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**MANAGING A MODERN SCIENTIFIC ORGANIZATION: A SOCIOLOGICAL
APPROACH**

5.4.7 – Sociology of Management

Abstract of the Dissertation
submitted for the degree of
Candidate of Sociological Sciences

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Relevance of the Research Topic

Amid contemporary global challenges, the scientific and technological development of the Russian Federation has become a strategic national priority. Achieving national development goals requires engagement of research teams along with intellectual, managerial, and human resources within scientific institutions. This, in turn, necessitates a reconsideration of established management approaches within scientific institutions. Existing research and managerial practices indicate that traditional administrative and planning models often fail to address the increasing complexity, cross-discipline nature, and rapid pace of modern research.

The growing complexity and rising expectations for research productivity make the continuous development of human capital a critical priority. Specifically, scientific institutions must attract, retain, and support the professional growth of early-career researchers. Ensuring generational continuity and supporting researchers' professional fulfillment require flexible management approaches that align individual research interests with the strategic priorities of both the state and the institution.

The relevance of this study is determined by the following factors:

- First, the need to enhance the effectiveness of scientific institutions in addressing national development goals, with fundamental and applied research serving as key drivers of technological advancement and sovereignty.

- Second, the limitations of traditional hierarchy-based management mechanisms with inherent bureaucratic constraints, hinder knowledge exchange, and deprive of flexibility in responses to environmental changes.

- Third, the necessity for systematic human capital management as a core institutional resource, with particular emphasis on integrating early-career scientists into priority research areas and establishing transparent pathways for their professional and academic growth.

- Fourth, the persistent gap exists between the growing need for flexible, project-oriented, and participatory management approaches and the limited theoretical, methodological, and practical development of integrated mechanisms capable of aligning institutional structures, human capital, and research performance.

State of Scientific Research. This investigation draws upon an integrated theoretical framework encompassing sociological and management approaches, thereby providing a multidimensional analytical foundation.

The first group comprises classical studies on the theory and methodology of social management and organization development. This body of scholarship includes the works of F. Taylor, H. Fayol, M. Weber, N. Wiener, W. Ashby, A. A. Bogdanov, L. von Bertalanffy, E. Mayo, M. Follett, C. Barnard, D. McGregor, H. Mintzberg, É. Durkheim, T. Parsons, R. Merton, T. Kuhn, A. I.

Prigozhin, H. Simon, J. Galbraith, P. Lawrence, J. Lorsch, T. Burns and G. Stalker, R. Dahl, A. Etzioni, M. Crozier, A. K. Gastev, G. A. Ilizarov, A. I. Evdokimov, and S. N. Fyodorov.

The second group focuses on contemporary approaches to management and includes studies by I. Chang, C. Chang, I. Chen, C. Wang, H. Hou, C. Li, M. Rolková, V. Farkašová, R. Chen, S. Kim, T. N. Batova, M. A. Savelyeva, A. R. Volkov, A. D. Boniani, A. V. Vavilina, Ya. V. Savchenko, L. A. Ramenskaya, T. A. Olcynik, I. I. Vafin, E. A. Zemskova, I. D. Kuznetsova, D. Kuprenas, S. Dan, P. Lægreid, and D. Špaček.

The third group comprises research on the management of scientific organizations as specific social institutions. Significant contributions in this area include the works of M. A. Voytikova, V. A. Cheymetova, I. A. Ganieva, G. V. Shepelev, E. A. Grigoryeva, O. A. Feoktistova, O. V. Vasina, V. A. Tretyakova, M. D. Balaeva, D. V. Gorobets, N. A. Ershova, L. N. Kosova, I. Yu. Eremina, E. V. Korneva, A. V. Chuprova, A. S. Abdulkadyrov, O. A. Piletskaya, A. V. Demin, I. V. Rybalchenko, I. V. Milkina, V. V. Shcherbina, I. P. Popova, S. Yu. Demidenko, M. A. Yurevich, V. A. Malakhov, A. V. Ivanov, E. P. Smirnova, D. A. Kozlov, V. V. Komleva, and T. V. Skipetrova.

The fourth group addresses the management of scientific organizations within the healthcare sector. Relevant studies include those by D. Bonfim, L. Belotti, L. de Almeida, P. Ovseiko, S. Davies, A. Buchan, V. Pellegrini Jr., D. Gazik, D. Wilson, K. Ewerts, L. D'Aniello, M. Spano, C. Cuccurullo, M. Aarii, H. Collard, S. Hooper, D. Spetz, J. Cohen, E. Siegel, A. Al-Fattani, A. Al-Firna, N. Al-Bedah, O. Purnik, B. Ahmad, and S. Gura.

Study object: the management of scientific institutions as a distinct form of social interaction.

Study subject: the social and managerial relations within a scientific institution enabled by matrix-based participatory management tools and their impact on the motivational, cooperative, status and role characteristics of research teams, using a state scientific medical institution as a case example.

Study goal: to develop and evaluate matrix-based participatory management tools and determine their impact on the social processes governing scientific institutional development, using a healthcare scientific institution as a case example.

Study objectives:

- 1) address the management practices within of a scientific institution as an object of sociological research and identify the characteristics of the investigated management model
- 2) determine theoretical approaches to studying and managing scientific institutions within an increasingly complex research environment
- 3) identify the potential and limitations of conventional and modern approaches to labor standards in scientific institutions and evaluate their impact on social relations and professional autonomy of research personnel

- 4) determine the role of the institution's ecosystem as a key factor in implementing matrix-based participatory management
- 5) develop and implement a matrix management tool to enhance social relations, decision-making systems, statuses roles, and social control mechanisms within a scientific institution
- 6) develop and implement participatory management elements to build social foundation for a matrix management system and enhance motivation, cooperation, and self-organization among research staff
- 7) evaluate the effectiveness of the matrix-based participatory mechanism and its impact on the social aspects of scientific institution management.

Study hypothesis: management output in scientific institutions improves through the integration of ecosystem principles, matrix management mechanisms, and participatory practices. These elements function not only as coordination tools but also as social and managerial mechanisms for transforming research team interactions. This approach aligns formal performance requirements with professional norms and informal research practices, legitimizes management decisions, fosters horizontal communication, clarifies status and role positions, and enhances motivation, cooperation, and mutual accountability among researchers to improve overall research productivity.

Scientific Merit

For the first time, contingency theory, professional bureaucracy, and bounded rationality are applied to scientific knowledge management and integrated into a theoretical and methodological framework to analyze management of science as a social, cognitive, and institutional system. This framework provides theoretical rationale for for hybrid and matrix-based participatory management models.

A matrix model of scientific institution management was developed and sociologically validated, framing management and communication mechanisms as an interconnected system of social and managerial interactions that ensure research coordination, professional cooperation, and staff involvement in decision-making. The study demonstrates that the management outputs within a scientific institution is driven by formal and informal communication networks, trust levels, status and role distributions, and the legitimacy of management decisions within the research team.

The findings demonstrate the limited applicability of conventional labor standardization within science institutions, which fails to account for the social, creative, communicative, and interdisciplinary nature of modern research. From a sociology of management perspective, this work generalizes the core concepts of flexible standardization as a social and managerial mechanism that balances formal performance requirements, professional autonomy, informal research practices, and team-based management of research.

Implementing matrix and participatory management models within a scientific medical institution requires establishing an appropriate ecosystem—an institutional and managerial environment that aligns formal administrative requirements, professional scientific norms, and collective research practices.

An original methodological approach to standardizing research work (the “Task Matrix”) was developed and tested. It integrates deconstruction of scientific outcomes, percent-based standardization of milestones, and personnel workload management into a single matrix tool. This tool performs both managerial and social integration functions by enhancing the link between individual key performance indicators (KPIs) and collective goals, thereby fostering mutual accountability.

Matrix and participatory management were shown to complement each other: the matrix model brings structure to planning and control, while the participatory approach increases employee engagement and responsibility. Accordingly, a human-centered management model for research activities was developed, translating control tools into motivational and self-organizational mechanisms adapted to state-funded scientific medical institutions.

Theoretical and methodological framework comprised systemic, structural and functional approaches, viewing the scientific institution as an open social system with interconnected subsystems, functions, and feedback mechanisms (A.A. Bogdanov, L. von Bertalanffy, T. Parsons, R. Merton). Max Weber’s theories were applied to analyze management as social actions, and Émile Durkheim’s concepts were used for normative integration. The specific nature of a scientific institution as an expert community was analyzed through Henry Mintzberg’s concept of professional bureaucracy and Thomas Kuhn’s theory of scientific paradigms. The contextual nature of management was grounded in contingency theory, and the limits of managerial rationality were framed using Herbert Simon’s concept of bounded rationality. Methodologically, the study compared vertical and horizontal management models, synthesizing them into a matrix model that accounts for interdisciplinarity and diverse external requirements. The core foundation conceptualized management as a balance between control and autonomy, wherein an open, institutionally protected communication environment facilitates knowledge circulation and reduces transaction costs.

The investigation applied sociological (identification of social management mechanisms, motivation factors, and the participation of research staff in management processes), activity-based (analysis of scientific and management activities as task-oriented social practices), process-based (addressing the management of a scientific institution as a continuous social process), project-oriented (development of a matrix mechanism for research management), and participatory approaches (development of a framework for engagement of research staff in management decision-making and

organizational development). The core research principles included systematic approach, interdisciplinarity, social determinism, the unity of theory and practice, and empirical verifiability.

Empirical basis:

1. The empirical basis consisted of statistical data and operational reports from the Research and Practical Clinical Center for Diagnostics and Telemedicine Technologies of the Moscow Health Care Department (hereinafter - the Moscow Center for Diagnostics & Telemedicine), alongside primary sociological research conducted by the author (listed in chronological order):

A 2020 pilot study, “Time Standards for Scientific Performance Metrics,” identified initial labor costs for key performance indicators. The data were obtained through expert interviews with research leads and principal investigators ($n = 19$) at the Moscow Center for Diagnostics & Telemedicine.

A 2021 pilot study, “Labor Intensity Across the Key Performance Indicators Milestones for Research,” addressed labor distribution across research stages. The study was conducted through expert interviews with research lab heads ($n = 12$) at the Moscow Center for Diagnostics & Telemedicine, clarifying managerial aspects of research projects and establishing labor intensity standards for research milestones.

The 2021 pilot study “Efficiency of the Most Cited Research Standardization Methods” evaluated established labor standardization methods as applied to scientific research. This study comprised expert surveys ($n = 9$) at the Moscow Center for Diagnostics & Telemedicine. Results were reviewed and approved by the institution's Scientific Board ($n = 30$), comprising researchers, physicians, engineers, and analysts involved in the research projects. This pilot study identified key advantages and limitations of existing labor standardization methods in research.

A 2022–2023 longitudinal study, “Attitudes of Scientific Organization Employees Towards Research and Development,” assessed the social impact of matrix-based participatory management using a standardized, repeated-measures questionnaire to compare evaluations pre- and post-intervention. Research personnel at the Moscow Center for Diagnostics & Telemedicine were surveyed across two phases: 50 respondents in 2022 and 68 in 2023. Sample representativeness was maintained across job titles and departmental affiliations within the institution.

The 2025 study “The Impact of Participatory and Matrix Management on Labor Productivity in Public Funded Organizations Subordinate to the Moscow Government” expanded the empirical base using structured interviews with lab heads ($n = 44$) across public funded organizations subordinate to the Moscow Government, confirming that matrix and participatory management positively influence labor productivity.

2. Secondary analysis drew from

two waves of a nationwide survey of scientists, “Scientific Capital of Russian Scientists in the Context of the Dissemination of New Technologies,” conducted by an independent research team using representative samples in 2022 ($n = 551$) and 2024 ($n = 536$) to evaluate professional well-being, scientific capital distribution, and status positions among Russian scientists^{1,2}.

“The Potential of Citation Indexes in the System of Social Management of Scientific Activity Quality” (2014–2017; research advisor - Vasilenko L.A., PhD, D.Sc. In Sociology), which surveyed experts ($n = 101$), including graduate students and senior scholars in the social sciences and humanities.

The long-term timeframe, retrospective data, the repeated survey, as well as structured interviews with the heads of organizations subordinate to the Moscow Government, ensure sufficient reliability and allowed to consider the findings as empirically substantiated and methodologically correct.

Key Statements Submitted for Defense:

1. Scientific institution management represents a distinct mode of social interaction wherein administrative mechanisms reproduce scientific norms, legitimize knowledge, and harmonize competing research paradigms rather than merely enforce control. While existing frameworks address isolated facets of managerial reality, they fail to provide a holistic framework for analyzing modern scientific institutions as manageable social systems. Synthesizing structural, functional and systemic theories with the paradigm theory, contingency theory, professional bureaucracy, and bounded rationality enables the scientific institution to be analyzed both as an institutional structure, a locus of social interaction, and a cognitive community. The proposed methodological synthesis provides a theoretical basis for scientific institution management models that integrate hierarchical, network, matrix, and participatory mechanisms.

2. Conventional scientific institution management models based solely on vertical or horizontal subordination fail to support sustainable scientific activity amid increasing interdisciplinarity, complexity of communications, and expanding stakeholder ecosystems. While a vertical management model maintains strategic integrity and regulatory stability, excessive centralization delays decision-making and limits innovation. Conversely, a horizontal model enhances research agility and adaptability but weakens managerial control. An optimal matrix management model integrates the administrative authority of vertical management with the project-

¹ Noskova A.V., Goloukhova D.V., Kuzmina E.I. Status Positions and Scientific Capital in Russian Science. *Sotsiologicheskie issledovaniya* [Sociological Studies]. 2024. No 2. P. 88-99.

² Noskova A.V., Goloukhova D.V., Kuzmina E.I. Professional Well-Being of Russian Scholars: Methodological Issues and Results of Sociological Measurements. *Sotsiologicheskie issledovaniya* [Sociological Studies]. 2025. No 7. P. 80-93

based agility of horizontal interactions. Achieving social effectiveness requires a communication environment that promotes knowledge flow, minimizes transaction costs, and accelerates scientific output.

3. Labor standards serve as a socially determined managerial tool whose effectiveness depends on the recognition of labor specifics. Conventional standards developed within industrial paradigms of scientific management of labor—focusing primarily on quantitative output and time metrics—are methodologically inadequate for modern scientific research. The intrinsic nature of scientific inquiry—characterized by creativity, uncertainty, interdisciplinarity, and collaboration—requires a transition from rigid standard-based regulation to flexible, project- and outcome-oriented metrics aligned with a human-centered framework.

4. The institution's ecosystem is a key factor in implementing matrix-based participatory management. Essential elements include institutional flexibility maintained through advisory expert bodies, a communication environment fostering routine horizontal interactions, and workforce strategies prioritizing interdisciplinarity, mentorship, and early-career integration. Together, these structural features mitigate the constraints of vertical management and transform employee participation into a sustainable managerial practice.

5. Practical application of matrix management is achieved through a “Task Matrix” that standardizes KPIs and research workloads across strategic, tactical, and operational timeframes. The Task Matrix is responsible for both management and social integration: by clarifying connections among individual KPIs, strategic goals, and team workloads, it fosters mutual accountability and reduces internal resource competition. This framework aligns project and functional management structures while preserving researcher autonomy. Applying the Task Matrix establishes the structural foundation for implementing matrix and participatory management within state-funded scientific medical institutions.

6. Participatory management provides the necessary social infrastructure for a matrix approach to research management. Delegating managerial functions to frontline researchers, expanding participation in decision-making, formalizing initiatives, and aligning individual career trajectories with institutional objectives transform matrix controls into mechanisms of motivation and self-organization. Participatory management enhances engagement, commitment, and accountability, strengthening research sustainability and outputs. Engaging frontline researchers in planning, standardization, and strategy transforms traditional matrix hierarchies into collaborative horizontal interactions, increasing staff satisfaction from 55.0% to 92.0% and reducing skepticism regarding plan feasibility from 7.0% to 1.0%.

7. Empirical testing of the matrix-based participatory framework demonstrated high efficacy across performance metrics and social dimensions. Standardized, algorithmic, and digitalized

workflows yielded significant reductions in timeframes for core research outcomes, including manuscript preparation, journal publication, and clinical guideline development. Concurrently, staff awareness, engagement, and confidence in strategic goals increased, alongside improved workplace satisfaction (reaching 96.0%) and professional development motivation. These findings confirm that optimal scientific management requires both process optimization and systemic human capital development grounded in human-centered principles.

Methodological reliability and validity are sustained through established sociological and managerial frameworks, verified and suitable analytical methods, commitment to the systemic approach and empirical protocols, and representative sampling. The reliability is evidenced by the empirical verifiability and comparability of the theoretical constructs against the implementation of the models and tools into operational workflow of scientific institutions. Statistical methods were employed to verify the robustness of the identified relationships. The reproducibility of the proposed methodologies and tools allows application across comparable scientific and medical institutions. Validity is further supported by operational implementation, registered software copyrights, and post-implementation evaluation.

The theoretical contribution expands the sociology of management by establishing a human-centered, evidence-based model tailored to modern scientific institutions using matrix-based participatory tools. The conceptual framework refines definitions for “scientific institution ecosystem”, “matrix management”, and “participatory management.” The findings establish a baseline for future research on career development of research staff, knowledge management within research teams, and adaptive management strategies in fast-paced scientific environments.

Practical applications apply to state-funded scientific and medical institutions conducting research and development. The proposed frameworks can be applied to comprehensive management mechanisms—including internal regulations, methodological guidelines, and research development programs—as well as R&D scheduling, and interdisciplinary team design. Additionally, the results apply to graduate curricula, further doctoral research, and participatory management implementations in scientific institutions.

This research aligns with **specialty code 5.4.7. “Sociology of Management”**, field 5. Social Sciences and Humanities, group 5.4. Sociology. Line of research: 4. Principles and Methods of Management under Modern Environments; 9. Social Issues of Enterprise and Organization Management; 14. Criteria and Performance Evaluation in Management. Social Monitoring.

Validation of Research Results:

The findings of this dissertation research have been validated in the following ways:

The key points and conclusions were presented at 12 scientific conferences.

Six peer-reviewed journal articles were published, including four (totalling 4.69 author's sheets) in leading journals recommended by the Higher Attestation Commission (HAC) of the Ministry of Science and Higher Education of the Russian Federation.

Articles published in the journals included in the HAC List of Journals recommended for presenting key dissertation findings for a degree of Candidate (Doctor) of Sciences:

1. Omelianskaia O.V. Research and Development Labor Rationing: Problems and Perspectives. Science Management: Theory and Practice. 2025. Vol. 7. No. 1. P. 67-82. DOI: <https://doi.org/10.19181/smtp.2025.7.1.5> (in Russ.).

2. Omelianskaia O.V., Vasilev Y.A., Pestrenin L.D., Vladzimirskyy A.V. Evaluating the Effect of Implementing an Integrated Management Approach During the Transition of a Scientific and Practical Institution to the Performance of R&D Projects. Science Management: Theory and Practice. 2024. Vol. 6. No. 3. P. 143-162. DOI: <https://doi.org/10.19181/smtp.2024.6.3.11> (in Russ.).

3. Omelianskaia O.V., Vasilev Y.A., Pestrenin L.D., Vladzimirskyy A.V. Assessment of the Impact of the Process Approach on the Time of Preparation and Publication of Scientific Papers in a Scientific and Practical Institution. Labour and social relations. 2025. Vol. 36. Is. 1. P. 80-92. DOI: 10.20410/2073-7815-2025-36-1-80-92 (in Russ.).

4. Omelianskaia O.V., Vasilev Y.A., Pestrenin L.D., Vladzimirskyy A.V. Task Matrix – a New Method of Rationing R&D Labor. Human Resources and Education. 2025. Vol. 15. Is. 4. P. 156-168. DOI: 10.21869/2223-1552-2025-15-4-156-168 (in Russ.).

Structure. The dissertation consists of an introduction, three chapters comprising 9 sections, a conclusion, a list of abbreviations and symbols, a bibliography, and appendices.



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