research conditions of conducting the survey:

- limited representative sample of respondents;
- industry’s specific feature, which may reduce potential application of the results to enterprises in other economic sectors;
- time constraints, which prevent to assess the long-term effects of KMS implementation.

RESULTS

The history of implementation of KMS at UEC JSC started in the year of 2014 at the seminar aimed to formulate a project concept in order to integrate the given direction into the production processes of the Chief Designer’s Service of PJSC UEC-“Saturn”.⁴ Thus, the following issues were identified:

- the need for fast training of young specialists and their involvement in the solution of complicated design and technological tasks;
- specific features of development at the enterprise: tight schedules for launch of the product for the market, a diversity of customers, and limited resources.

PJSC UEC “Saturn” started building a system tailored to its corporative needs in the light of experi-

⁴ PJSC UEC “Saturn” is incorporated in “UEC” JSC.

ence of such companies as Snecma (France), the State Corporation Rosatom, and ZAO CROC Incorporated.

In the year of 2017, as a follow up of the successful implementation of the project at PJSC UEC “Saturn”, UEC JSC commenced expanding its best experience in knowledge management and KMS implementation in the activity of the Corporation. The relevance of implementing the KMS innovation was influenced by such problems as:

- lengthy and labour-intensive process of researching for required information;
- scaling information problems;
- unnecessary duplication of functions and regular errors;
- knowledge drain after the departure of some employees;
- high cost of adaptation of new employees;
- the need for an integrated communication system.

The objective of the project was to develop and implement a unified system for obtaining, collecting, storing, distributing, putting in operation, and providing new knowledge for all enterprises and services of UEC JSC. One of the priorities was to eliminate unnecessary duplication of R&D expenses and reduce the time required for sharing knowledge between projects.

Three aligned ways were determined for the implementation of the project:

- building a unified information environment for knowledge management;
- developing a method to identify, preserve, and improve knowledge;
- establishing a system to motivate personnel to work with knowledge.

Regarding key project milestones of the project, we have indicated the following:

- In the year of 2020, the Board of Directors of UEC JSC approved the knowledge management policy.
- In 2021, Knowledge Management Information System (KMIS) was put in industrial operation on the Jive software platform.

- In 2022, the organisational standard (STO) on knowledge management was published.

- In 2024, the project of import substitution of Jive software was completed.

Since 2024, KMIS has been operating on the VK People Hub platform.

The *Figure* below presents the chronological model of KMS implementation at UEC JSC with an outlook to the year of 2030.

Based on the analysis of the experience of UEC JSC, the approach to ensure implementation of KMS was formulated, namely:

- Formation of Knowledge Management Strategy: defining key knowledge required to implement the strategy.
- Knowledge Identification: selecting the knowledge needed for systematising and enhancing key business processes of the entity.
- Source Identification: revealing sources of knowledge required for specific business processes.
- Systematisation: Developing tools to support knowledge management processes, which inquires:
 - Building a knowledge base with Information Technology (IT).
 - Compiling and mapping inventories of knowledge.
 - Fostering a system of mentors.
 - Introducing a motivation system for effective transfer of knowledge.
 - Compiling experience records based on product project outcomes.
 - Compiling a portfolio of Knowledge Management projects.
 - Developing a procedure to evaluate effectiveness of KMS.
- Building culture of knowledge management, as a set of measures including:
 - Introductory training sessions and seminars.
 - Establishing professional communities for specific application areas of knowledge.
 - Support of the top management for the KMS.
 - Integrating the KMS into the professional activities of employees.

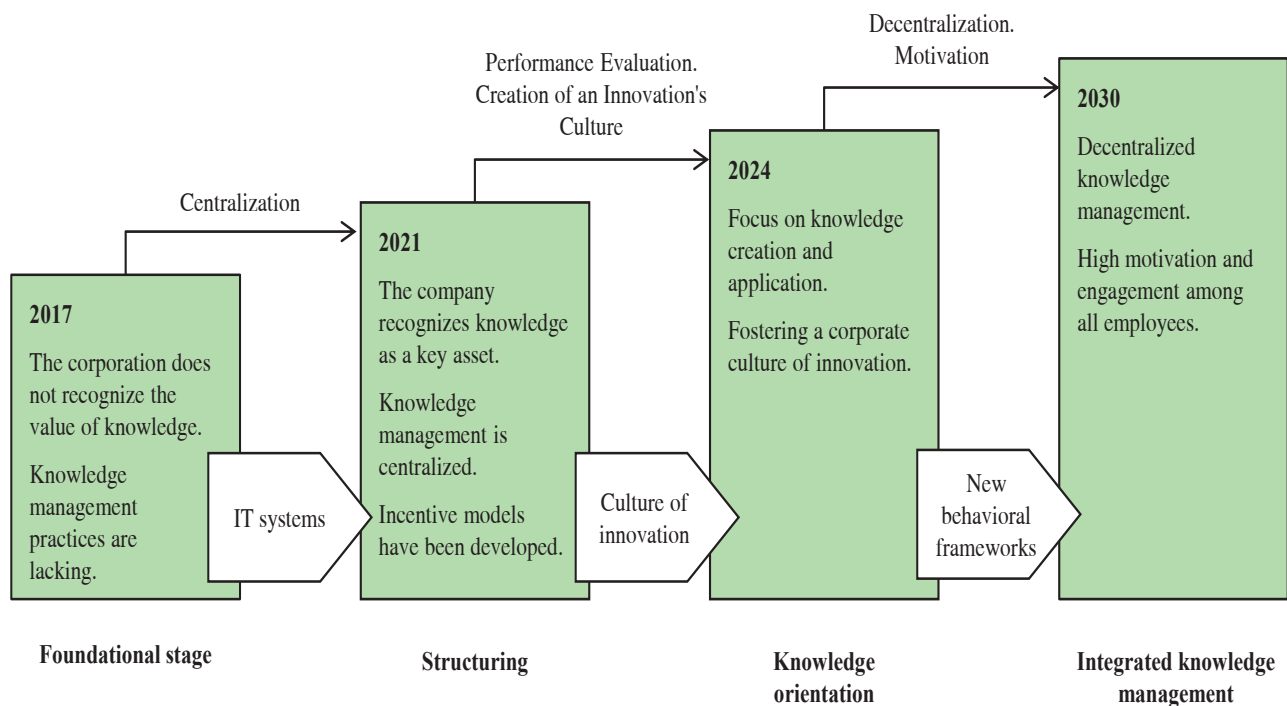


Fig. Model of KMS Implementation

Source: Compiled by authors.

- Evaluating the maturity level of the UEC KMS related to existing processes using such methods as:

- Personnel surveys (interviews).
- Monitoring surveillance of workflows, conditions in the work area.
- The study and analysis of documents.
- Modelling situations related to work environment.

The effective process of Knowledge Management is evaluated against such benchmarks as:

- Timely achievement of established indicators of maturity level for KMS.
- Fulfilment of the annual plan for raising the maturity level of KMS.
- Availability of a knowledge inventory for the process.

Measures, which contribute to the achievement of established indicators of KMS performance, are compiled on the basis of a final report. The latter contains a plan for raising the maturity level by the turn of the current year. Their fulfilment facilitates the dissemination of the best practices related to the KMIS.

The establishment of the qualification category “Knowledge Management Master” is distinctly noteworthy, as it definitely stimulates the development and enhancement of professional competencies of employees in this area and fosters a community of specialists with practical skills in applying the KMS and its tools.

The described above KMS implementation model encompasses elements of the approach advanced by J.A. Albers and the IRIS methodology.

Thus, the analysis of the experience accumulated by UEC JSC allows us to formulate a unique method based on the specific nature of the activities and expanded experience of the enterprise. At the same time, the emphasis is posed on the combination of theoretical preparation and practical implementation, which helps accounting for the specific features of the production process and requirements of the industry.

A key feature of the approach is an engaged support of top managers in fostering the culture of knowledge management, which ensures a necessary stimulus for the environment at all levels and contributes to its faster and more effective

implementation. Particular emphasis is given to human resources.

In the course of this research, the KMS of the UEC JSC was at the Knowledge Orientation level (represented by a focus on creating and using knowledge). Due to the knowledge management system, the latter knowledge is accumulated within the corporation at all managerial levels, enabling to increase both the speed of knowledge exchange and the effectiveness of its use by departments and project teams, as well as to ensure the accessibility to the knowledge and minimise turnover.

CONCLUSIONS

The given research has identified the key aspects of implementing the systems of knowledge management in enterprises. The analysis of global and Russian sources has revealed that a KMS is a comprehensive tool for enhancing efficiency of enterprises by means of optimising the processes of building, storing, disseminating knowledge, and putting knowledge into operation.

The implementation of KMS involves the use of various methodological approaches adapted to the specific features of particular enterprises and in conformity with the experience of UEC JSC a successful realisation of such approaches requires:

- a phased approach involving all organisational levels;
- building a knowledge-oriented corporate culture;
- introducing a system to encourage employees for sharing knowledge;
- building a technical base to operate with the knowledge;
- ensuring protection of confidential information.

Effective implementation of KMS depends on solution of a number of issues, namely:

- the need to rapidly train young specialists;
- time constraints and limited material resources;
- specific feature of the industry and particular production processes;
- ensuring the continuity of transferring knowledge.

The presented approach to the implementation of KMS suggests further adaptation in view of the particular realities of Russian legislation, requirements of information security, organisational specifics of companies, and technological constraints.

Among some promising directions for the development of KMS include: integration with digital technologies, modernisation of artificial intelligence mechanisms, building decentralised systems of knowledge management, and expanding interactive communication platforms.

The practical significance of the given research is the potential use of the suggested recommendations for developing programmes to implement and improve existing KMS in companies, enhancing enterprise efficiency, as well as preserving and developing competencies of the personnel. The results of the work supplement the information obtained by predecessors and specify existing approaches to knowledge management.

Thus, the implementation of a KMS constitutes a significant factor in increasing competitive potential of contemporary enterprises, although, it requires a comprehensive approach and consideration of multiple factors in order to reach optimal performance.

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ORIGINAL PAPER



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JEL I15, B41, P5

The Role of Business Processes in Building a Healthcare Ecosystem

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ABSTRACT

The **purpose** of this study was to analyze ecosystems, including business, educational, and socio-economic ecosystems. The research defines the concept of a “healthcare ecosystem,” identifies its primary objective, and highlights the key element of ecosystem modeling. The article presents examples of successfully implemented models for integrating digital technologies into the operations of healthcare ecosystems abroad. It examines both the conceptual business model of a healthcare ecosystem and the contribution of business processes to achieving its goals and creating value. Universal trends shaping the digital future of healthcare are identified, along with the specific characteristics of the industry in Russia and the significant challenges faced by domestic healthcare ecosystems. The **methodological basis** of the study includes various forms of analysis, structuring, and graphical methods. The information base was drawn from the ELibrary scientific electronic database. The **findings** may be of interest to both public and private organizations seeking to create new value for individual health preservation while maximizing benefits and minimizing costs.

Keywords: business processes; model; integration; ecosystem; healthcare

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INTRODUCTION

Despite the widespread popularity of studies of ecosystem in healthcare, scholars have not suggested any unified viewpoint regarding the foundations of their construction. Using the tag “ecosystem in medicine, healthcare” in the scientific library database www.elibrary.ru, we have identified 3,794 sources published over the last five years. Our content analysis has demonstrated that the terms “digitalisation” and “digital” were mentioned 950 times in their titles, which constitutes 25 per cent of their total number and it indicates the predominant interest in the ecosystem strictly from a digital perspective. The word “process” appears only 152 times in these same publications, which we interpreted as evidence of insufficient attention paid to the essence of digitalisation and the principle of construction of ecosystem.

The term “ecosystem” introduced in economics from biology denotes a system, which arises from the interaction of living organisms with the environment [1]. However, nowadays this concept is widely used within healthcare, trade, education and other sectors of the national economy of the Russian Federation [2]. Possessing the properties of a system, the ecosystem exhibits specific characteristics as well, that distinguish it from the general understanding of systems. Concurrently, various scholars come to the same conclusion that all elements of an ecosystem are interrelated by the processes of production, consumption, distribution, and exchange of the results of their activity.

We suggest defining an ecosystem as a system of complex networks, which unite various participants on one’s own accord. From our perspective, its specific characteristics consist of common goals

among all the participants, as well as integrated interaction within their achievement.

Hence, for constructing an ecosystem in health-care, it is necessary to determine its subsystems and elements, as well as to substantiate the processes, which lay the basis for their integrated network interaction.

METHODOLOGY

The theoretical and methodological basis of the research was created by the concepts and approaches of domestic and foreign scholars, who developed it within the framework of the theory of socio-economic systems, business modelling, and business process management. The analysis was based on monographs, scientific articles, materials derived from the records of international and Russian scientific conferences, and other publications in peer-reviewed journals.

In the course of the research, the authors employed the *modus operandi* of theoretical cognition: such as dialectical and axiomatic methods, formalisation and analogy, as well as analysis (including comparative analysis), synthesis, methods of abstraction, deduction, induction, and modelling. Systemic, cybernetic, and process approaches ensured the comprehensive character of the research.

DISCUSSION

A meta-analysis of 41,546 publications from sources of the last five years, selected via the tag “ecosystem, processes” in www.elibrary.ru, demonstrated that scholars investigate among others the following terms: “digital”, “business ecosystems”, “forest-related”, “aquatic ecosystems”, “pharmaceutical”, “customs ecosystems”, “educational”, “medical ecosystems”, “IT ecosystems”, “territorial ecosystems”, “artificial ecosystems”, “closed ecosystems”, “innovation ecosystems”, “state ecosystem”, “socio-economic ecosystems” etc. However, currently, among the existing approaches to the formation of ecosystems, this term is predominantly used in the context of a digital ecosystem. This connotation is traced back

in such ecosystems as X5 Retail Group,¹ and Russian Postal Services.²

It can be pointed out that medical ecosystems are characterised by a variety of models for integrating digital technologies into their activities. **Russia** emphasises corporate digital ecosystems (Sber, Yandex, MTS)³ [3] and public-private partnership digital ecosystems («RZD-Medicine»)⁴.

International practice indicates a fragmented combination of commercial and state projects. For instance, **Brazil** introduces a large-scale integration of telemedicine into the national public health system via the instrument of the System Usability Scale in the Unified Health System,⁵ particularly in remote regions of Amazonia [4]. **India** advances unique hybrid models⁶ based on a successful combination of high-tech medical tourism (Apollo Hospitals) with its traditional Ayurveda service. **China** is distinguished with effective combination of AI platforms with elements of traditional national medicine, actively backed by the state support (a notable example is the company Ping An Good Doctor).⁷ **South Africa** solves the issues of healthcare accessibility by means of interaction of systems of high-tech private clinics (notably

¹ Useful services for the partners X5 Group. DIALOG X. URL: <https://dialog.x5.ru/> (accessed on 15.11.2023).

² Information Technologies of the Russian Postal Services. Tadviser URL: https://www.tadviser.ru/index.php/Статья: Информационные_технологии_в_Почте_России (accessed on 15.11.2023).

³ SBER: More Than Just A Bank. URL: <https://www.sberbank.com/ru/ecs> (accessed on 15.11.2023); Development of ecosystem MTS. URL: <https://ar2021.mts.ru/obzor-transformaczii-ekosistemy/razvitie-ekosistemy-mts/> (accessed on 15.11.2023).

⁴ RZD: We Are Open To Everyone. URL: <https://rzd-medicine.ru/about> (accessed on 06.04.2025).

⁵ System Usability Scale: a quantitative method for assessing system usability by means of a standardised questionnaire consisting of 10 statements rated by users on a 5-point scale. This instrument measures perceived facilitating use, interface convenience, and learnability of the product.

⁶ GenH New Generation Healthcare. Annual-Report-FY 2023–2024. URL: https://www.apollohospitals.com/apollo_pdf (accessed on 30.08.2024).

⁷ Alibaba Health Reports Robust Growth in 2024 Earnings. URL: <https://www.nasdaq.com/articles/alibaba-health-reports-robust-growth-2024-earnings> (accessed on 26.11.2024).

Netcare) and the programmes to combat socially significant diseases.⁸ **The United States** implements a market-oriented approach by means of commercial platforms (Amazon Care, Teladoc) and venture startups (Medable), with the highlight of the scalability of solutions and integration with private insurance systems, however, the problem of social disparity in access to high-tech care still persists there⁹ [5]. **The European Union** is developing state-regulated ecosystems with an emphasis on compatibility for these countries (for instance, the Italian monitoring system of patients), stringent data protection (GDPR),¹⁰ and the mandatory introduction of digital platforms for public medical institutions¹¹ [5]. **Turkey** successfully implements vertical integration from medical education (universities) to a system of high-tech clinics and laboratories through the model of Acibadem Healthcare Group, thus combining Western quality standards with competitive prices attractive for medical tourism¹² [6]. **South Korea** is deploying “smart hospital campuses” with completely digitalized processes from appointment to discharge of patients, integration of robotics into surgery operations, and national-system of electronic medical

records accessible through a single portal.¹³ **Israel** counts on a startup ecosystem (for instance, AI diagnostics platforms) in close collaboration with the military ecosystems (IT personnel employed), academic science, and venture funds, thus, creating export-oriented medical technologies. Singapore has developed a gold-standard model for a “digital twin” of health system for population: data from portable devices are transferred via polyclinics and research centres for consolidated analytical system of predictive medicine.¹⁴ **The UAE** is investing in medical free zones (Dubai Healthcare City), which integrate best international practices, cutting-edge diagnostics, and personalised wellness programmes to develop medical tourism in the high-end segment of the market.¹⁵

We can identify general consistent patterns in the development of medical ecosystems: universal trends determine the digital future of healthcare. **Managerial models** represent divergence: as to the USA, which relies on market mechanisms and competition among commercial platforms, the EU and Singapore adhere to efficient centralised regulation with rigorous quality standards. **Integration strategies** range from vertical (for example, Turkish Acibadem model is a combination of education, science, and clinical practice) to horizontal (inter-members’ systems in the EU ensures the compatibility of national digital solutions). **Sources of innovation** diverge too: whereas Israel generates a breakthrough system by means of startup culture and military-medical technologies, South Korea achieves successful accomplishments with corporate R&D and systemic digitalisation of medical institutions. **Economic models** differ from domestic market-oriented strategy (EU) to

⁸ Medicine and healthcare in South Africa: characteristics of the healthcare sector in South Africa. URL: <https://visitworld.today/ru/blog/1070/medicine-and-health-care-in-south-africa-peculiarities-of-the-field-of-health-care-in-south-africa#osobennosti-sfery-zdravooxraneniya-v-yuznoi-afrike> (accessed on 19.10.2022).

⁹ The Healthcare Ecosystem. Navigating the Healthcare Ecosystem: A Guide for Entrepreneurs. URL: <https://fastercapital.com/ru/content/Экосистема-здравоохранения—Навигация-по-экосистеме-здравоохранения—руководство-для-предпринимателей.html> (accessed on 21.03.2024).

¹⁰ GDPR — The Law on data privacy and security for all organizations that process information about residents of the European Union, even if they are located outside it.

¹¹ The Healthcare Ecosystem. Navigating the Healthcare Ecosystem: A Guide for Entrepreneurs. URL: <https://fastercapital.com/ru/content/Экосистема-здравоохранения—Навигация-по-экосистеме-здравоохранения—руководство-для-предпринимателей.html> (accessed on 21.03.2024).

¹² Acibadem hospitals and outpatient clinics. URL: <https://acibadem.com.ru/why-acibadem/integrated-healthcare-model> (accessed on 2021).

¹³ World Health Organisation URL: <https://www.who.int/publications> (accessed on 2025)

¹⁴ Israel: Medtech Innovation Hub for the World. URL: https://medical-technology.nridigital.com/medical_technology_jun19/israel_a_medtech_innovation_hub_for_the_world (accessed on 06.2019).

¹⁵ The Rise of Healthtech Startups in Dubai and How to Start One // URL: <https://www.duqe.ae/healthtech> (accessed on 07.01.2025).

the export of medical services (UAE, Turkey, which are actively developing premium medical tourism through building specialised clusters).

These global trends formulate benchmarks for the development of Russian ecosystems in healthcare, where currently there persists a gap between:

- corporate digital services (Sber, Yandex);
- state digitalisation programmes;
- academic research centres.

To bridge this gap, a thoughtful adoption of international experience is required as well as consideration of specific features of the national healthcare system.

Sber,¹⁶ Yandex [3], and MTS¹⁷ have demonstrated successful projects in this sphere with elements of ecosystem approach and digital transformation applied as a key driver (including the implementation of unified digital platforms, telemedicine solutions, and mobile services for patients). For example, the strategy developed by MTS assigns a top priority for the medical segment. A sustainable partnership with the clinical network “Medsi”¹⁸ has led to the foundation of an acceleration platform capable to identify and develop innovative projects in the field of personalised telemedicine. The implementation of this programme has contributed to choose three startups that gained access to the clinic’s infrastructure for testing and implementing their technological solutions.

“RZD-Medicine” constitutes a corporate ecosystem with comprehensive digital integration, embracing over a hundred of medical institutions throughout Russia aimed to run comprehensive care of the staff and their families of RZD.¹⁹ Its key features include the introduction of a unified digital

platform involving electronic medical records, online booking system, telemedicine consultations, as well as the development of preventive medicine by means of the programmes of prophylactic medical check-ups and health monitoring via portable devices.

“Medscan” represents a modern diagnostic ecosystem, which employs artificial intelligence (AI) technologies.²⁰ AI algorithms are used for a precise analysis of CT, MRI, and radiological data obtained within its network of diagnostic centres. “Medscan” system also operates in integration with state medical institutions, it ensures data transfer for subsequent treatment, and also develops partnership networking with pharmaceutical companies and scientific centres focusing on development of innovative, personalised diagnostic methods.

“Invitro” constitutes a thoroughly extensive laboratory-scale ecosystem with advanced digital services.²¹ In addition to traditional laboratory testing, the company actively develops innovative research areas, including genetic tests to predict hereditary diseases, mobile applications for easy-to-monitor tracking of test results, and integration with leading telemedicine platforms such as “SberZdorovye”.

However, Sber and Yandex face a number of limitations, due to their position of proprietors of their own services entitled “Health” and subsequently establishing themselves as ecosystem operators for developing AI in medicine. Firstly, the functionalism of these platforms is predominantly restricted to telemedicine services, thus preventing them from playing a significant role beyond specialised medical ecosystems. Secondly, their degree of market demand remains low: according to the survey held by “Romir” holding (polling sample included 1500 respondents from various Russian regions), only 10 per cent of interviewees

¹⁶ SBER: More Than Just A Bank. URL: <https://www.sberbank.com/ru/ecs> (accessed on 15.11.2023).

¹⁷ Development of ecosystem. MTS. URL: <https://ar2021.mts.ru/obzor-transformaczii-ekosistemy/razvitie-ekosistemy-mts/> (accessed on 15.11.2023).

¹⁸ The Rise of Health-Tech Startups in Dubai and How to Start One. // URL: <https://www.duqe.ae/healthtech> (accessed on 07.01.2025).

¹⁹ RZD-Medicine: We Are Open To Everyone. URL: <https://rzd-medicine.ru/about> (accessed on 06.04.2025).

²⁰ Why Medicine Needs Ecosystems. URL: <https://ict.moscow/news/medical-ecosystems> (accessed on 20.04.2021).

²¹ INVITRO uses “digital twin” technology to build and develop its network. URL: https://www.invitro.ru/moscow/about/press_relizes/invitro-ispolzuet-tekhnologiyu-tsifrovogo-dvoynika-dlya-postroeniya-i-razvitiya-seti (accessed on 14.06.2023).

used the services at least once, while about 30 per cent were totally unaware of the existence of such medical services.²²

As we have mentioned previously, foreign countries are actively developing medical ecosystems. For instance, **Italy** is implementing a cooperation programme involving universities, hospitals, and the government in the sphere of introduction of remote patient monitoring systems and automating immunisation processes.²³ Among successful international projects are Philips, Amazon Care, and Acibadem. The international company Philips HealthCare/Philips HealthTech develops digital medical ecosystems, which integrate AI, telemedicine, and big data. Their cloud platforms provide networking for doctors and patients across Europe, while smart wearable devices with Internet of Things technology collect data to help predicting diseases and developing customised treatment plans²⁴ [6].

The American project Amazon Care operates based on a different approach: it integrates digital medical services with an e-commerce ecosystem. The platform provides telemedicine consulting, pharmacy supply, and integration with Electronic Health Records (EHR), which ensures the access to medical care for people in remote regions by means of cloud services and mobile applications.²⁵ International medical ecosystems resort to a more sophisticated approach. For instance, Acibadem (Turkey) involves clinics, educational institutions, technological developments (medical information systems), accredited laboratories, and mo-

bile medical services, which ensure a full cycle of health management. The given ecosystem includes Acibadem University, which trains a highly qualified staff of specialists by means of advanced educational programmes and scientific research. The latter involves the research activity of the Centre for Advanced Simulation and Education (CASE), which bear the status of “Centre of Excellence”.²⁶

Startup projects are especially noteworthy for the interest in the medical sphere. Specifically, the company Medable (USA) has launched an innovative platform for medical trials, speeding up pharmaceutical development employing digital tools and the automation of regulatory processes. The African project Zipline solves problems of access to medicinal products in remote areas by means of their rapid delivery by drones [5].

In general, we would note, that the existing medical ecosystems enhance the efficiency of healthcare system via digitalisation and innovations. The advantages of these systems include the following aspects: the digital integration of personal electronic medical records, telemedicine and mobile applications via unified platforms (as in “RZD-Medicine”, Philips HealthTech, and Amazon Care); tailored treatment using AI, big data, and portable devices (Medscan, Invitro); expanded access of healthcare through telemedicine solutions and medicine delivery (Zipline); support for innovations through acceleration programmes (MTS and “Medsi”) and strong cooperation with scientific and pharmaceutical enterprises; as well as development of hybrid models, which combine traditional and digital approaches (Acibadem, Chinese TCM platforms).

However, to build such a healthcare ecosystem, significant challenges must be solved: namely, the fragmentation of medical ecosystems; or the limited functionality of Russian services (SberZdorovye, Yandex.Zdorovye), which are predominantly telemedicine-oriented. Besides, there is a low public

²² Why does medicine need ecosystems? URL: <https://ict.moscow/news/medical-ecosystems> (accessed on 20.04.2021).

²³ The Healthcare Ecosystem. Navigating the Healthcare Ecosystem: A Guide for Entrepreneurs. URL: <https://fastercapital.com/ru/content/Экосистема-здравоохранения—Навигация-по-экосистеме-здравоохранения—руководство-для-предпринимателей.html> (accessed on 21.03.2024).

²⁴ Acibadem hospitals and outpatient clinics. URL: <https://acibadem.com.ru/why-acibadem/integrated-healthcare-model> (accessed on 2021).

²⁵ The Healthcare Ecosystem. Navigating the Healthcare Ecosystem: A Guide for Entrepreneurs. URL: <https://fastercapital.com/ru/content/Экосистема-здравоохранения—Навигация-по-экосистеме-здравоохранения—руководство-для-предпринимателей.html> (accessed on 21.03.2024).

²⁶ World Health Organization. URL: <https://www.who.int/publications>

awareness and insufficient demand for such platforms (used by only 10 per cent of Russians) and regulatory barriers make data integration quite complicated. In addition, a lack of unified standards lead to fragmentation of ecosystems, as well as the problems of technological risks related to AI algorithm errors and data vulnerability to cyberattacks.

Consequently, despite the activity of digital players, the abovementioned examples illustrate that a fully-fledged healthcare ecosystem requires more comprehensive integration of all participants involved (clinics, IT, science, the state) and flexible models (telemedicine in combination with real-life non-virtual services).

RESULTS

To distinguish the possible types of activities within a healthcare ecosystem, the authors studied the all-Russian classifier system OKVED-2²⁷ to determine the following classifications numerically indexed: 21 — Manufacture of pharmaceuticals and materials for medical use; 32.50 — Manufacture of medical instruments and equipment; 84 — Activities of public administration bodies in ensuring military security and compulsory social security; 85 — Education; 79 — Activities of travel agencies and other organisations providing services in the field of tourism; 86 — Healthcare activities; 58 — Publishing activities; 61 — Telecommunications; 62 — Computer programming, consultancy, and related activities; 63 — Activities in the information technology service, etc.

Healthcare in Russia constitutes a vertically integrated economic system. Contemporary domestic healthcare companies face the fundamental problem during transforming into rigid, monolithic structures with a unified business model. As an alternative to this approach, dynamic ecosystems should be generated with the integration of diverse products and innovative services (from classical medical services to digital solutions), multiple

business models (B2B, B2C, B2G), as well as projects with different level of developments (from tried-and-true solutions to promising experimental developments). A critically essential factor should become the balance between innovativeness and regulatory requirements, which implies building partners' relationship with regulatory authorities.

A major challenge is to ensure a successful intersubjective interaction. A medical ecosystem, by its very nature, cannot function autonomously, since its effectiveness is directly determined by the quality of integration with other socio-economic spheres. This is justified by the nature of health, where medical services by itself represent only one of many significant factors.

Key aspects include interaction with educational institutions through fostering a culture of healthy life-style and implementing preventive programmes; collaboration with social services aimed at supporting vulnerable groups of population and developing programmes of mental health, as well as integration with technology-oriented companies for introducing digital solutions.

An equally significant aspect is partnership with the business community, which involves attraction of investments and the implementation of corporate programmes, as well as coordination with regulatory bodies in the field of service standardisation and quality control. A particular problem is disparity: in case if there is interest in targeted technological solutions, there is a persistent lack of long-standing investment in the comprehensive development of ecosystems. This situation is most dramatic in the regions, which face a shortage of infrastructure and lack of qualified specialists.

The fragmentation of the healthcare system, which is divided into state, private, and corporate institutions, hampers strongly the creation of a unified information and service space. Developing interaction between state medical institutions, scientific centres and pharmaceutical companies is of significant potential, since it would enable the provision of aggregated services. The formation of a healthcare ecosystem presents an evolutionary

²⁷ OKVED-2 is the all-Russian classifier of types of economic activity.

process, which requires a balanced aggregation of market mechanisms, social responsibility, and state regulation.

One of the key challenges is the medical data fragmentation. Electronic systems often face the problem of incompatibility between each other, which hinders the exchange of information between ecosystem participants. The solution of such a problem requires not only technological innovations (for instance, block chain for secure data storage) but also changes to the regulatory framework. The most complicated problem of regulation framework is related to telemedicine services and processing of personal data, where the legislative framework falls behind technological expertise.

Digital gap between leading medical centres and provincial institutions becomes another restrictive factor due to a complicated integration of different information systems and equipment from a variety of manufacturers. Besides, strong risks exist in the field of cybersecurity and protection of patient personal data. Regulatory constraints escalate complications, for instance, the abovementioned outdated regulatory framework that cannot catch up to the development of telemedicine and AI diagnostics, excessive bureaucratic impediments to the implementation of innovations, or insufficiently transparent mechanisms of payment for digital medical services. Technological challenges also represent a digital gap: on one hand, medical professionals are not sufficiently ready to work with modern digital equipment, and on the other hand, senior patients and rural residents show inadequate digital skills²⁸ [16].

Social factors make a strong impact too: low digital literacy among the population (especially among the elder generation and society in rural areas), conservative mindset among part of the medical community relating to new technologies,

and persistent patient distrust of distant means of provision of medical care. Concurrently, there is a persisting trend towards combining economic efficiency with social orientation, which is quite characteristic of contemporary solutions for ecosystems in healthcare.

Restrictive nature of digital platforms also make a number of challenges. Even large technologically developed players, such as Sber and Yandex, encounter barriers when entering the medical sphere. Their services are still quite narrowly focused (telemedicine, appointments to visit doctors)²⁹ [3], whereas a real ecosystem should provide a complete coverage of medical care: from prevention and diagnosis to treatment and rehabilitation.

An ineffective use of resources is also noted within the framework of healthcare ecosystem (due to insufficient coordination between its subsystems and participants, which leads to duplication of functions), as well as a drastic shortage of qualified personnel, especially in remote regions where the outflow of specialists to large centres is rigorous [7].

The most developed is the educational subsystem, since medical education is continuously progressing. It involves institutions of higher and secondary medical and pharmaceutical education, and treatment-and-prophylactic clinics.³⁰

Solving the abovementioned tasks requires a comprehensive approach aggregating technological, organisational, and social issues. Moreover, such challenges envisage the development and coordination of measures within the framework of state policy, corporate strategies, and educational programmes. To build an effective healthcare ecosystem it requires not only updating existing business models, but also inventing a fundamentally new approach that takes into account the specifics of the industry, the diversity of stakeholders, and the dual nature of the consumer-tailored value.

²⁸ Shortage of Doctors and Medical Personnel: Vacancies in Khakassia Number in the Hundreds. URL: <https://vskhakasia.ru/press-centr/news/19540-nekhvatka-vrachej-i-medpersonala-vakansii-v-khakasii-ischislyayutsya-sotnyami> (accessed on 12.04.2014).

²⁹ SBER: More Than Just A Bank. URL: <https://www.sberbank.com/ru/ecs> (accessed on 15.11.2023).

³⁰ On the other hand, healthcare facilities are also part of the socio-economic ecosystem.

Within the analysis of definitions of ecosystems, the authors identified the most significant definitions for understanding the essence of a healthcare ecosystem. G.B. Kleiner interprets a business ecosystem as “a network consisting of organisations and individual representatives of business community, which do not only form collectively a system of mutual support, but also develop together” [8].

A similar approach to the content of an ecosystem is observed in the sphere of education. In scientific discourse, the authors of the given article [1] consider an educational ecosystem as “a dynamic network of interacting subjects aimed to the following activity: consciously build interdependent connections, purposefully create developing relationships and conditions for the emergence of new opportunities for continuous education”.

If business community and educational ecosystems focus on separate spheres of interaction, the socio-economic ecosystem unites them into an aggregated complex. It is perceived as a spatially limited system, which is distinguished by the existence of a network of interdependent economic and social players, the creation of specific products of activity, the capability for autonomous operation and evolution, and sustainability by means of the circulation of key resources [5, 6].

In the context of the abovementioned definitions, a healthcare ecosystem obtains some specific features. Unlike highly targeted (business and edu-

cational) ecosystems and compared to territorially limited socio-economic systems, a healthcare ecosystem has a large-scale structure and involves heterogeneous subjects (medical institutions, pharmaceutical companies, insurance companies, sanatoriums, disease screening and prevention centers, etc.), a multitude of categories of economic activity, as well as overlapping institutional fields. This factor requires to structure the ecosystem in view of functional, stable interdependence (similar to business ecosystems), social orientation (in the same way as educational ecosystems), and geo-referenced aspect (in line with socio-economic ones). We should also point out, that a distinctive feature of the healthcare ecosystem is its specific dynamics, characterised by a high degree of regulation (in contrast with business ecosystems) and stringent standardisation requirements (compared to educational ecosystems). At the same time, it maintains its adaptive potential, which is inherent in all types of ecosystems. Besides, being a highly organised interacted system it originates a fundamentally new quality of systemic integrity, which possesses a synergistic effect, however, the latter cannot be limited to the simple aggregation of the capabilities of individual elements.

Such nature of the Russian healthcare ecosystem is contingent on the necessity of combining economic efficiency, social responsibility, and clinical effectiveness within the framework of the national development objectives of the Russian Federation. Different scholars consider approaches to formulate the objectives of an ecosystem in relation to its purpose. For example, the objective of business ecosystems is to reduce transaction costs by means of overcoming restrictions specific to vertically distributed economic systems.³¹ In the course of analysis of educational ecosystems, contemporary researchers pay special attention to developing life-long learning programmes accessible to all categories of learners [1, 9]. However, in our view-

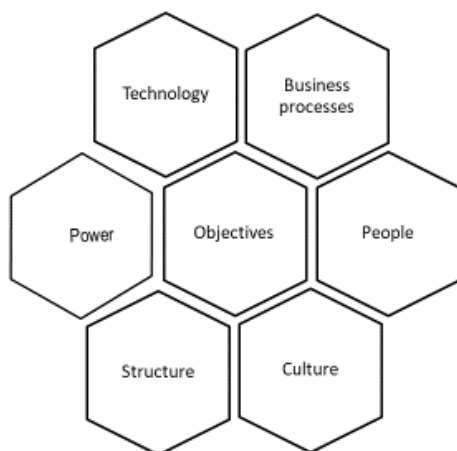


Fig. 1. Integral Model of Organization by Boddy – Peyton.

Source: Compiled by the authors based on [12,13].

³¹ Acıbadem hospitals and outpatient clinics. URL: <https://acibadem.com.ru/why-acibadem/integrated-healthcare-model> (accessed on 2021).

point, G.B. Kleiner most comprehensively expressed the essence of an ecosystem. In his opinion, its objective is expressed in evolution “in a temporal perspective with the preservation (and in some cases, perspective of the growth) of its spatial niche, which ensures the sustainability of its functioning”.

As far as the sphere of healthcare concerns, it is advisable to visualise the national development targets of the Russian Federation as the objective of the ecosystem.³² Considering the abovementioned analysed definitions, it can be stated, that a healthcare ecosystem is a complex socio-economic system structured as a network of interconnected autonomous subsystems. Their participants are economic, social, medical, and organisational subjects, developing in co-evolution, involved by the shared objectives of national development of the Russian Federation and integrated business processes that generate the added value (or benefit) of ecosystem, namely, the essentials for preserving the health of the national population.

Despite all lively discussions and the elaboration of theoretical and methodological aspects of development of ecosystem, currently, the issues related to the contribution of business processes to achieving its objectives and value generation are not revealed sufficiently. In this respect, we have studied the conceptual business model advanced by scholars from the Higher School of Economics: the key interacting subjects are suppliers, the manufacturer, and distribution channels, involved in the processes of value generation for the consumer [10]. Business processes generate and distribute value as the material and intangible results of the activities of participants. It is exactly the business process, which represents the foundation for its network-integrated interaction in order to ensure the sustainable functioning of the ecosystem. The objective of achieving the national development targets of the Russian Federation requires the gen-

eration and sustainable distribution of the added value of the healthcare ecosystem and it emphasises its business processes as the key aspect for its design, building, and functioning.

In the context of analysis of ecosystem, G.B. Kleiner's definition seems methodologically prominent, since it reveals the complex character of interconnections between participants of the system. To supplement his justified viewpoint, we shall observe, that the interaction of subjects of ecosystem is implemented through a multi-level system of relationship, which includes not only traditional material and financial transformations but as well as complex mechanisms aimed to distribute responsibility, authoritative requirements, and the dialectical combination of competitive and cooperative strategies of behaviour [8]. It is exactly the multidimensional nature of interactions, which combines elements of subordination and partnership, transforms an aggregation of autonomous subjects into an integral functional subsystem with new qualitative characteristics.

Such an ecosystem obtains the capability for self-sustainable development in the long-run perspective. Exactly such a capacity to generate the value through complex network interactions constitutes the distinctive feature of the ecosystem approach in healthcare.

The given approach acquires particular significance, when the professional autonomy of participants exists in a dialectical unity with the requirements of strict coordination; financial mechanisms are strongly bonded with ethical imperatives. Besides, competitive relations between healthcare providers are organically combined with the need of cooperation to achieve the main goal, namely, to provide the necessary requirements for preservation of the health of the country's population, as well as ensuring the health of each patient individually.

The potential of ecosystem approach:

- it opens fundamentally new opportunities for the proactive development of participants of ecosystem, allowing them to react flexibly to changes in the regulatory environment, which is essentially

³² Decree on the national development goals of the Russian Federation for the period up to 2030 and for the perspective up to 2036. URL: <http://www.kremlin.ru/events/president/news/73986>

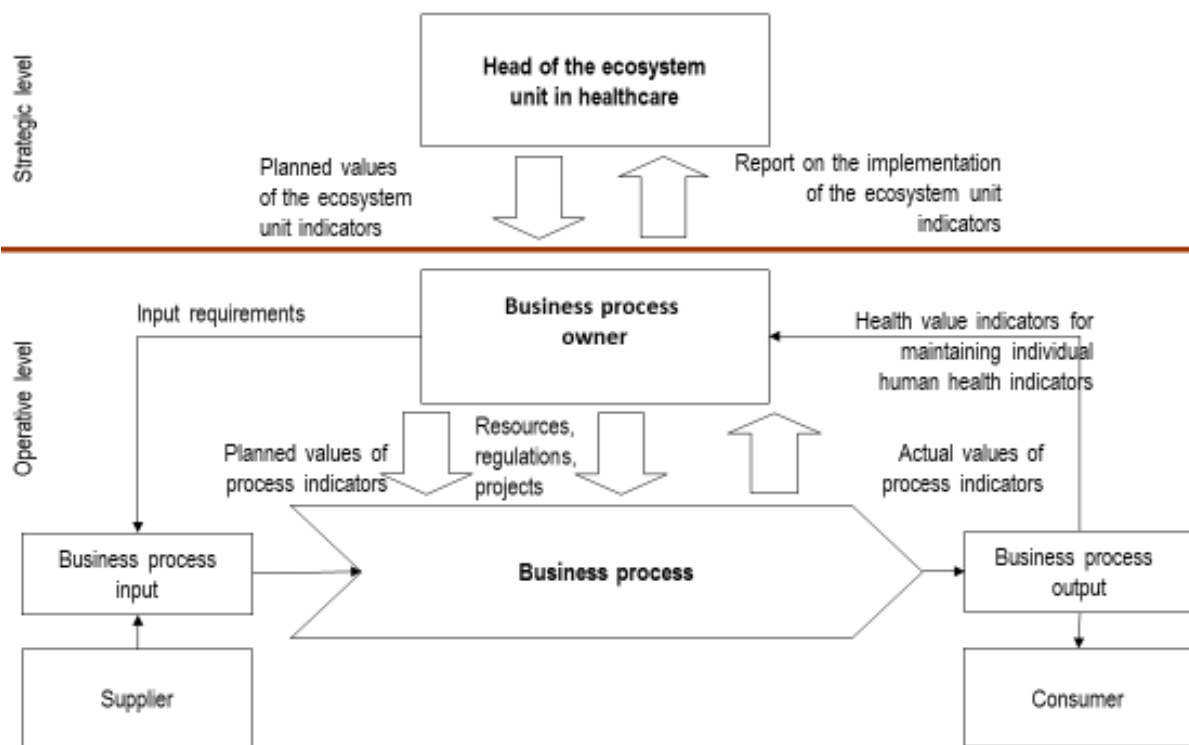


Fig. 2. Conceptual Diagram of Process Management within a Specific Component of the Healthcare Ecosystem

Source: Compiled by the authors based on [13, 14].

vital in the highly regimented sphere of healthcare. In contrast with business ecosystems, where the drivers are private companies, the state plays a key role in healthcare. The state must ensure regulatory flexibility (for instance, experimental legal regimes with limited access for testing innovations), financial support (financing prospective projects), and, lastly, infrastructure foundation (developing digital platforms such as the Unified State Health Information — USHISH³³);

- it involves the optimisation of both transaction costs and the distribution of resources between established and innovative directions of activity, and it also allows for the application of differentiated methodologies of management, from classical approaches for mature services to “agile”³⁴

³³ USHISH (The Unified State Information System in Healthcare) — an automated system that provides Russian citizens with rapid access to their medical data and healthcare services.

³⁴ Agile — a general term for a group of methods and

practices” aimed to develop fields and acceleration mechanisms for startups [11].

This kind of model becomes especially relevant under contemporary challenges, when medical organisations must simultaneously maintain traditional medical practices in clinics, introduce digital innovations (including telemedicine platforms and AI-driven diagnostic systems), build strategic partnerships with technology companies, and ensure compliance with ever more stringent regulatory requirements.

However, with regard to building a healthcare ecosystem, it is not simply a matter of adapting such a model, which takes into account of the number of subjects, their specifics, and diversity of their activities. It is mandatory to define its subsystems and subjects, their business processes, and the generated value for the consumer. These

approaches based on the values and principles of progressive project management.

processes ensure a synergistic effect exceeding the simple amount of the capabilities of separate participants.

Each subject (and subsystem) of the ecosystem can be analysed from a systemic viewpoint, and represent its internal environment in accordance with the Boddy-Payton model (*Fig. 1*).

As illustrated in *Fig. 1*, the objectives hold the central part of the presented model and all the activities of the ecosystem are aimed towards these objectives. Herein:

- people represent the participants of the unit, holding certain positions in the organisational structure;
- structure means the organisational framework that ensures vertical and horizontal division of labour for its coordination within the ecosystem unit;
- culture includes traditions and rules for executing business processes, which contribute to the effective solution of work targets to achieve the objectives of each unit;
- business processes represent grouped types of activities by means of which participants transform resources and create favourable outcome (new value);
- power ensures the priority of the common objectives of the ecosystem over the goals of separate units and individual plans of participants;
- technology encompasses the means of labour employed to transform resources into a valuable result [13]. The key integration mechanisms for ecosystem subdivisions are interconnected business processes. Within the systemic paradigm, we propose a visualised model for managing these processes at the level of an individual organisational unit (*Fig. 2*). Subsequently, there are the following essential aspects:
 - A leader of an independent economic, social, or organisational agent heads the ecosystem unit in healthcare, who accepts the ecosystem's objectives, transforms them into the goals of the unit in charge of, and receives feedback on their achievement. The leader interacts with the leaders of other ecosystem units.

- The owner of business process is a responsible official who coordinates the process and is liable for its results. The process owner's functional duties include organising interaction between suppliers of resources, consumers of the process results, and other process owners within the ecosystem unit.
- The process input represents a whole conglomeration of objects (products, results of the activity) that have value from the perspective of maintaining an individual's health. In the course of process transformation, inputs are converted into corresponding outputs (it should be emphasised, that the outputs of one process naturally become inputs for other process related to it).
- Process resource provision encompasses a variety of material and intangible assets, which are provided for the activity of its owner for the effective implementation of the process. They include the following: technical means (production, diagnostic and office equipment), qualified staff as a key human resource, necessary infrastructure (specialised premises, transport vehicles, and communication systems), financial and material assets, as well as a regulatory and methodological base substantiated by governing documents and project documentation.
- The consumer of the results is the entity that employs the process outputs, whose degree of satisfaction represents the key criterion for assessing the efficiency of the process. It is particularly complicated to identify the end consumer in the healthcare ecosystem, since, contrast to traditional business models, value is created simultaneously for several groups: patients (quality and accessibility of care), medical organisations (operational efficiency), insurance companies (risk management), and the state (public health).
- The supplier is the entity that ensures the process either with input resources or with components necessary for the implementation of the process.
- Process indicators represent a system of measurable characteristics based on which its owner accomplishes operational management and con-

trol, tracking back current values of indicators and dynamics of their transformations. Effective application of this approach requires elaborating a balanced system of value estimators (scorecard) that allows analysing and optimising economic and organisational interactions within the participants of the ecosystem. Business processes within this sphere are based on flexibility, digital integration, and network interaction. Business processes combine the automation of routine tasks through Business Process Management (BPM), as a concept of permanent sophistication of business processes, and AI with innovation, which implies a balance between standardisation and the specifics of local requirements [15]. Integration of management systems is a key condition to achieve maximum efficiency of the local process-related and the general one, since it enables coordinated actions of all elements of the ecosystem and lays the foundation for sustainable development.

The analysis of global practices of the leading players has indicated that contemporary medical ecosystems are drastically reorganising traditional business processes by means of implication of the following five key organisational principles:

Modular Process Architecture. Leading players (Acibadem, Philips) build flexible structures with clinical services, diagnostic laboratories, and IT solutions functioning as autonomous business units, however, technologically interlinked with each other. For example, Acibadem's Labmed laboratory operates as an independent revenue centre, serving as both internal clinics and external clients, thus, it increases the all-round efficiency of the system by 25–30 per cent [11, 13].

Digital Platform Integration. Ecosystems like Amazon Care reconsider value chains through the employment of unified digital entry points, automated end-to-end processes (from appointment to discharge of patients), and cross-service analytics. This decreases transaction costs by 20–35 per cent in comparison to traditional models [9].

Coordination through the medium of Innovative Business Models

- Medable: Platform solutions for clinical research [9],
- Zipline: Commercialisation of medical supply logistics [10],
- Acibadem: Synergy of education, science, and medical practice in clinics [13].

Deep Operational Automation. Major ecosystems implement automated tools to optimise up to 40–50 per cent of routine processes by means of AI monitoring of patients (Philips), algorithmic dispatch (Zipline), and smart contracts (Medable) [9, 10, 13].

Standardised Management Solutions. Successful projects include: embedded compliance (HIPAA in Amazon Care), international accreditations (Labmed in Acibadem), and corporate quality standards (Acibadem CARE) [9, 13].

To bottom-line the abovementioned aspects, we can draw the following conclusions:

1. The modular approach establishes flexibility and scalability.
2. Platform models ensure new income streams.
3. Automation of processes provides a competitive advantage.
4. Standards become industry filters.

For Russian players, it is of paramount importance to reinterpret differently organisational structures, monetisation models, key performance indicator systems (KPIs), as well as partnership strategies.

The analysis conducted by the authors of the given research leads to the conclusion, that effective management of a healthcare ecosystem requires a comprehensive approach, which integrates:

1. A system of indicators of processes which is use as an instrument for operational control and management.
2. Mechanisms for value creation and distribution concentrated on preserving the health of patients.
3. An equilibrated system for assessment of economic and organizational interactions.
4. Harmonious implementation of process management introduced in the integrated system of healthcare management.

The implementation of these principles in operation ensures a synergistic effect, which contributes to a sustainable development of the healthcare

ecosystem in the context of digital transformation in the industry. The subsequent research should be focused on the elaboration of specific methodologies for assessing the efficiencies of business processes, taking into account of specific features of various participants of the ecosystem.

Global experience confirms that transformation in compliance with such a model helps to cut down the time of the process and hit the market for new services by 2–3 times, as well as it yields a 30–50 per cent growth in operational effectiveness, ensuring fundamentally new opportunities for the development of the medical business.

CONCLUSIONS

A healthcare ecosystem, that represents a network of interrelated economic, social, and organisational subjects, requires a comprehension of business processes as collective labour focused on achieving a common objective: preserving health at the individual and population levels. The COVID-19 pandemic clearly demonstrated the importance of the concept of collective health, where the aggregation of interactions exceeds the amount of individual efforts.

In this context, business processes represent a mechanism for transforming resources into a new value by means of the following aspects:

- integration of performances — the coordinated interaction of heterogeneous elements of the system;

- cumulative effect — the mutual enhancing of the results of separate processes;
- systemic effectiveness — the achievement of values of indicator in the circumstances, when participants operate without interaction to each other.

The proposed model of ecosystem is focused on:

- the interdependence of processes;
- the complementarity of processes;
- criteria for assessing the contribution of each element to the all-round value of proposition;
- performance factors, which take into account both economic and social consequences.

Such a paradigm allows for the streamlining of management of resources, provided a balance is maintained between individual needs and requirements of society in the sphere of healthcare. The capacity of the ecosystem's architecture to maintain the stability of well-tested management practices, at the same time demonstrating adaptability to technological transfigurations, makes it the optimal model for sustainable development in the context of the fast-rising transformation of the healthcare industry. Such an approach allows participants of ecosystem to remain competitive using effective distribution of resources among various activities and applying the most suitable management instruments for each consumer.

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Motivational Personnel Management as an Integral Element of the Strategic Human Resources Management System in a Modern Organization

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ABSTRACT

This article addresses a pressing issue in contemporary management theory – the search for effective human resource management tools relevant to current market conditions. The concept of strategic management is proposed as a foundational approach to the development and implementation of HR mechanisms that, when aligned with business strategies, contribute to achieving company objectives. One such mechanism is motivational management, which scholars consider a stand-alone concept. The **purpose** of this study is to develop, based on the theoretical aspects described, a motivational personnel management program for a modern enterprise. The theoretical foundation of the research draws on the works of Russian and international scholars in the fields of economic theory, organizational theory and behavior, labor economics, personnel management, and strategic management. The developed program can serve as a methodological basis for HR managers in creating similar documents tailored to specific cases.

Keywords: motivational management; personnel management; strategic human resource management; motivation; human resource management

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INTRODUCTION

Initially, Karl Marx established the significance of labour in generating surplus value. Labour force generates added value, by means of its capacity to create value greater than its own. Subsequently, this value is redistributed and generated as an income for other participants in socio-economic relations. The role of labour expands each year in post-industrial society. According to the World Bank assessment, 16 per cent of total wealth in any nation stems from physical capital, 20 per cent from natural capital, meanwhile the lion's share — 64 per cent — derives from human capital [1].

Globalisation, informatisation, and the snowballing advancement of scientific and technical progress triggered hyper-competition (a restricted access to natural resources), turbulence, and unpredictable economic development. Due to these trends, the human factor becomes the primary source of competitive advantages and a key organisational resource. Although, notably, adverse conditions indicative of modern nations exist at the labour market: an ageing workforce, a drop of the working-age population, structural and regional disparities, and a lack of highly qualified staff [2]. This situation requires a high relevance of modern scientific research of Intensifying Human Resource Management (HRM) within socio-economic systems.

O.S. Vikhansky, a leading management theorist among modern Russian academic scholars, addressed in his work that people constitute the main and most valuable “resource” in any enterprise, and he emphasised that the quality of this resource directly influences competitive capabilities of the enterprise [3]. Industrial development and the emergence of the sixth technological paradigm have inevitably impacted the system of “human-production” relationship, since this qualitatively alters the level and content of personnel's knowledge and skills. Employees can no longer subsist mainly on their professional knowledge and experience; now they strive for continuous education. This leads to exchange and sharing

of knowledge that employees acquire within the production process (i.e., social learning within the collective) and also improving organizational performances.

In line with these qualitatively new trends in production development and labour factor formation, a new strategy for Human Resource Management is required too.

A strategic approach to implement human potential requires the need for motivational management as an essential element that provides a new vision for organising work operations and implements behavioural mechanisms for enhancing labour productivity and competitive advantages [4].

Renowned Russian scholars O.S. Vikhansky, B.M. Ghenkin, Yu. G. Odegov have examined classical and well-tested motivation theories. G.G. Rudenko, S.N. Apen'ko, A.P. Egorshin, I.K. Makarova, etc. Initially, these scientists specified the scientific categories for investigation and then established stable logical links between them. However, the analysis of Russian and foreign scientific research on this issue, the author of this article has identified a gap in the contemporary set of practical tools for motivational personnel management. This finding links to the tools that could be relevant and appropriate to modern market conditions, which determines the relevance and practical significance of this research.

RESEARCH METHODS

The given research selected the process of personnel management at a contemporary enterprise as its object. The subject of the research was chosen the tool of modern human resource (HR) management known as motivational personnel management. The objective of this research was to develop a programme for motivational personnel management for a contemporary enterprise, namely, LLC Agrokhozyaistvo “Petrovskoye”. The conceptual foundation included publications by Russian and foreign scholars on the given research topic. The scientific framework was made up of the methods of analysis, synthesis, and comparison.

RESULTS

The Role of Motivation in the Concept of Strategic Human Resource Management

The analysis of Western and domestic theories and practical experience in personnel management facilitated scholars to identify a new management paradigm: “the concept of Strategic Human Resource Management” (SHRM). This concept presents a logical sequel and the quintessence of human resource management theory, which is oriented towards a long-term organisational forecasting [5]. A principal advocate of SHRM is M. Armstrong, one of the most influential experts in personnel management, both worldwide and in his native Great Britain. His monograph “Strategic Human Resource Management: A Guide to Action” has been published and reprinted many times in Russia [6].

A distinctive feature of this new paradigm is the enhanced strategic aspect of HRM. According to the abovementioned Armstrong, “strategic human resource management represents an approach to developing and implementing HR strategies which, altogether with business strategies, facilitate the achievements of objectives for enterprises.” Concurrently, the scholar distinctly formulates the viewpoint, that integration represents the defining characteristic of SHRM, namely: vertical integration (of HR strategy with general organisational strategy) and horizontal integration (among individual HR strategies). This criterion of the concept is entitled “strategic congruence” and its theoretical foundations are of paramount importance for the successful implementation of an SHRM model within an enterprise [5].

It is difficult to overestimate the methodological significance of motivation research for strategic management objectives of an enterprise. Effective labour management is determined primarily by human behaviour within the socio-economic system, which depends on the motivation leading to this behaviour.

A scientific approach, which enables the construction of a conceptual model, facilitates accounting for all possible motivational factors: objective

and subjective, material and non-material, those factors influencing the formation of motives that make employees to work and chose their work behaviour. Employees, being individuals, may have their own needs and interests, which do not always meet the enterprise’s goals and, thus, with the objectives established for them [7].

Moreover, motivation plays a crucial role in harmonising the interests of management and staff. The stakeholder theory gives a certain scientific justification for this assertion. This theory, in turn, stems from the systems approach and organisation theory and it is of particular significance in the context of strategic management. It is only the strategy, including all its functional parts, which must harmonise the interests and potential of all stakeholders for the sake of the company’s survival and achievement of sustainable competitive advantages. Consequently, managers should try to develop a strategy that meets the needs of the maximum amount of stakeholders, or groups, to reach a synergistic effect. In reality, such endeavour leads not to the waste of spread resources but, on the contrary, to their aggregation and an increase in organisational efficiency.

A.P. Egorshin¹ attributes a significant importance in the field of motivation to such categories as individual motives, work incentives, human needs, and methods of influence. Essentially, domestic scholars interpret similarly these concepts. The system-forming category of “motivation” is considered by the majority of authors as “the process of urging a person to activity for achieving goals.” Foreign researchers interpret it as the process of encouraging oneself and others to action aimed at achieving individual and common objectives.

Stakeholders in the Corporate System of Strategic Human Resource Management

Any enterprise constitutes a unified, contradictory integration, the outcome of interaction

¹ Egorshin, A.P., Motivation of Labor Activity. A Textbook for University Students. Nizhny Novgorod: NIMB. 2003. p. 320.

among different stakeholder groups, each with its own interests and influence. Internal stakeholders, as part of the system, are interested not only in their own priorities are important but also the entity's needs.

There are the following categories for employees (as internal stakeholders):

- Primary goals: quality of life (level of remuneration, working conditions and job content, job security).
- Interests: the ratio of effort to reward (material and non-material).
- General patterns in interest development: dependence on social stages of the general life cycle (growing up, starting a family).
- Resources/Power of influence — level of work effort, labour discipline, capacity for constant development and improvement, innovative potential [7].

Personnel are mainly interested to satisfy their own needs and those of their family members, however, for this objective, the entity must develop in stability. The system of personnel motivation functions as the mechanism for increasing the interest of internal stakeholders (employees) in the results of their enterprise's activity. HR specialists also point out that common interests between employees and the entity are achieved when employees understand the mission, goals, and strategy, and are aware of the need for the growth of their entity's economic efficiency and their own role in this process.

Classifications of Motivation Theories

All domestic economists adhere to the same classification of motivation theories, which mirror a certain stage of production and are carried out in practice in view of current realities). Specifically, they divide them into three blocks: content theories; process theories; and context (A. V. Tebekin) or primary theories (A. P. Egorshin). The classification criterion serves as the link in the motivation mechanism.

These concepts are closely linked to motivational practice; their tenets are the basis of motivational systems, as one can manage personnel only understanding the structure and patterns of their needs. This is why it is relevant to deliver a substantiated critique of these theories. Currently, the classification of needs is viewed as primary advanced by the US psychologist A. Maslow and regarding this, L. A. Birman points to a shift in priorities for satisfying needs during economic crises, technological disasters, and terrorism.² The latter believes that safety needs is the main one, and in the information society, spiritual needs (second-level needs) may even overshadow them.

B.M. Genkin also criticises well-known content theories of motivation (by A. Maslow, F. Herzberg, etc.). Back in the year of 2000, he postulated a general theory of needs. It includes existence needs of two levels (minimum and basic) and needs for achieving life goals (self-realisation). In the author's viewpoint, its key trump over other approaches is that it considers individual characteristics of people. The scholar explains the mechanism of need formation and change via the influence of self-realisation factors. The concept of B.M. Genkin and content motivation theories, presented as its specific cases, facilitate the practical analysis of an entity's personnel needs [8].

However, the scientific literature presents these approaches not only from an epistemological viewpoint, but also as a scientific methodological basis for practical purposes: constructing motivation systems for specific companies. Coincidentally, T. Yu. Bazarov points out the lack of a unified concept of labour motivation despite the large diversity of theories and practical developments.³

Motivational Management

The growing importance of the human factor in the production activity of the post-industrial era,

² Birman L.A. Human Resource Management. Study Guidebook. Moscow: Delo; 2018. 346 p.

³ Bazarov T. Yu. Personnel Management. Study Guide. Moscow: Academia; 2008. 224 p.

and consequently its motivation as a management function, initiated the rise of a distinct type of management activity: motivational management or control. There does not exist a single definition of this concept in the scientific society, however, we can clearly define its goals and objectives. Its main goal is to improve the human resource management process via ensuring increased interest of the personnel in the results of their activities, as well as increasing labour productivity [8].

Motivational management is a concept that defines the concept of HRM based on the priorities of specific motives, based on motives as a means of management.

Motivation management can be structured like any other process. The object is the labour motivation of personnel, and the subject is the organisation (as a system) represented by the management and its HR department. Work motivation mechanisms, which ease the transition of employee needs and interests into specified work behavior, make the basis for the interaction between the managed and managing subsystems of the motivation management system comprises.

Motivational management must interconnect such categories as need, interest, motive, stimulus, motivational mechanism, behaviour, motivational system, and motivational structure. Some economists regard motivational management as the most effective approach, aimed to develop work motivation by providing conditions that foster the interest of employees in the final results of labour [9].

Motivational management in the post-industrial era can be considered relevant, since due to environmental unpredictability and turbulence, personnel motivation management, as a functional subsystem of personnel management (*Fig. 1*), transformed into human resource management and required a strategic approach.

Motivational management should be aimed at forming a motivation strategy integrated into the general HRM concept, which, in turn, is determined by the entity's overall business strategy [10].

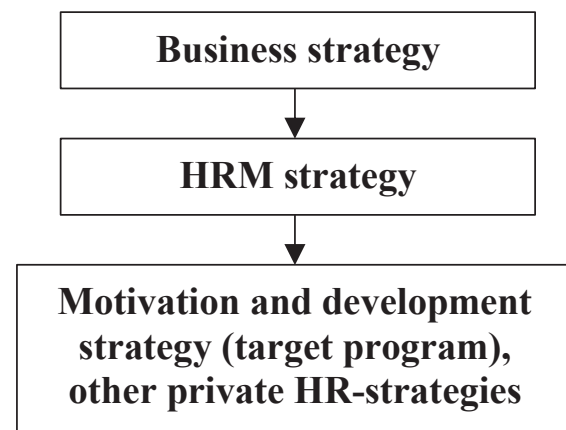


Fig.1. Hierarchy of Organizational Strategies

Source: Compiled by the author.

The Personnel Motivation and Development System

The conceptual guidelines of the personnel motivation and development system are the following:

- Methodologically, the HRM strategy concept stems from the resource-based view, human capital, and stakeholder theories.
- The human factor should be considered as the primary source of competitive advantage.
- The impact of external environmental conditions on the choice of human resource management strategy is as significant as the influence of the entity's internal factors.
- The HRM strategy is vertically integrated with the business strategy.
- Private HRM strategies are horizontally integrated.
- A hierarchy of strategies exists.
- General HRM strategies define the personnel management style, while individual functional strategies determine plans for achieving goals in individual functional areas of HRM.
- New roles for the HR service may emerge (strategic partner, creator of human capital) [11, 12].

The concept of SHRM stems from the position that an enterprise's personnel represent not merely an object of costs and one of the necessary organisational resources, but the primary resource determining competitive advantages

and, consequently, an object for investment [13]. Such interpretation relies on human capital theory, according to which investments in the employees' knowledge, skills, and abilities are long-term investments. The entity spends resources on training and developing competencies of its employees and creates conditions for their exchange of experience and knowledge. The subsequent payback of such investments can far surpass the effectiveness of material and financial assets.

Practically, SHRM fundamentally differs from traditional HRM: it aims to align personnel management functions with the entity's general strategy and its performance results. Besides, it most completely meets the needs of building a system of motivation and development management of the personnel. The interrelation between the SHRM concept and strategic management theory serves as the methodological basis for development and implementation of personnel motivation and development system for any enterprise [14].

When a situational approach is implemented to form an HRM strategy (its functional part related to personnel motivation and development) for a specific entity, it needs to adapt it to concrete external conditions. It allows for the connection of HRM functions with the business strategy of the entity (which largely stems from the external environment). If so, a SWOT analysis is to be fulfilled, as a well-tested tool to identify the essential directions for development of the entity in accordance with the influencing external and internal factors. These factors and the already formed business strategy should determine the HRM strategy (both general and specific).

Conducted Research on Forming a Human Resource Management Strategy

LLC Agrokhozyaistvo "Petrovskoye", a functioning small-to-medium-sized enterprise (SME) became empirical base for the given research. The findings of the analysis of its general economic activity for the period of 2020–2024 has demonstrated, the company is consistently unprofitable,

non-rentable, and its cost price is permanently declining. Agricultural production per se is efficient, but considerable capital investments in fixed assets take place, not yet fully recouped, and additional capital covered losses. Organisational and economic indicators like staff attrition reveal inefficient personnel management. Labour productivity in monetary and material indications corresponds to the regional average level.

Preliminary analysis of the company's activity indicated a problem of the personnel management system: within the past five years (2020–2024), employees who had worked for over a year and had successfully passed adaptation, left the company. According to the author of the given article, job frustration due to payment, the current remuneration system, and conditions could be the reasons for this phenomenon. High level of staff attrition and the lack of growth in terms of real labour productivity (25 centners/hectare) indicate an inefficient personnel motivation system.

A comprehensive staff motivation programme for LLC Agrokhozyaistvo "Petrovskoye" via SWOT analysis of the company's personnel management system was held (see *Table* below), and the following goals for its HRM strategy were established, based on the company's mission and management's conceptual approach to industrial operations:

1. Ensuring the availability of necessary high-class and multi-skilled specialists at all times and at any stage of the agricultural cycle.
2. Long-term and mutually beneficial collaboration between the staff and management through cultivating loyalty and involvement of employees for the economic and social efficiency of the agricultural enterprise.

The next stage involved the direct development of the HRM strategy, which involved the following aspects:

1. Setting goals and objectives.
2. Auditing the enterprise's human resources by number, structure (strategic environmental analysis).

Table

SWOT-matrix of the Personnel Management System at LLC Agrokhozyaistvo "Petrovskoye"

Opportunities	External Risks
1. Well-developed network of educational institutions in the Vladimir region. 2. High level of strategic management at the local level. 3. Availability of national projects. Favorable image of the organization in the Yuryev-Polsky district.	1. Problems regarding the development of the agricultural sector of the economy – working conditions (since the main source of funding is the agricultural enterprises' own funds, there is a shortage of these for full-scale technical and technological modernisation). 2. Demographic problems (low rural population density). 3. Lack of regional transportation, social infrastructure. 4. Lack of methodological recommendations for systematic HR management.
Strong points	Weak points
1. High creative and labour potential of employees 2. Competence of several key specialists (Agronomist, Chief Mechanic). 3. System of incentives and bonuses for employees based on their performance. 4. Clearly defined business strategy.	1. High staff turnover. 2. Lack of qualified workers (managers, specialists) with both higher and secondary specialized education. 3. Poor information support. 4. Low labor productivity (in physical terms). 5. Low level of HR management (lack of a strategic approach to human resource management by function: lack of retraining and development of personnel and control, inability to improve production conditions). 6. Low motivation of employees to develop and expand their professional skills and competencies

Source: Compiled by the author.

3. Developing strategic alternatives and selecting an HRM strategy.

4. Building strategy implementation mechanisms (selecting congruent personnel management practices).

5. Implementing the strategy and evaluation.

6. Adjusting the HRM strategy in case of changes of internal and external environmental factors in the company.

Such a scheme for formation of an HRM strategy preserves the main methodological guidelines of the SHRM concept, namely, vertical integration (links to the entity's strategic goals) and horizontal one (a set of HR management practices which complement and support each other).

The process of creating a strategic HRM model is presented in Fig. 2.

It consists of several stages, and one of them is the most important being the development of a target HRM programme.

The similar programme presented below for LLC Agrokhozyaistvo "Petrovskoye" can serve as a methodological conceptual framework for equivalent documents.

Proposed Programme for Motivational Personnel Management

Goals

1. The following postulates were suggested as the programme's goals:

2. Enhancing labour productivity through motivation of employees and forming organisational behaviour based on optimal dedication and initiative.

3. Employees start mastering new, adjacent specialties necessary for agricultural labour.

4. Improving qualification and professional growth in existing specialties.

5. Establishing the ambiance that encourages high-quality, dedicated work.

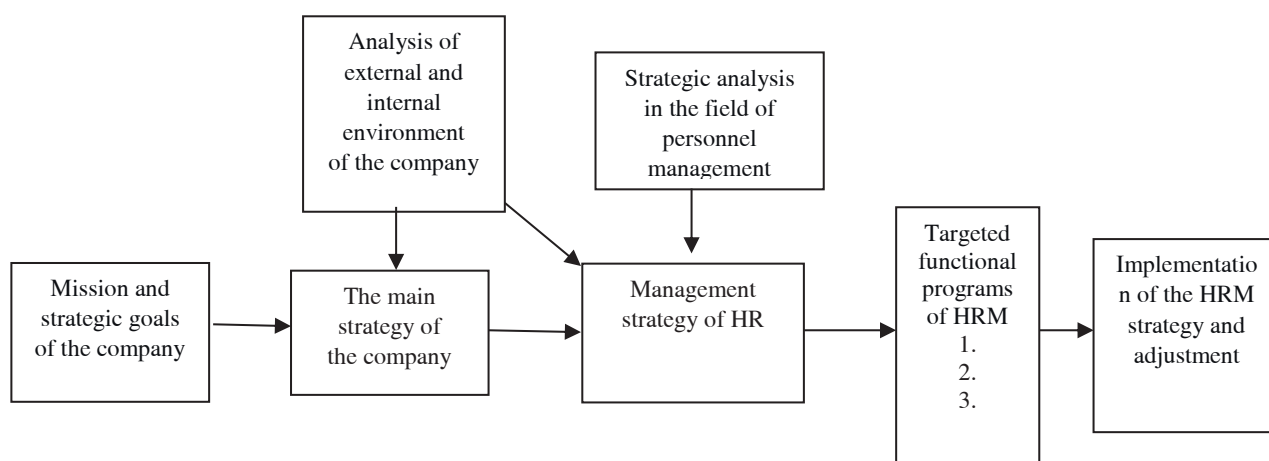


Рис. 2 / Fig. 2. Модель стратегического УЧР / Model of Strategic HRM

Source: Compiled by the author.

6. Establishing the farm's organisational competencies, based on worker experience exchange, mentoring, and collective innovation.

Programme Content

1. Improving the system of material stimulation (reforming the remuneration system):

1.1. Ensuring a decent (not below-market) level of wages, which is a "hygiene factor" necessary for the entity's viability.

1.2. Determining the wage structure by elements (fixed part and variable one as a percentage) to maximally link remuneration to the end results of the enterprise's activities. A significant share of the variable part, determined by the working results of the employee and the entity's overall activities, reflects the connection between the reward amount, fulfilment of organisational indicators and its strategic goals. The fixed part of the wage structure should prevail (to guarantee its reproductive function). The conditionally fixed part of the wage corresponds to the employee's qualification, and the variable part to the performance.

1.3. Developing the principle for forming the fixed part of the wage is based on a grading system using the Hay method. Each grade has a specific min-max range of official salaries. An employee's labour remuneration is determined within the grade by their qualification level and effectiveness. Advantages: the salary depends only on the

competencies required for the proper position; the pay min-max accounts for their qualification, a clear incentive for personnel development (which specific skills and competencies needed to learn for the higher wage).

1.4. Classifying the list of allowances by activity type as well as structuring it by employee categories.

1.5 Improving the variable part of the wage by tightening its link with the work results of specific employees, team, and the entire entity. Personnel must be motivated to achieve business strategy goals. Determining employee performances through Key Performance Indicators system is the most perfect tool to assess personnel activity: it presupposes personal responsibility for goal achievement, assignment of particular tasks to each specialist, integration of personal and entity's goals (with the chance to adjust goals and indicators), and an integrated instrument for planning, assessment, and development.

1.6. Developing criteria for awarding bonuses for qualitative indicators of work performance: initiative, activity, development, innovation.

1.7. Forming and documenting the bonus system.

2. Sophistication of the non-material motivation system:

2.1. Motivation through engagement. Cultivating individual engagement. The term "engage-

ment” is more often used instead of such as “job satisfaction”, “motivation”, and “commitment”. Special emphasis is made on voluntary effort as a form of reciprocity when employees respond to a good employer.

2.2 Using the following factors influencing engagement of employees when forming the individual motivation and development system:

- Qualitative characteristics of the work per se (interesting and challenging, varied labour activity, responsibility, autonomy as freedom of action), scope for and development of skills and abilities, opportunities for advancement.
- Working conditions (organisation of team-oriented work; improvement of work processes, equipment; work-life harmony and convenience; job security, satisfaction of personal development needs; organisational ambience; stress reduction).
- Qualitative relations between subordinates and managers (support of employees by management, delegating responsibility, ensuring autonomy, providing subordinates a possibility to give their opinion and receive feedback; recognition of merits for contributions).
- Opportunities for personal development and growth (an environment positive for learning: enlargement of job functions; providing authority instead of constant control; self-made learning instead of instructions; career growth).

2.3. Ensuring the interrelated and complementary application of the practices abovementioned for different employee groups to reach a synergistic effect in cultivation of engagement.

3. Development of corporate culture:

3.1. Forming an organisational culture as a unified socio-economic space within the entity, when employee's interaction is based on common ideas, perceptions, and values in correspondence with the specific nature of their work activities. Implanting well-achieved values and traditions into the organisational culture.

Objective: creating an organisational culture as an effective incentive within the framework

of positive attitude of staff to work activity and professional development, forming engagement oriented to realising the entity's strategic goals.

3.2. Clear explanation (in documents) of the mission, philosophy, objectives, values, norms of behaviour, characteristics of the organisational climate, and entity's image.

3.3. Creating a common informative field that transmits and explains the entity's mission, strategic objectives, and values. Developing diverse means for identifying organisational culture for employees: information support (verbal, non-verbal), communications (official: meetings, briefings, interpersonal informal talk). Informing employees on the entity's mission, goals, and strategy. Conducting events to unite team spirit, showing care for employees, building teamwork.

3.4. Organising feedback, monitoring and diagnostics of the organisational culture by the most important parameters: required work place behaviour, socio-psychological microclimate (surveys, questionnaires, surveillance) and adjusting the programme.

4. Improving the personnel development system.

Objective: ensuring individual training and development, promoting organisational learning, forming a collective culture oriented to individual and organisational learning, and free sharing of knowledge among employees.

4.1. Individual learning and development, incl. internal and external training. Current goal: staff interchangeability. Task: improving professional skills and competencies both vertically and horizontally (mastering adjacent professions). It is mandatory due to the seasons of agricultural activity and deployment of activities in a new area of sheep farming:

- Arranging internal training (identifying needs and organisation), based on mentoring (creating “Mentoring Guidelines”), coaching, discussions and debates, exchange of experience, teamwork; work-based training (via observing the job of an experienced employee to acquire

similar skills, as well as by creating and developing professional communities / teams).

- Ensuring external formal training: professional development courses, e-learning, seminars, regional field conferences.
- Assessing effectiveness of training by monitoring results (tests, the trainee's personal opinion).

4.2. Organisational learning and development, facilitating the exchange to pass the knowledge among the staff:

- Curculating knowledge obtained from external sources to some other, interested staff.
- Rotating specialists to adjacent units.
- Organising constant communications for exchanging "intellectual models" – "round tables", "briefings", or meetings on important organisational work issues with the specialists from different departments, or experts of the same profile, or one team.
- Group training.
- Creating technological information systems for knowledge exchange, ensuring access to them.

5. Plan for implementing the personnel motivation and development strategy: list of activities, resources, responsible persons, deadlines.

6. Monitoring the implementation of the personnel motivation strategy and development (performance indicators: change in staff attrition, labour productivity in natural units for the main staff categories, and profit/profitability)

and programme adjustment: list of activities, responsible persons, deadlines.

The proposed programme was developed based on empirical implementation of an entity of agricultural sector. However, it can serve as a methodological basis for creating a similar document for enterprises in other economic sectors. In view, that the programme's goals and points contain no highly specialised references specific to an agricultural enterprise, it can be adapted to other areas of economic activity.

CONCLUSIONS

The concept of Strategic HRM derives primarily from the uniqueness of personnel as a resource (its value, exclusivity, and scarcity) as well as the necessity for its adequate managing. The ontology of the SHRM concept is extremely vital for assessing its current practical application.

The system of knowledge in the scientific field of "Strategic HRM" correlates with the guidelines of motivations of personnel management. The SHRM concept ensures a systematic approach to managing employees and facilitates the economic and social effectiveness of the entity's activity, determined by such indicators as growth, labour productivity, profit, profitability, and reduced staff attrition. The scientific-theoretical guidelines of the SHRM concept are methodological recommendations, which are mandatory for application in cultivating a personnel motivation and development strategy.

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