

Federal State Budgetary Educational Institution
of Higher Education
RUSSIAN ACADEMY OF NATIONAL ECONOMY
AND PUBLIC ADMINISTRATION
UNDER THE PRESIDENT OF THE RUSSIAN FEDERATION

Manuscript

Filippov Evgeniy Valeryevich



**Development of Methods for Reproducing Organizational Processes
and Managerial Decisions of IT Companies
Based on Load Testing Technologies**

Specialty: 2.3.4 Management in Organizational Systems

**Abstract of the dissertation
for the degree of Candidate of Technical Sciences**

Scientific Supervisor:

Shornikova Natalya Yurievna,
Candidate of Economic Sciences, Scientific Secretary of EMIT

Moscow 2026

Relevance of the Research Topic

The relevance of this dissertation research is driven by the increasing complexity and scale of IT projects, which leads to bottlenecks in project and production processes. These processes can be formalized as queuing systems (QS). In IT companies, there is a widespread practice of assigning highly qualified technical specialists to managerial positions. This leads to a systemic transfer of behavioral algorithms (exceeding the bounds of economic rationality), characteristic of technical expertise, into managerial processes, thereby exacerbating existing problems. Under these conditions, there is a growing need to develop methods for designing organizational structures based on simulation modeling of their functioning.

The application of operations research methods and specialized simulation modeling tools is associated with a number of licensing and personnel constraints, the complexity of the methods, and the inflexibility of the tools.

An alternative approach is to use for modeling purposes the same software platform that the organization implements for its clients in its core business. Built-in load testing tools have the greatest potential in this context, offering the capability to build scalable models not only of technical but also of organizational systems.

An analysis of contemporary scientific literature reveals the absence of a comprehensive methodological framework integrating technical, process, and behavioral aspects of modeling organizational systems.

Thus, the lack of such a framework for building models of organizational systems in IT companies that combine technical feasibility, process correctness, and consideration of alternatively-grounded behavior determines the relevance of this research.

Extent of Elaboration of the Topic

The researched problem area is characterized by a fairly high degree of detail of its individual components; however, there is no systematic integration of these components into a single methodological framework. Each of the key blocks – queuing theory, load testing methods, decision-making models, and organizational behavior – is elaborated in detail in the scientific literature. However, the integration of these

directions within a unified approach to modeling and analyzing complex IT systems, including their organizational aspects, remains insufficiently studied.

In the theory of queuing systems (QS) analysis, two main methodological approaches stand out: operations research methods and simulation modeling methods. A comparative analysis of these approaches is presented in the works of Borschev A. and Filippov A. The first approach was developed in the works of Saaty T., Venttsel E.S., Gnedenko B.V., Kovalenko I.N., Morz F., Good H., Machol R., Kendall D., Taha H. The second – in the works of Shannon R., Ackoff R., Sasieni M., Russell S. and Norvig P., Ferber J., Iglesias C., Tarasov V.B., Sudakov V.A., Wooldridge M., Kuznetsov A.V., Hewitt C.

Applied aspects of organizing and interpreting load testing results, particularly for the IC platform, are covered in the works of industry experts: Gilev V., Morozov A., Rupasov K., Pisarenko A., and others. They examine the technical aspects of conducting tests and side effects of parallelism – timeouts and deadlocks. The problems of parallelism uncertainties have been studied by Lamport L. and Lobachev A.

When modeling systems that include decision-making processes, adequately reflecting these processes in the model becomes particularly important. To ensure model validity, it is necessary to reproduce not random but conscious behavior and to embed decision-making algorithms into the model.

Classical decision-making theory is developed in the works of Bomas V.V., Sudakov V.A., Romanov O.T., Abdelrahman M., Olaniran O., Saaty T., Podinovsky V.V., Piyavsky S.A. However, these approaches, based on the premise of complete rationality, prove insufficient for describing the actual behavior of participants in complex systems. Already Machiavelli noted that people pursuing goals are guided not only by rational considerations. Modern research in behavioral economics (Tversky A., Shafir E., Kahneman D., Shiller R., Akerlof G., Thaler R.), quantum decision theory (Wang Z., Busemeyer J., Shan Z.-H.), organizational theory (Simon H.), and cognitive psychology (Gigerenzer G.) demonstrates that real behavior deviates from the ideals of rationality. This work uses the term "alternatively-grounded behavior" because the term "irrational" carries additional negative connotations.

It is important to note that most of the cited research focuses on individual behavior. Factors determining alternatively-grounded behavior at the organizational level remain poorly represented in the scientific literature (although there are exceptions, e.g., Simon H.).

The issues of organizational behavior and management have been developed in the works of Taylor F., Gilbreth F., Gantt H.L., Münsterberg H., Emerson H., Towne H.L., Cooke M.L., Fayol H., Urwick L., Milner B.Z., Daft R.L. Specific aspects, such as personnel overqualification and the role of trust in organizational systems, are discussed respectively in the works of Galperin R., Maynard D., Joseph T., Khan L., Morrow P., Erdogan B., Milner B.Z., Shikhirev P.N. The applied aspect of multiple decision-makers (DM) (the influence of the "second DM") is examined in the works of industry experts, particularly in the works of Mann I.B.

Thus, the scientific literature the overarching research challenge remains unaddressed – the creation of methodological foundations for empirical modeling of the behavior of socio-economic systems on digital twins, integrating technical, process, and behavioral aspects of functioning.

Within this general task, the specific scientific task of this research was to develop methods for reproducing organizational processes and management decisions in IT companies by means of load testing of information systems (using the 1C platform as an example) for subsequent analysis of the behavior of such systems on digital twins.

Object of Research – organizational processes of IT companies and management decisions made within them or their structural elements during production and project activities.

Such activities include: software development, client consulting and training, technical support. Decisions concerning task assignment and planned labor intensity estimation are considered. Decisions may not appear rational from the perspective of the IT companies.

Subject of Research – reproduction of these processes and decisions using load testing technologies.

Aim of Research – development of methods for reproducing organizational processes and management decisions in IT companies based on load testing technologies of information systems (using the 1C platform as an example) for analyzing the behavior of organizational systems on digital twins.

Achieving this aim was based on the consistent resolution of the following **main research tasks**:

1. Compare known methods for modeling systems that can be interpreted as QS with the load testing approach of 1C; classify this approach as a modeling method.
2. Develop methods for reproducing the behavior of organizational systems based on such an approach; build and test a system for reproducing business process models using these methods.
3. Analyze patterns of alternatively-grounded management decisions in the context of management in IT companies; identify and operationalize their key factors in the form of parameters suitable for use in digital twins of organizational systems.
4. Develop a model that uses, among others, these parameters and decision-making factors and allows transitioning to the technical implementation of reproducing management decisions.
5. Plan, prepare, and conduct experiments to test the scalability of the system reproducing organizational processes and management decisions with over 1000 participants.

Solving each of these tasks leads to a specific scientific result. Their consistent and iterative elaboration together allows solving the main scientific task – creating and verifying methods for constructing digital twins of organizational and managerial systems of IT companies based on accessible IT platforms under conditions where people make alternatively-grounded management decisions.

Field of Study

The dissertation corresponds to the Passport of Specialty 2.3.4. Management in Organizational Systems (Technical Sciences): Clause 2 "Development of mathematical models and criteria for efficiency, quality, and reliability of organizational systems",

Clause 3 "Development of methods and algorithms for solving management problems in organizational systems", Clause 5 "Development of methods for data acquisition and model identification, forecasting and management of organizational systems based on retrospective, current, and expert information", and Clause 10 "Development of new information technologies for solving management problems in organizational systems".

Methodology and Research Methods

The general methodological basis of the research is the systemic approach: management decisions are considered as part of a complex system. Additionally, a behavioral approach to decision-making is used. Some solved tasks involve working with poorly formalized problems.

Theoretical methods: analysis and synthesis, modeling (simulation, mathematical, visual), refinement of classification.

Methods for monitoring and assessment quantitative and qualitative indicators: quantitative control, qualitative control, logging mechanism.

Research methods: decision theory methods, simulation modeling, observation, surveys, declarative and domain-specific programming.

Theoretical Basis of the Research

Operations research, queuing theory, decision theory, organization theory. For patterns of alternatively-grounded behavior – behavioral economics and elements of quantum decision theory (regarding choice under uncertainty).

Empirical / Practical Basis of the Research

Empirical data: observation results, survey data from employees and managers of IT companies.

Practical tools: simulation models based on load testing, software methods (declarative and domain-specific), logging of the reproduction system's operation.

Scientific Novelty of the work consists of the following:

1. A classification of the main approaches to load testing solutions on the IC platform has been developed as methods for multi-agent simulation modeling of systems that can be interpreted as queuing systems (QS).

2. Methods for simulation modeling of organizational systems have been developed, based on adapting load testing approaches of universal platforms (using 1C as an example) for analyzing various resource employment models (two-level and project-based). It is shown that the proposed methods ensure the correct reproduction of the behavior of complex organizational structures – they demonstrate queues, personnel idle time, and the formation of work backlogs.

3. Based on a substantive reinterpretation of patterns of alternatively-grounded decisions, systematically significant attributes of poorly formalized behavioral concepts in the context of managing organizational systems have been identified. This allowed for their operationalization and engineering interpretation for digital twins of organizational systems.

4. A model has been developed and an algorithm described for making alternatively-grounded management decisions in organizational behavior according to patterns, most of which were previously considered by authors only for the individual behavior of decision-makers.

5. The scalability concept of the organizational process modeling method, based on the integration of load testing approaches of universal IT platforms and the reproduction of decision-making processes, has been substantiated and experimentally confirmed.

Theoretical Significance of the Work

A theoretical foundation (classification) has been formed, complementing the apparatus of multi-agent simulation modeling methods and allowing for the targeted selection and adaptation of load testing tools (e.g., 1C tooling) for reproducing business processes.

A method for separating the technological noise of the host system from the logic of the organizational model based on differences in event duration is proposed. Criteria for evaluating model behavior have been formalized.

Systematically significant attributes of poorly formalized behavioral concepts applied to individual behavior and not accounted for in models of rational decision-making in organizations have been identified. Their operationalization and engineering

interpretation have been performed, enabling a scientifically grounded transition to building a mathematical decision-making model that includes behavioral aspects.

A synthesis of attributes of alternatively-grounded decisions into a unified mathematical and logical model has been carried out, describing the interaction of these factors among themselves and with rational parameters, and defining the rules of influence of these factors on the management decision.

The scalability concept of the integrated method has been substantiated and experimentally confirmed, allowing for the expansion of the classification of multi-agent modeling methods considered within the first task. Factors of instability that manifest with increasing dimensionality have been identified. This defines the applicability limits of the method and enables predicting its behavior in new subject areas.

Practical Significance of the Work

The developed methods for reproducing organizational processes and management decisions make it possible to build digital twins of organizations using accessible IT tools, including for IT companies where decisions are based not only on rational factors. The concept embedded in the methods operationalizes and theoretically substantiates the practice of the strategic investment committee of a large Russian IT company, where subjective criteria – the initiator's personality and past achievements – are excluded when evaluating proposals. This allows such practice to be moved from the realm of empirical to that of scientifically grounded managerial decisions and confirms the practical relevance of the approach for improving the quality of strategic decisions.

The obtained dependencies between the parameters of both the model and its operating environment (dimensionality, magnitude of technological noise, model runtime, hardware resources) allow simulations to be configured for real team sizes, ensuring a balance between the accuracy of process reproduction, setup time, and simulation time.

The scientific and practical results of the dissertation research have been implemented in two institutions and organizations.

Reliability of Scientific Results – The scientific provisions, theoretical conclusions, and practical recommendations presented in the dissertation are confirmed by the implementation of the research results in organizational systems and by the approbation of the results at conferences of various levels.

Author's Personal Contribution – All scientific results presented in the dissertation belong to the author personally.

Presentation and Validation of Results – The provisions of the dissertation have been approbated at international scientific conferences and industry conferences.

Publications

Based on the dissertation materials, 8 scientific works have been published, including 6 articles in a K2 category journal from the list of leading peer-reviewed scientific journals recommended by the HAC RF (all 6 in specialties 2.3.4 Management in Organizational Systems (Technical Sciences), in the previous classification – 05.13.10 Management in Social and Economic Systems (Technical Sciences)) and 2 reports at international conferences.

Scope and Structure of the Dissertation

The work consists of an introduction, 5 chapters, a conclusion, a bibliography containing 186 titles, and appendices. The text is presented on 162 pages and contains 20 figures and 20 tables. Each chapter of the dissertation is devoted to solving a specific scientific task, ensuring the sequential acquisition of scientific results: the conclusions and solutions obtained in previous chapters are used in subsequent ones and ultimately integrated into a single comprehensive concept.