ABSTRACT

of the dissertation by Narsymbat Salimgereyev for the degree of Doctor of Philosophy (PhD) in the educational program 8D04105 – "Innovation Management" on the topic: "Innovative solutions in labor norming in organizations of the Republic of Kazakhstan"

General characteristics

The dissertation develops an evidence-based methodological toolkit for analyzing the task content of managerial and professional work and for modernizing labor norming (labor standardization) under conditions of digitalization and organizational complexity. The study integrates traditions from labor economics and HRM with contemporary work analysis and industrial–organizational psychology approaches, emphasizing empirical measurement of work as a portfolio of task statements that differ in duration, frequency, routineness, and cognitive demands.

The first section examines the theoretical and methodological foundations for analyzing the content of work performed by managers and specialists within HRM and labor standardization systems. The section reviews the evolution of approaches to measuring labor intensity, complexity, and work structure, including (i) the routine/non-routine task perspective, (ii) functional approaches to describing work (including Functional Job Analysis (FJA) logic as a task-oriented representation of duties), and (iii) contemporary literature on workforce planning and organizational design. Particular attention is paid to the problem of operationalizing task complexity for managerial and professional work, the limitations of traditional normative and expert-based methods, and the ways digitalization and business process transformation reshape task content. These theoretical premises motivate the need for a reproducible, data-driven tool for quantifying task structure and complexity.

The second section presents and justifies the research methodology aimed at quantitative assessment of labor intensity (workload), routineness, and cognitive complexity of work. The section details principles for constructing task and function lists based on job responsibilities and business process descriptions, as well as the procedure for elemental (task-level) time accounting supported by digital instruments. It describes approaches for classifying tasks by cognitive requirements; algorithms for calculating indicators of workload structure; and a composite index of labor/task complexity consistent with this project's logic (i.e., a workload-weighted representation of complexity at the level of roles and organizational subunits). The section also specifies data processing methods (descriptive and inferential statistics, correlation and group-comparison techniques) and the application of machine learning models for tabular data to forecast labor intensity and to derive normative (staff) headcount without relying on subjective expert judgments.

The third section reports the results of an empirical study based on materials from government bodies and organizations in the electricity and oil & gas sectors of the Republic of Kazakhstan. The section analyzes observed time use and workload patterns of managers and specialists, identifies structural features of work in administrative and specialized departments, and reveals differences in routineness and cognitive complexity between units and job levels. The developed Task Complexity Index (TCI) is tested and its consistency with job levels and organizational structure parameters is evaluated, including its applicability for comparing units engaged in different types of work. Results from ML-based normative headcount estimation are presented alongside comparisons with traditional calculations, enabling identification of reserves for headcount optimization and redistribution of functions and workload.

The conclusion summarizes the main results, substantiates the scientific and practical contributions of the proposed toolkit, and outlines directions for applying the findings in labor norming, workforce planning, and organizational design, as well as prospects for further research.

Relevance of the research

The relevance of the dissertation is driven by the need to modernize scientifically grounded approaches to work content analysis, labor standardization, and staffing justification for managers and specialists in the context of digitalization, automation, and increasing organizational complexity. In Kazakhstan (particularly in the public sector and large infrastructure organizations) accurate determination of the workload and complexity of managerial and professional work is increasingly consequential because it affects organizational design effectiveness, staffing justification, and the rational allocation of human resources.

Current labor standardization practice for managers and specialists often relies on aggregated norms, expert assessments, and retrospective indicators that do not sufficiently reflect actual task content and do not capture changes generated by digital tools and business process redesign. As a result, comparability across departments and organizations is limited, while identifying reserves for headcount optimization and functional redistribution becomes methodologically difficult.

Despite sustained development of labor standardization concepts, there remains a shortage of reproducible tools for quantitative analysis of observed labor costs and the cognitive complexity of work among managers and specialists. The greatest methodological challenge concerns non-routine analytical, coordination, and managerial tasks: their share tends to increase with job level, while they are poorly represented in traditional normative descriptions and are difficult to capture using coarse timekeeping methods.

The study is additionally relevant due to the need to integrate labor standardization with contemporary tools for workforce planning and organizational design. The transition to digital management increases demand for objective, machine-processable information on workload structure and task complexity that can support statistical analyses and ML-based modeling; the lack of such data constrains evidence-based management and reduces decision quality.

Accordingly, the dissertation's relevance is determined by the need to develop a methodological toolkit that provides a quantitative, reproducible assessment of the structure, labor intensity, routineness, and complexity of managerial and professional work using observed workload data thereby strengthening labor standardization theory and improving HR policy effectiveness in Kazakhstan.

Degree of scientific development of the research topic

Issues of work content analysis, workload measurement, and staffing justification are well represented in labor economics, HRM, and organizational development research. A substantial body of approaches exists for labor standardization, functional classification, and normative staffing (primarily for operational and production work).

However, quantitative methods for analyzing managerial and specialist work remain less developed because such roles include a high proportion of non-routine analytical, coordination, and leadership tasks that resist direct normative specification. In practice, expert judgments, surveys, and aggregated coefficients are often used, which decreases objectivity and reproducibility.

In international literature, task-functional perspectives and routine/non-routine concepts are actively developed, including research on how digitalization reshapes employment structures. Yet many studies rely on secondary sources, occupational classifiers, or broad surveys, limiting sensitivity to within-job variability and to observed time use, which reduces applied value for labor norming and staffing planning in specific organizations. While functional analysis and workload measurement approaches exist, they often require strong expert assumptions and insufficiently integrate workload estimation with cognitive complexity measurement and predictive modeling.

The growing interest in digital tools and data analytics, including machine learning, is primarily related to forecasting staffing needs using aggregated indicators, and less frequently to detailed measurement of task content based on observed labor costs.

Thus, a scientific gap persists regarding empirically grounded and reproducible tools to quantify the structure, routineness, and cognitive complexity of managerial and specialist work. This gap determined the topic selection and the formulation of the study's aim and objectives.

Object and subject of the study

Object of study: organizations of the Republic of Kazakhstan as socio-economic systems in which labor standardization and work management processes are implemented.

Subject of research: methods and tools of labor norming (labor standardization) integrated with contemporary management concepts and data science approaches.

Aim and objectives of the research

The aim of the dissertation is to develop and scientifically justify a methodological toolkit for quantifying the structure, labor intensity (workload), routineness, and cognitive complexity of managerial and specialist work based on observed labor cost data, and to determine normative (staff) headcount without relying on subjective expert assessments.

To achieve this aim, the dissertation addresses the following objectives:

- Analyze the evolution and current state of scientific approaches to labor standardization, identifying key principles, limitations, and opportunities for integration with modern management theory and digital technologies.
- Justify the need to update labor norming in the context of evidence-based HRM and the digital transformation of the economy.
- Develop a methodological system for analyzing task content of managers and specialists by integrating work measurement and work-analysis approaches, enabling a transition from general functional descriptions to measurement of the cognitive structure of work and complexity drivers in managerial work.
- Develop a methodology for determining staffing levels of managers and specialists based on observed workload data and data analytics methods, ensuring reproducibility and reducing expert subjectivity.
- Propose an approach for objective assessment of labor/task complexity at the organizational level, combining workload structure and cognitive characteristics of functions, with applicability to workforce planning and organizational design.

Develop a methodological basis for embedding labor standardization into managerial decision-making as an empirical foundation for evidence-based HRM.

Theoretical and methodological basis of the research

The dissertation's theoretical basis draws on labor economics, HRM, organizational development, labor standardization, and work process analysis. The study also relies on task and occupational theory, the routine/non-routine task perspective, and task-functional approaches to describing work, including FJA-style task representation, which conceptualizes work as a system of interrelated tasks and functions that vary by workload and cognitive complexity.

Methodologically, the research applies systems and process approaches to analyze managerial and specialist work within organizational structures and business processes, along with evidence-based HRM principles emphasizing empirical measurement of observed labor costs.

The methodological toolkit combines work measurement methods (task and function structuring; elemental time accounting) with functional work analysis. Data processing uses descriptive and analytical statistics, correlation analysis, and group comparison methods. Mathematical modeling and ML algorithms for tabular data are applied to predict labor intensity and compute normative staffing.

The information base includes observed workload data collected using digital time tracking tools, as well as organizational and administrative documents defining duties and processes. The integration of these data sources supports validity and reproducibility of the results.

Scientific novelty of the dissertation research

The dissertation's scientific novelty lies in developing and substantiating an integrated, data-driven approach to quantitative analysis of the task content of managerial and specialist work based on observed labor costs and modern analytics. Unlike approaches relying primarily on expert judgments and aggregated norms, the proposed toolkit provides reproducible and empirically grounded measures of workload structure, routineness, and cognitive complexity.

For the first time in the Republic of Kazakhstan, a methodology for digital collection and structuring of task-level workload data has been developed and tested using elemental accounting of tasks and functions, enabling transition from descriptive accounts of work to quantitative measurement of work structure that explicitly incorporates task duration and frequency.

Building on the integration of functional work analysis and time-study evidence, an integrated index of cognitive labor complexity was developed and empirically tested (consistent with this project's Task Complexity Index (TCI) logic) supporting comparative evaluation of jobs and departments based on the complexity profile of performed tasks.

Additionally, the dissertation substantiates the feasibility of deriving normative staffing levels of managers and specialists using models trained on observed workload data and ML algorithms, without reliance on subjective expert assessments. The study demonstrates that ML-based estimates are comparable with traditional staffing calculations and can reveal reserves for optimizing functional allocation and workload distribution. Collectively, the results expand the analytical toolkit for labor standardization and workforce planning and provide an empirical basis for using task complexity indicators in organizational design and HRM.

Theoretical and practical significance of the research

The theoretical significance lies in advancing labor standardization and HRM theory for managerial and specialist work by clarifying methodological foundations for quantifying work structure and complexity using observed workload data. The dissertation expands scientific understanding of how cognitive complexity and routinization can be operationalized for organizational design and workforce planning, treating work as a set of interrelated tasks and functions with varying complexity and skill requirements. The findings also provide a foundation for further research in evidence-based HRM.

The practical significance is determined by the applicability of the developed toolkit in government and corporate organizations for normative headcount justification of managers and specialists. The results can be used to analyze workload structure, identify overload and optimization reserves, and redistribute functions between units. The proposed workload and complexity indicators can inform organizational design, job evaluation and grading practices, and competency profiling and development. The dissertation materials may also be used in education and training in HRM, labor economics, and management.

Testing and implementation of research results

The main findings were discussed and tested at republican and international scientific and applied conferences, where presentations reported theoretical premises, methodological tools, and empirical results.

The dissertation's conclusions are reflected in the author's publications in peer-reviewed scientific journals, including outlets indexed in international scientific databases, addressing work content analysis, measurement of workload and task complexity, and the application of digital and analytical methods in workforce planning and labor standardization.

The results have been applied in practice in government and corporate organizations in activities related to workload analysis, staffing justification for managers and specialists, and organizational structure improvement, as confirmed by relevant acts of implementation and certificates of practical use.