

UDC (005.7+001.8) :: 81'32

INNOVATIVE PROJECT MANAGEMENT FOR R&D IN THE FIELD OF COMPUTATIONAL LINGUISTICS IN TIMES OF UNCERTAINTY & CRISIS

Krasniuk S.O.

senior lecturer

ORCID: 0000-0002-5987-8681

Kyiv National University of Technologies and Design,
Mala Shyianovska Street 2, Kyiv, Ukraine

Abstract. *The use of innovative management of R&D projects in the field of computational linguistics allows you to increase the efficiency of scientific and technical activities. Due to rapid technological development and global competition, classical management methods are becoming insufficiently adaptive. An intelligent approach using artificial intelligence optimizes processes, predicts threats, minimizes risks and rationally allocates resources. Integrated management combines the analysis of critical phenomena, process modeling, synergistic methods and system planning, which increases the accuracy of forecasts, adaptability and competitiveness of projects, transforming the manager from an administrator into a strategist.*

Key words: *innovation management, R&D, project management, uncertainty, crisis, intelligent technologies*

Introduction.

Innovative project management in the field of scientific research and development (R&D) is the most important tool for increasing the efficiency and effectiveness of scientific and technical activities. Modern conditions of rapid technological development and global competition require the implementation of flexible management models based on the use of intelligent information technologies [1-3], strategic planning and risk management. The use of innovative management methods allows you to optimize the use of resources, improve the quality of research, ensure transparency of processes and timely adapt to changes in the external environment [4-6]. This contributes to the successful implementation of R&D projects, strengthening the competitive positions of organizations and the formation of a sustainable innovation environment. However, it is in the current conditions of global turbulence and crisis processes [7-9] that improving the management of innovative projects in the field of scientific research and development (R&D) becomes particularly relevant. Classical approaches to project management often turn out to be insufficiently adaptive and unable to provide a prompt response to the challenges of high uncertainty [10-12].

In this regard, the importance of the use of innovative methods based on the use of intelligent digital solutions [13], complex analysis, risk-oriented approach [14] and strategic forecasting is growing. Such tools allow for early detection of potential threats, minimizing negative consequences, rationally distributing resources and increasing the effectiveness of the implementation of scientific and technical projects. The use of modern technologies for managing R&D processes contributes to strengthening organizational resilience, developing innovative potential and increasing the competitive advantages of research structures and enterprises in crisis conditions. The topic chosen by the author is extremely relevant and complex. It combines the principles of project management, artificial intelligence methodologies and the specifics of linguistic research.

The Main Part. In general, Computational Linguistics is an interdisciplinary field at the interface of computer science and linguistics, which deals with the development of computer systems for the analysis, processing and generation of human language. R&D projects (scientific research and development work) in this area often face unique challenges: data fuzziness, a high degree of uncertainty of results, the need to integrate different disciplines and rapid obsolescence of technologies. In today's conditions of development of information technologies and artificial intelligence, projects in the field of computational linguistics are becoming increasingly complex and large. They include the processing of huge arrays of text and multimodal data, the development and training of complex machine learning models, as well as the integration of research results into applied software solutions. These processes are accompanied by a high degree of uncertainty due to the constant change of technologies, standards and user requirements. Traditional approaches to R&D project management lack sufficient flexibility and the ability to adapt to rapidly changing conditions, which reduces the effectiveness of project implementation. In this context, intelligent project management becomes a key tool for improving research efficiency, ensuring the quality of results and strategic planning.

Traditional project management methods, such as waterfall and even agile, are always effective due to the unpredictability of scientific research results. In this regard,

there is a need for intelligent management - an approach that uses artificial intelligence (AI) technologies to optimize and automate project management processes.

In particular, we will briefly summarize the scientific and practical results on this topic:

1). Analysis and verification of critical phenomena in computational linguistics projects.

1.1. Identification of system risks: identification of potential bottlenecks and points of possible failure in complex language data processing processes.

1.2. Forecasting of critical events: use of analytical and statistical models to predict unexpected changes in the operation of algorithms and experiments.

1.3. Quality and reliability control: implementation of data verification methods, model testing and monitoring of workflows to minimize errors and increase the stability of results.

Application examples: detection of bugs in machine translation or automatic text analysis systems, prevention of a decrease in the accuracy of neural models with an increase in the volume of data.

2. Modeling of nonlinear dynamics of project processes.

2.1. Study of interdependencies: study of the impact of various factors on the timing, costs and quality of project implementation.

2.2. Project development forecasting: building scenarios for various conditions of uncertainty, including changing requirements, resource constraints and external factors.

2.3. Process optimization: developing resource allocation strategies, task priorities and research stages taking into account dynamic changes in the environment.

Application examples: adaptive planning of language model training stages, load balancing between research groups and computing resources.

3. Synergistic and econophysical research methods.

3.1. Complex analysis: identifying hidden relationships between project elements, data structure and processing algorithms.

3.2. Mathematical and physical-economic modeling: using models to analyze the

evolution of language corpus structures, the dynamics of AI system learning and the allocation of computing resources.

3.3. Synergistic approaches: using interdisciplinary methods to integrate different data sources and optimize design solutions.

Application examples: analysis of the distribution of thematic clusters in large text corpora, forecasting the impact of data changes on the quality of NLP models.

4. Systemic management methodology in an unstable information environment.

4.1. Strategic planning: implementation of a systematic approach to planning, monitoring and coordination of research processes.

4.2. Adaptability and scalability: ensuring flexibility of management methods for rapid response to changes in requirements, technologies and the external environment.

4.3. Ensuring project sustainability: development of decision-making procedures that minimize risks and allow maintaining high quality results.

Application examples: creation of flexible architectures for deploying NLP models, management of multi-stage projects with the participation of distributed teams.

Summary and conclusions.

Intelligent management of R&D projects in computational linguistics is a comprehensive approach that combines the analysis of critical phenomena, modeling of process dynamics, synergistic methods and system planning. It provides risk reduction, increased accuracy of forecasts and adaptability to the changing conditions of the technological and scientific environment. The use of intelligent management methods allows you to create scalable, sustainable and innovatively effective solutions in the field of natural language processing, contributing to the rapid implementation of scientific results in practice and ensuring the competitiveness of projects.

Intelligent management of R&D projects in computational linguistics is not just automation, but a new level of synergy between people and technologies. It allows you to reduce uncertainty, accelerate the research process and increase the efficiency of resource use. The transition to such management methods is inevitable for the successful implementation of complex and innovative projects in a rapidly developing area.

Ultimately, intelligent management transforms the role of the project manager. He ceases to be just an administrator and becomes a strategist who uses intelligent tools to make more informed and far-sighted decisions, which, in turn, contributes to breakthroughs in the field of computational linguistics.

Discussion.

1). Current R&D projects in the field of computational linguistics are characterized by a high degree of complexity, interdisciplinary nature and the need to process large-scale data sets. Classical approaches to the administration of such initiatives often turn out to be insufficiently effective to ensure the necessary flexibility, transparency and sustainability of research activities. In these conditions, hybrid technologies that integrate the capabilities of intelligent information platforms, artificial intelligence algorithms, machine learning and analytical tools are of particular importance. Their use allows you to automate typical processes, increase the accuracy of information processing, predict potential risks, rationally allocate resources and support strategic management [15]. The use of hybrid solutions in the administration of R&D projects in the field of computational linguistics contributes to increasing the effectiveness of scientific research, developing an innovative environment and strengthening the competitive advantages of educational and research institutions.

2). The increasing complexity and unpredictability of modern information environments require innovative approaches to managing computational linguistics projects. The assessment of critical phenomena in complex economic systems provides a basis for identifying systemic risks and emergent patterns in large-scale systems [16] (including language processing systems). Nonlinear dynamics modeling allows predicting and optimizing project workflows under uncertain conditions, increasing efficiency and sustainability [17]. Synergistic and econophysical methods offer new methods for analyzing structural and dynamic characteristics (including multilingual corpora and language models) based on artificial intelligence [18]. Finally, the systematic methodology for studying the evolution of the modern information economy supports strategic planning, contributing to the creation of scalable and adaptive computational linguistics solutions in times of increasing instability.

References:

1. Tuhaienko V., Krasniuk S. Effective application of knowledge management in current crisis conditions. *International scientific journal "Grail of Science"*. 2022. № 16. pp. 348-358.
2. Naumenko, M. (2024). Models of business knowledge in artificial intelligence systems for an effective competitive enterprise. *International scientific journal "Internauka". Series: "Economic Sciences"*. № 6. DOI: <https://doi.org/10.25313/2520-2294-2024-6-10010> [In Ukrainian].
3. Naumenko, M., & Hrashchenko, I. (2024). Modern artificial intelligence in anti-crisis management of competitive enterprises and companies. *Grail of Science*, (42), 120–137. DOI: <https://doi.org/10.36074/grail-of-science.02.08.2024.015> [In Ukrainian].
4. Maksym Naumenko (2024). Modern concepts of innovation management at enterprises. *Scientific innovations and advanced technologies* No. 6(34) (2024). DOI: [https://doi.org/10.52058/2786-5274-2024-6\(34\)-435-449](https://doi.org/10.52058/2786-5274-2024-6(34)-435-449)
5. Mykytenko V.V., Hryshchenko I.S. (2008). Adaptive management system of innovative processes at enterprises. *Problems of science*, (4), pp. 32-37.
6. Hrashchenko I.S., Khmurova V. V. (2016). Innovative policy as a tool for organizational change. Economic development: theory, methodology, management. *Materials of the 4th International Scientific and Practical Conference*. Budapest-Prague-Kyiv, 28-30 November 2016. 386, p. 361-369. [In Ukrainian].
7. Tsalko T. R., Nevmerzhytska S.M. (2023) Risk assessment in innovative activity. *Actual problems in economics, finance and management: materials of the International Scientific and Practical Conference*. East European Center for Scientific Research (Odesa, 25 october 2023). Research Europe, 2023. pp. 92-94 <https://researcheurope.org/product/book-31/> [in Ukrainian].
8. S. Illiashenko, O. Bilovodska, T. Tsalko, O. Tomchuk, S. Nevmerzhytska, N. Buhas (2022). Opportunities, threats and risks of implementation the innovative business management technologies in the post-pandemic period COVID-19. *WSEAS Transactions on Business and Economics*. Volume 19. Pp. 1215–1229.

9. Naumenko, M. (2024). Methodology of determining factors of activity efficiency and competitive position of the enterprise on the market in crisis conditions. *Scientific innovations and advanced technologies*, № 7(35) (2024). DOI: [https://doi.org/10.52058/2786-5274-2024-7\(35\)-648-665](https://doi.org/10.52058/2786-5274-2024-7(35)-648-665) [in Ukrainian].

10. Karpenko, Oksana & Kravchenko, Olha & Palyvoda, Olena & Semenova, Svitlana. (2025). Evaluating the effectiveness of innovation implementation at transport enterprises under conditions of uncertainty. *Academy Review*, #2. 75-88. 10.32342/3041-2137-2025-2-63-5.

11. Palyvoda, Olena & Semenchuk, Tetiana & Rachkovskyy, Eduard. (2024). Modelling growth strategies of transport enterprises in the conditions of context uncertainty. *Baltic Journal of Economic Studies*. 10. 255-267. 10.30525/2256-0742/2024-10-3-255-267.

12. Nevmerzhytska S. M. (2018). Formation of a strategy for the innovative development of enterprises in conditions of uncertainty. *Scientific Bulletin of the Kherson State University. Series: Economic Sciences*. 2018. Vol. 32. pp. 99-103. URL: <https://ej.journal.kspu.edu/index.php/ej/article/view/422/418>.

13. Krasnyuk, M., Kulynych, Y., Krasniuk, S., & Goncharenko, S. (2024). Design of innovative management information system. *Grail of Science*, 36, pp. 237-245.

14. Krasnyuk M., Kulynych Yu., Hrashchenko I., Krasniuk S., Goncharenko S., Chernysh T. (2023). Innovative management information system in post-crisis economic conditions on emerging markets. *Moderní aspekty vědy – Modern aspects of science: svazek XXXVII mezinárodní kolektivní monografie*. Česká republika: Mezinárodní Ekonomický Institut s.r.o. pp. 185–203.

15. Krasnyuk, M. (2014). Hybridization of intelligent methods of business data analysis (anomaly detection mode) as a standard tool of corporate audit. *The state and prospects of the development Education and science of today: materials of the III International science and practice conf.* [m. Ternopil, October 10-11. 2014]. TNEU, 2014. pp. 211-212 [in Ukrainian].

16. Derbentsev, V. D., V. M. Soloviov, and O. V. Serdiuk (2005) Precursors of critical phenomena in complex economic systems. *Modeling of nonlinear dynamics of*

economic systems. - Donetsk: DonNU, 1 (2005). pp. 5-13 [in Ukrainian].

17. Derbentsev, V. D., B. O. Tishkov, O. D. Sharapov (2013). Systematic methodology for studying the dynamics of the current information economy in the minds of increasing instability. *Modeling and information systems in economics*. – 2013. – Vol. 89. – pp. 47-62 [In Ukrainian].

18. Derbentsev, V. D., Serdiuk, O. A., Soloviov, V. M., & Sharapov, O. D. (2010). *Synergistic and econophysical methods of studying dynamic and structural characteristics of economic systems*. Cherkasy: Brama-Ukraine. - 2010 [in Ukrainian].

Article sent: 16.09.2025

© Krasniuk S.O.