ABSTRACT
dissertation work by N. ZH. Nalgozhina on «Models and Methods of Hybrid Business Process Management Based on RPA Technologies», submitted for the degree of Doctor of Philosophy (PhD) in the educational program: 8D06102 - «Computer and Software Engineering».

Relevance of the research topic. The efficiency and optimization of business processes determine the success of any business today. These parameters have become key success factors for organizations of all sizes and industries. Constant changes in the economic, technological, and social context create a range of opportunities, but at the same time, numerous challenges arise during the adaptation and improvement of business processes.

Therefore, the relevance of research aimed at analyzing, optimizing, and innovating business processes is increasing every day. Key aspects such as digital transformation, customer orientation, adaptability to change, and risk management become the foundation for the successful operation of organizations in a dynamic environment.

Business processes surround us everywhere. By definition, business processes are a set of interconnected actions or activities aimed at creating a specific product or service for consumers. The approach to business processes has changed with the development of civilization. Industrialization, a natural accelerator of the evolution of all processes on the planet, has also influenced business processes.

This research explores various innovations and new approaches to managing modern business processes, which, like many aspects of everyday life, have undergone significant changes due to the latest technologies. For example, many routine tasks that previously required significant human resources are now successfully automated. With each stage of industrialization, the business sphere undergoes a new interpretation of automated improvement. In the current economic environment, automation becomes a key factor in optimizing business processes.

Various technologies allow automating routine and monotonous tasks, freeing up human resources for tasks that require strategic and more creative solutions. However, despite significant advancements, many companies still have processes that use both manual and automated approaches. Effective management of such hybrid business processes becomes a challenge, requiring the development of new models and methods capable of ensuring synergy between human and robotic labor. All of this is aimed at reducing transaction costs, reducing the likelihood of errors, and improving the speed and quality of task execution. This comprehensive approach influences business outcomes and the competitiveness of the company, as well as contributes to more effective and rational resource management, including environmental impact.

Research on the development of models and methods for managing hybrid business processes contributes to the formulation of new practical recommendations

and approaches. The results of such research can be implemented in business scenarios to enhance management processes and decision-making.

Thus, the research topic "Models and Methods of Hybrid Business Process Management Based on RPA Technology" is relevant and promises to make a significant contribution to the development of modern methods of managing business processes using innovative technologies.

Proposal. A model and methods for managing business processes are proposed, implementing a hybrid approach using RPA (Robotic Process Automation) technology. The research goal is to enhance the efficiency and consistency of logistic business processes by employing robotic agents.

Research objectives. To achieve the research goal, the following interconnected tasks have been set and addressed:

- Systematic analysis of the subject area and algorithms for hybrid business process management;
- Development of an efficient integration model for RPA and BPM (RPABPM);
- Mathematical modeling of business process automation using RPA.
- Calculation of performance indicators for the developed mathematical model;
- Conducting experimental studies to evaluate key performance indicators of the hybrid RPABPM model.

The subject of the research includes models and methods for managing hybrid business processes using RPA technology, encompassing automation algorithms, coordination methods, and mechanisms for adaptation and monitoring of logistic processes.

Scientific Novelty. The dissertation work has yielded the following key scientific results:

- Development of a hybrid approach to business process management, integrating robotic agents into traditional processes;
- Design of an integration model for RPA and BPM (RPABPM), illustrated using logistic processes;
- Formalization of the RPA integration process with BPM to evaluate the efficiency of the hybrid RPABPM approach in logistic processes;
- Architecture design of RPABPM, ensuring the system's stable operation.

Scientific Propositions for Defense:

- Concept of RPA and BPM integration for business process management;
- Hybrid RPABPM model as a unified mechanism for managing business processes (illustrated with logistic processes);
- Method for calculating the efficiency of the RPABPM model, determining optimal interaction points between business processes;
- Experimental research results of the hybrid RPABPM model (illustrated with logistic processes).

Theoretical and practical significance. Theoretical significance of the work introduces a new paradigm of integrating Robotic Process Automation (RPA) and Business Process Management (BPM), expanding the theoretical foundation in this field and meticulously analyzing their interaction. The practical significance lies in the fact that the developed methodologies and models help organizations enhance the efficiency of business processes, reduce operational costs, and achieve a competitive advantage in the market.

Dissemination and publications. The main propositions and scientific results of the work were presented and discussed at seminars of the "Computer Engineering" department at the International University of Information Technologies and at the 14th International Conference on Emerging Ubiquitous Systems and Pervasive Networks (EUSPN) on November 7-9, 2023.
The main results obtained during the dissertation work have been published in four printed works, including 2 articles in publications recommended by the Committee for Control in the Field of Education and Science of the Ministry of Education and Science of the Republic of Kazakhstan, 1 article in publications indexed by Scopus in a high-impact scientific journal with an impact factor of 3.6, citescore 5.5, and a percentile of 80, and 1 article in proceedings of international conferences.

Results on the dissertation topic are presented in the following publications:

1. R.K. Uskenbayeva, A.A.Kuandykov, N.Zh.Nalgozhina, M.A. Berklaiyeva (2022), RPA approach in business process management life cycle. Herald of Almaty Univeristy of Power Engineering ISSN 2790-0886. Vol. 1(56) (2022). – pp. 126-132
2. Uskenbayeva, R., Nalgozhina, N., & Berkaliyeva, M. (2022). Introduction and evaluation problem of BPM and RPA approaches in modern logistic systems. Scientific Journal of Astana IT University, 12(12), 45–54. https://doi.org/10.37943/12UXAN3708
3. Nalgozhina, N.; Razaque, A.; Raissa, U.; Yoo, J. Developing Robotic Process Automation to Efficiently Integrate Long-Term Business Process Management. Technologies 2023, 11, 164. https://doi.org/10.3390/technologies11060164
4. Nalgozhina N., Uskenbayeva R. Automating hybrid business processes with RPA: optimizing warehouse management // Procedia Computer Science. - 2024. - №231. – P. 391-396.

Main content of the dissertation. This work consists of four main chapters and a list of references. *The first chapter* justifies the relevance of the problem related to the development and use of hybrid models for managing business processes in logistics using RPA technology. This section formulates the research goal and objectives, presenting the methodology of its implementation. A literature review on the topic is also conducted, identifying unresolved aspects and determining the theoretical and practical significance of the upcoming research.

The second chapter provides a detailed review of existing research and literature related to the topic under consideration. It describes the main theoretical concepts, models, and methods used in this research, as well as highlights the main problems and shortcomings of current approaches.

The third part of the dissertation is devoted to the development of models for full and partial automation. This chapter thoroughly examines key aspects and results of automated systems' development. It describes the developed models, as well as the methodology of their creation and integration into business processes.

The fourth chapter of the dissertation is dedicated to the analysis of the developed model. This section helps identify its advantages and limitations, as well as conduct an effectiveness analysis in various business scenarios.