The technological innovation landscape is rapidly evolving based on the convergence of knowledge and artificial intelligence. This creates unprecedented opportunities and challenges for managing innovative projects. The object of this study is the system of syncretic management of innovative projects in the era of the artificial intelligence explosion. The problem addressed is related to the application of principles, models, and methods of syncretic management of innovative projects in the context of integrating various elements, including interdisciplinary collaboration, artificial intelligence technologies, and adaptive methodologies, to optimize project outcomes. The result of the research is a system of syncretic management of innovative projects that encompasses various aspects of management, innovation, and integration with artificial intelligence systems. The essence of the results outlines the stages of managing the life cycles of innovative projects, emphasizing resource allocation, risk assessment, and adaptive strategies. In the field of innovation management, the model includes methodologies for idea generation, technological scouting, and open innovation, recognizing the role of artificial intelligence in shaping the innovation environment. A crucial aspect of the model is the integration of artificial intelligence technologies throughout the project. The syncretic approach emphasizes cross-functional collaboration, creating an environment where different disciplines contribute to project success seamlessly. The importance of the proposed approach is associated with the integration of syncretic control with artificial intelligence systems based on additional competencies. The effectiveness of the practical application of systems of integrated syncretic management of innovative projects was evaluated in the process of analyzing the situation and preparing solutions many times faster, with a quality that exceeds existing systems

Keywords: syncretic approach, models, augmented competencies, integration, management methodologies, artificial intelligence

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CONSTRUCTION OF MODELS AND APPLICATION OF SYNCRETIC INNOVATION PROJECT MANAGEMENT IN THE ERA OF ARTIFICIAL INTELLIGENCE

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1. Introduction

In the era of rapid spread of artificial intelligence (AI) technologies, the project management landscape has undergone profound changes. The synthesis of innovation and artificial intelligence has created unprecedented opportunities, shaping a new way of designing, executing, and ultimately succeeding projects.

Dynamic technological changes and innovations in various sectors of the economy and management require catalysts for development projects based on artificial intelligence. As organizations seek to remain competitive and harness the potential of artificial intelligence, traditional project management paradigms are not working. This creates complexities and new opportunities that the technological revolution opens up.

The study of the problems of integration of various project management methodologies, which are simultaneously used in organizations and create problems, reveal the key components of the proposed syncretic model of innovative project management. At the same time, the main focus of the research should be on the stages of project life cycle management, including adaptive strategies, risk assessment, and resource allocation. Innovation Management emphasizes the role of artificial intelligence in idea generation, technological intelligence, and open innovation, recognizing the transformative impact of AI on the creative process.

The central aspect of the research is the integration of artificial intelligence technologies during the life cycle of the project within the framework of known methodologies and framework models of innovative project management. To achieve the goal, it is necessary to consider in detail the options for using AI, effective data management strategies, the selection of models, and the construction of decision support systems. A syncretic approach embraces cross-functional collaboration, recognizing the diverse expertise necessary for project success.

Syncretism, which is considered as a tool for solving existing problems, means a harmonious combination of different disciplines, methodologies, and technologies. Therefore, the focus is on devising a comprehensive model that not only recognizes the symbiotic relationship between innovation and artificial intelligence but also uses this synergy to optimize project outcomes. From the conceptualization of ideas to the execution of projects, the syncretic management model aims to be a guiding framework that adapts to the changing landscape of artificial intelligence technologies and promotes the creation of an environment conducive to innovative success.

Therefore, the research is relevant and forms the paradigm of syncretic management, an approach that integrates various elements, starting from interdisciplinary cooperation and ending with advanced technologies of artificial intelligence. This will make it possible to navigate the complexity of innovative projects in the era of exponential growth of artificial intelligence applications and ensure high efficiency of project management processes.

2. Literature review and problem statement

The seventh version of the RMI PMBOK knowledge system [1] formed the prerequisites for the implementation of syncretic management. At the same time, the integration of project management methodologies with artificial intelligence systems is not foreseen. This is due to the release date of the knowledge system long before the appearance of industrial versions of artificial intelligence systems.

The system of knowledge on the management of innovative projects and P2M programs [2] also provides for the integration of essentially different methodologies, including Agile, but the use of artificial intelligence in the processes of managing innovative projects is not discussed.

Paper [3] claims that artificial intelligence can replace people in innovation management, requiring companies to rethink their innovation processes and consider the possibilities of digital transformation. This confidence is based on the expectation that versions of «general artificial intelligence» will be released in the near future.

In [4], it is emphasized that artificial intelligence can improve project management by managing stakeholders' expectations, resolving conflicts, and ensuring flawless project support and execution, but there are no examples or ideas about integration with artificial intelligence.

Technological progress in the field of artificial intelligence is leading to the development of human-like machines capable of operating autonomously and imitating cognitive behavior. The progress and interest among managers, academics, and the public has created excitement in many industries, and many firms are investing heavily to capitalize on the technology through business model innovation [5]. However, managers are left without support from academia when they seek to introduce AI into their firm's operations, leading to an increased risk of project failure and undesirable outcomes.

In study [6], it is determined that AI has the potential to revolutionize the economy and society but to ensure its successful implementation and future impact, it is necessary to solve industry problems and develop research programs for the effective application of artificial intelligence.

In [7], aspects of smartization of artificial intelligence models are considered. An integrated model of the competencies of artificial intelligence application specialists is proposed. The model is a dynamic and multidimensional system of competencies. The problem of integrating management systems with artificial intelligence on the basis of the necessary range of competencies remains unsolved.

Convergence of knowledge, rapid progress in the application of artificial intelligence and the need for adapted project management to stimulate innovation and effective communications create fertile ground for research in certain fields of knowledge [8]. Although the specific field of «syncretic management» for AI-driven projects is still emerging, there is a need to find relevant application ideas scattered across several fields of activity in the digitalization and development management of complex systems.

Work [9] considers the application of entropy approach in managing the dynamics of the development of organizations. In this case, information entropy is considered as an element of resistance to the development of organizations. These studies are fundamental to understanding the impact of uncertainty when applying artificial intelligence in organizational development projects. At the same time, the problems of integration of different approaches to project management remain neglected.

Work [10] examines the problems of the interaction of interested parties in the processes of sustainable development. At the same time, artificial intelligence is not a driver of interaction and decision-making. This significantly reduces the effectiveness of the actions of project managers. Work [11] reports a study on the model of syncretic management, competition, and cooperation in the field of economic development. The models and methods considered in the study do not take into account the development of artificial intelligence, which reduces the effectiveness of applications of syncretic management of innovative projects. Interesting results were obtained in [12], in which a syncretic control model based on the «win-win» model was used. This allowed stakeholders to engage in sustainable development processes without the use of artificial intelligence technologies. The problems of integration of various models of project management with artificial intelligence remained neglected.

Work [13] examines the problems of strategic management based on sustainable development in the Industry 4.0 model based on social responsibility. At the same time, the transition to Knowledge Industry 5.0 opens up fundamentally new opportunities in managing sustainable development. Problems that are not considered in the work are related to the application of knowledge systems in the project management system.

Problems of value creation based on cross-sector cooperation are studied in [14]. A value approach is key from the point of view of sustainable development management. At the same time, an important role is played by the processes of digitization and the use of artificial intelligence, which is not taken into account in the research.

Paper [15] examines the issues of sustainable development of social organizations based on the hybridization of management of public organizations. This is an important direction of application of syncretic management. But the transition to the Industry 5.0 economy significantly reduces the practical application of the authors' proposals.

The model of sustainable development based on innovations within the framework of collaboration of cross-sector business models to create a multi-level, dynamic organizational environment is considered in work [16]. This is an important step in the development of syncretic management, but the authors do not take into account the exponential growth of artificial intelligence applications.

Our review of existing models and methods of syncretic project management during the period of rapid penetration of artificial intelligence proves that syncretic project management with controlled artificial intelligence, which takes into account rapid innovations, competition, uncertainty, and the transition to knowledge economy, is proposed as a tool for solving the specified problems of integrating various methodologies for managing innovative projects with the growth of artificial intelligence applications.

3. The aim and objectives of the study

The purpose of our research is to build a system of models and mechanisms of syncretic project management, on which the combination of innovations and artificial intelligence will provide an opportunity to create value from innovations faster, cheaper, and better.

To achieve the goal, the following tasks were set:

– to devise an approach and a conceptual model of syncretic management of innovative projects with artificial intelligence;

– to build a framework model, method, and mathematical model of syncretic management of innovative projects and programs;

– to carry out a practical test of the proposed model in the implementation of innovative projects in the educational sector while verifying the results of research.

4. The study materials and methods

4. 1. The object and hypothesis of the study

The object of our study is a system of models of syncretic management of innovative projects and programs integrated with artificial intelligence.

The main hypothesis of the study assumes that the integration of syncretic management of innovative projects and programs with artificial intelligence will ensure synergy during the implementation of innovative projects and programs.

The assumptions adopted in the work are related to the use in research of two artificial intelligence systems – Gemini and ChatGPT.

In the research process, existing knowledge systems and creative technologies were used, which formed a chain of models and an algorithm of syncretic project management – a conceptual model, a framework model, and a formalized model. Based on these models, an algorithm for modeling the conceptual basis of syncretic management was developed.

In order to test the models, a case was implemented in the form of interviews with leading specialists and students of IT specialties at universities. The simplifications adopted in the research are a limited number of iterations of the interaction of the syncretic control system with artificial intelligence systems when analyzing their synergy.

5. Research results related to syncretic control systems using artificial intelligence

5. 1. Approach and model of syncretic management of innovative projects with artificial intelligence

Syncretic management of innovative projects is a comprehensive approach that combines elements of various project management methodologies and practices adapted to the specificity of innovative activity. Research into syncretic control systems with the use of artificial intelligence has revealed significant potential for improving system management of innovative projects. The proposed model of syncretic management of innovative projects integrates artificial intelligence technologies, which makes it possible to increase efficiency, adaptability, and innovativeness in project management processes.

The main results of the research include key components and principles of syncretic management, which provide integration of different methodologies, integrated artificial intelligence provides analysis of situations, generation of ideas and alternative solutions throughout the life cycle. The model of syncretic management of innovative projects using artificial intelligence demonstrates significant potential for improving management processes, reducing response time to critical situations, and improving the quality of innovative project management.

The approach to syncretic management of innovative projects is based on a system of principles, models, and methods. Syncretic management of innovative projects in the period of exponential growth of artificial intelligence involves the integration of various approaches, methodologies, and prospects to effectively overcome the complexities and uncertainties associated with projects managed on the basis of the application of artificial intelligence. The key principles of the conceptual model of syncretic management are shown in Fig. 1.

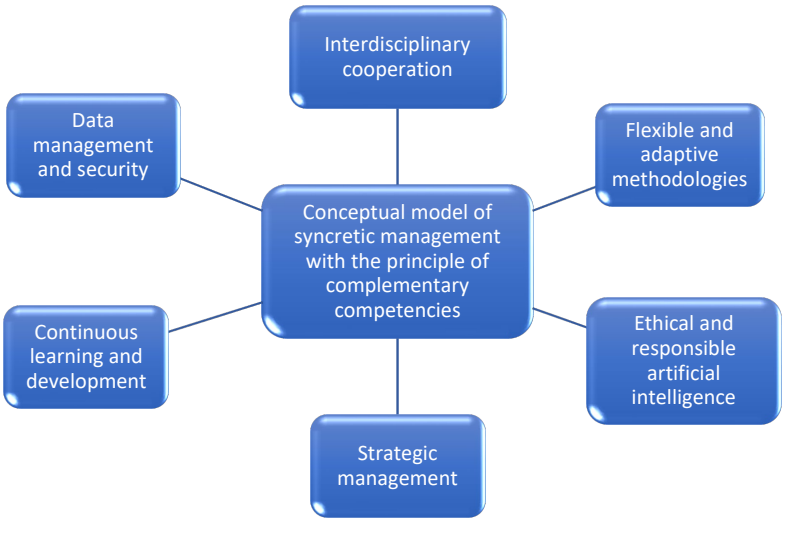

Fig. 1. Key principles of the conceptual model of syncretic management integrated with artificial intelligence based on enhanced competencies

Each principle for the conceptual model of syncretic management is defined as follows:

1. The principle of complementary competences is based on the interdisciplinary cooperation of the role of the project team. As a rule, cross-functional teams are formed with members who possess various competencies, including knowledge of artificial intelligence, knowledge of the subject area, project management and communication skills.

2. Flexible and adaptive methodologies based on the Agile framework model and agile methodologies such as Scrum or Kanban. This promotes flexibility and adaptability in response to rapid changes in AI technologies and project requirements in the iterative design of managed iterations, enabling continuous improvement and adjustment of projects based on emerging AI trends.

3. Ethical and responsible artificial intelligence is based on ethical principles that guide the responsible use of artificial intelligence, taking into account factors such as bias mitigation, transparency, and accountability. Human-centered design prioritizes needs and experiences in the development and implementation of artificial intelligence solutions, ensuring compliance with ethical principles.

4. Strategic management that is based on predicting the trend of artificial intelligence, ensuring that projects meet the future trajectory of technology and risk management. Sound risk management strategies address the uncertainties associated with exponential growth by accounting for technical, regulatory, and market risks. At the same time, engaging an ecosystem of collaboration with external partners, research institutions and industry experts to gain a wider pool of knowledge and resources.

5. Continuous learning and development based on training programs for team members to keep them abreast of the latest developments and best practices with knowledge sharing.

6. Data management and security will establish effective data management practices to ensure the quality, privacy, and security of data used in AI projects based on robust cyber security measures and protection of the AI system against potential threats and attacks.

The integration of management models and methods and artificial intelligence is based on the principle of complementary competencies.

7. The principle of complementary competencies offers an approach to the integration of artificial intelligence (AI) and management systems, which is based on complementarity and synergy in cooperation between them. This principle states that AI and control systems have different strengths and weaknesses, and that they can be combined to design a more powerful and effective system.

5. 2. The framework model, the method, and the mathematical model of syncretic management of innovative projects

At its core, the syncretic project management framework emphasizes cross-functional teamwork and communication, creating an environment where diverse expertise contributes to project success [7]. Cross-disciplinary collaboration in goal setting, integration with artificial intelligence, life cycle management that requires bringing together experts from different fields to work together on project tasks, using their diverse prospects, 'complementary competencies' and skills.

Creation of a system of models and mechanisms of syncretic project management, where the combination of innovations and artificial intelligence will provide an opportunity to create value from innovations faster, cheaper, and better. This is not a scientific paradox but is determined by the synergy of innovation and artificial intelligence. In this case, the development of a framework mathematical model for the syncretic management of innovative projects in the era of the explosion of artificial intelligence is a difficult task as it covers a wide range of qualitative and quantitative factors. However, it is necessary to investigate the construction of a structure that includes different dimensions of syncretic management with the help of mathematical components.

The framework model of syncretic management of innovative projects provides a comprehensive basis for effective management of innovative projects. It combines elements of different project management methodologies, integrating them and adapting them to the unique characteristics of innovation.

The key components of the framework model are shown in Fig. 2.

Fig. 2. Key components of the framework model of syncretic management

Each element of the framework model of syncretic management is defined as follows:

1. Vision and strategy of innovative development of the organization.

In the process of initiating an innovation project, a clear and convincing vision of the innovation project is determined, aligning it with the overall strategic goals of the organization. Compliance of the vision with the organizational strategy undergoes verification and validation based on Business intelligence models [17]. It is checked how the goals of the project are consistent with the strategic direction and priorities of the organization. At the same time, the goals are determined according to the SMART system – specific, measurable, achievable, relevant, and time-bound goals for tracking the progress and success of the project.

2. Portfolio management.

Portfolio managers prioritize innovation projects based on their strategic fit, potential impact, risk tolerance, and resource availability. When forming a portfolio, projects are chosen that meet the organization's strategic goals, resource capabilities, and risk appetite. Based on limited resources, a portfolio of projects is balanced to ensure a mix of high-risk, high-reward projects with lower-risk, lower-reward projects.

3. Management of projects and programs.

Syncretic management offers a flexible and adaptive approach to project and program management, such as Agile, to match the dynamic nature of innovation projects. When combining projects with fundamentally different life cycles, a hybrid approach is used. The project or program team then builds project models and the basis of iteration cycles, providing continuous feedback, adaptation, and improvement. The key to success at this stage is a collaborative mental space where team members from different professions can exchange ideas and work effectively together.

4. Risk and change management.

Proactive risk management throughout the project lifecycle, using methods such as brainstorming, creative risk assessment techniques, and mitigation scenario planning, is a key tool for assessing the likelihood and impact of risks on project goals and success.

Changes are the essence of implementing innovative solutions. The effectiveness of the implementation of changes is formed through communications and the involvement of stakeholders in the processes of solving their problems and providing support.

5. Stakeholder management.

Key stakeholders involved in the project or affected by the project, including internal teams, external partners, customers, and regulatory bodies have interests. At the same time, expectations and problems, the solution of which requires individual communication strategies, ensuring clear, consistent, and

timely communication in the process of managing relations with interested parties.

6. Knowledge management.

The acquisition and documentation of knowledge gained during project implementation, including lessons learned, best practices, and innovative solutions, is applied throughout the organization through knowledge repositories, workshops, and mentoring programs. The use of accumulated knowledge and proposals for future innovative projects increases the overall innovative capacity of the organization.

The driver of the framework model is the tools for measuring productivity during the implementation of innovative projects. The management team should establish clear and measurable performance indicators that align with project goals and the organization's strategic goals and regularly monitor progress.

The effectiveness of the syncretic management model is tested through monitoring and evaluation using key performance indicators, real-time monitoring and feedback loops for iterative improvements. Communication and collaboration, supported by modern tools, are integral components for stakeholder engagement and effective teamwork.

Resource optimization, an important aspect of the proposed model, uses the power of AI to efficiently allocate resources, predict service needs, and improve overall project efficiency. Ethical and legal aspects are integrated into the model, emphasizing the responsible use of AI technologies. Continuous learning and development are implemented to ensure the necessary team skills in AI knowledge management.

In exploring syncretic management in the age of artificial intelligence, a framework has been created that is useful for project managers, interdisciplinary teams, and decision makers navigating the intersection of innovation and artificial intelligence.

Therefore, studies on the development and implementation of syncretic control systems with AI integration are relevant and have significant practical interest in the field of innovative development.

The step-by-step method and model of forming the conceptual basis of syncretic management allows decision-making to assess the possibilities of an innovative project. Weighting coefficients of various criteria, such as technical feasibility, economic feasibility, social impact, and ethical considerations without and with artificial intelligence are the basis for performance evaluations. Combining the assessment of individual criteria into a general assessment of the «valuation» of the project forms an integrated view of the effectiveness of innovative project management systems. The step-by-step modeling method as a conceptual basis of syncretic control is shown in Fig. 3.

This is a conceptual framework, and the specific mathematical functions, method, and inputs will depend on the specific field, project objectives, and available data. Domain experts and data scientists will likely need to be brought in to refine and effectively implement this model.

We propose a mathematical model for the strategic vision component of syncretic project management.

The purpose of the model is to increase the expected impact of innovative projects based on artificial intelligence, taking into account their consistency with the organization's goals and success criteria.

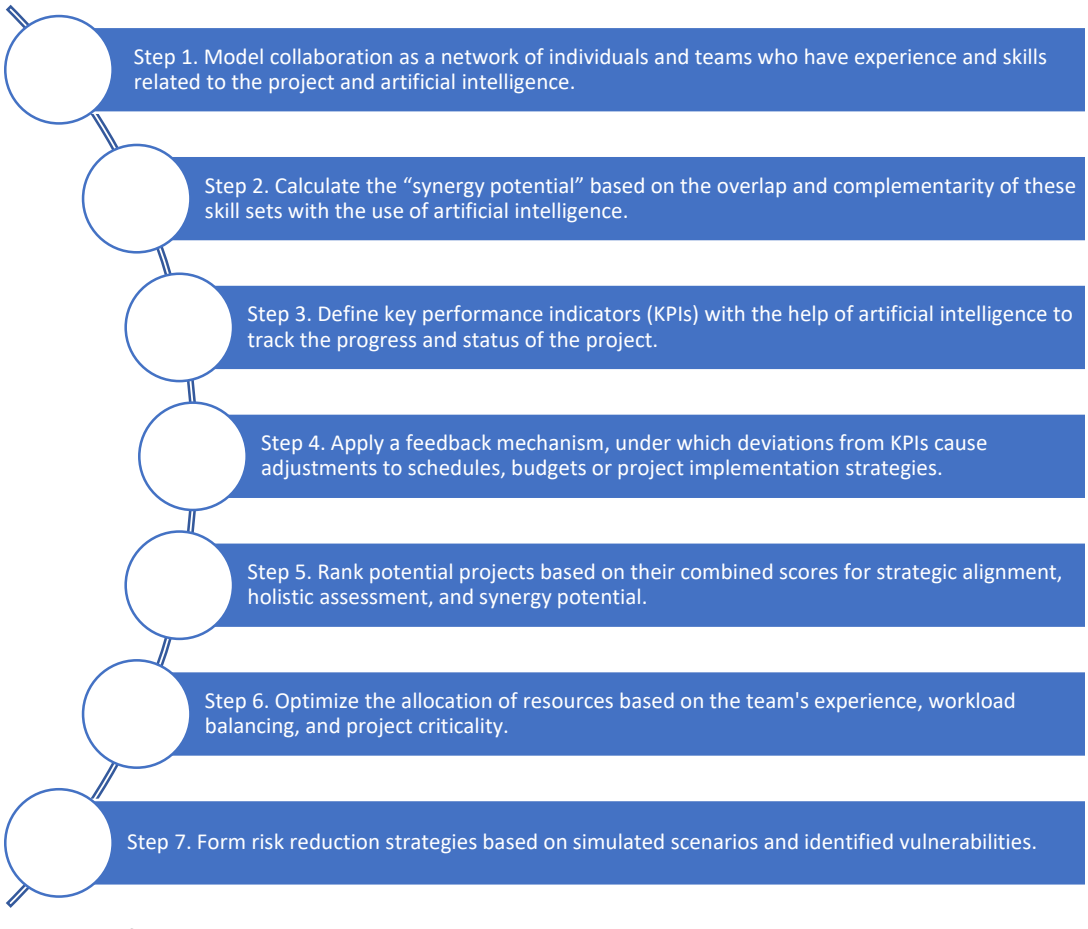

Fig. 3. A step-by-step method for modeling the conceptual basis of syncretic management

Let there be a set of project management methodologies that form a continuum with predicative ones of the first group, hybrid ones of the second group and adaptive ones of the third group:

$$M = \left\{ M_1^1, M_2^1, \ldots M_k^1, M_1^2, M_2^2, \ldots M_l^2, M_1^3, M_2^3, \ldots M_a^3 \right\}, \quad (1)$$

where *k, l, a* are the number of methodologies by group.

For each methodology, there is a set of scenarios in the form of requests that form an interface with artificial intelligence systems:

$$\forall \left(M_k^m \exists S_k^m \right), \quad (2)$$

where S_k^m is the set of framework model interface scenarios with artificial intelligence systems.

Each scenario is defined by reference to the current state of the project, problem, and tasks. In the process of interaction with artificial intelligence, the necessary actions and the expected result are determined. In this case, the STAR (Situation, Task, Action, Result) approach is used. The triggers for launching the scenario S_k^m are determined by the syncretic project management methodology M_k^j, which is used in the current situation.

Variables in the model:

– G_i is a vector representing the *i*-th strategic goal of the organization (for example, revenue growth, customer satisfaction, operational efficiency);

– W_{gi} is the weight assigned to the *i*-th goal, reflecting its relative importance (for example, $W_{g\_revenue} > W_{g\_engagement}$);

– P_j is a binary variable that indicates whether the *j*-th project is selected for implementation (1) or not (0);

– I_{jgi} – the impact of the *j*-th project on the *i*-th goal, quantified using an estimate or metric (for example, a projected increase in revenue, an improvement in the customer satisfaction index);

– U_j – the expected value (utility) of the *j*-th project, including such factors as technical feasibility, market potential, and resource requirements.

Formulation of the model:

$$\sum_N^{i=1} W_{gi} \times \sum_m^{j=1} P_j \times I_{jgi} \times U_j \times$$
$$\times \sum_N^{i=1} W_{gi} \times \sum_M^{j=1} P_j \times L_{jgi} \times U_i \to \max, \quad (3)$$

$$\sum_M^{j=1} P_i \le B, \quad (4)$$

B is a budget constraint.

Each constraint must be tailored to the specific context (e.g., team capacity, risk tolerance).

The objective function maximizes the weighted sum of the impact on all goals and projects, also taking into account their expected value.

W_{gi} weights ensure that projects that contribute more to priority goals have a higher overall impact.

The selection variables P_j allow us to choose the best projects within the budget constraint *B*.

The proposed model, formulae (1) to (4), is a tool for preparation and decision-making. Professional judgment and qualitative factors still play an important role in creating a successful strategic vision for AI-based innovation. The value system is based on two key parameters in management decision-making – the speed of preparation and decision-making in response to current situations in projects and the *quality of decisions made*.

The key success factors that should be taken into account in the syncretic management of innovative projects are shown in Fig. 4.

Fig. 4. Key success factors in the syncretic management of innovative projects

Each factor is defined as:

1. Uncertainty and risks. Innovative projects are often characterized by a high level of uncertainty and risk. This is due to the fact that new ideas and technologies do not always have a clearly defined result, and the process of their development and implementation can be complex and unpredictable. At the same time, it is necessary to apply flexible and adaptive project management methodologies, such as Agile, which allow changing plans and priorities as new information is received. Conduct regular risk analysis and take preventive measures to minimize them. Build a culture of innovation that fosters creativity, collaboration, and risk-taking.

2. Leadership, cooperation, and communication. Innovation projects often require leadership, close collaboration between different stakeholders who have different experiences, knowledge, and prospects. For effective cooperation and communication, it is important to form a clear project management structure and define the roles and responsibilities of all participants, ensure regular information exchange and transparency of the decision-making process. Use effective communication tools and methods such as online platforms, data visualization, and shared workspaces.

3. Flexibility and adaptability. Innovative projects often require flexibility and adaptability, as new circumstances and challenges may arise during their implementation. To ensure flexibility and adaptability, it is important to apply an iterative approach to the development and implementation of innovative solutions. Regularly collect feedback from stakeholders and use it to improve the project. Be ready for changes and be able to quickly react to them.

4. Human factor. The success of innovative projects largely depends on the people who participate in them. In order to maximize the human factor, it is important to create a team with a high level of qualification and experience in various areas. Motivate and involve employees to work on the project. Provide them with an opportunity for development and self-improvement.

5. Focus on results. Innovative projects should be aimed at achieving clearly defined results that have value for business

or society. In order to focus on results, it is necessary to set clear and measurable project goals. Regularly monitor progress and make necessary adjustments. Evaluate the results of the project and use the obtained data to improve future projects.

The cyclical application of success criteria for syncretic management of innovative projects is a basic element of multi-criteria management.

5. 3. Practical testing of models and methods in the implementation of innovative projects

AI integration is the implementation of AI technologies throughout the project lifecycle to improve decision-making, automate repetitive tasks, and analyze complex data sets. Adaptive methodologies for applying flexible project management methodologies that allow for iterative improvements and adjustments based on changing requirements and circumstances. Resource optimization ensures effective allocation of resources, including human, financial, and technological, to maximize project productivity and achieve desired results. Risk assessment and management is related to the identification of potential risks and the implementation of strategies to mitigate them, which ensures the success of the project even in conditions of uncertainty.

The study of practical aspects was carried out on the example of the implementation of the master's educational program «Artificial intelligence. Cognitive technologies» at Kyiv National University of Construction and Architecture (Ukraine).

The study was conducted on the case «Changes in the landscape of IT specialist competencies in the process of exponential growth of applications of artificial intelligence systems». Conceptual and framework models of syncretic management were applied.

For the purpose of practical verification of the research, we implemented a business case for changing the landscape of IT specialist competencies under the influence of the exponential development of applications of artificial intelligence systems.

At the first step, lecturers and students of IT specialties from Ukraine, the Republic of Kazakhstan, and Azerbaijan took part in the research. More than 150 participants were involved in the case, including about 100 lecturers and about 50 students and post-graduate students of IT specialties. The questionnaire contained nine sections. An example of one of the sections of the questionnaire with student evaluations is given in Table 1.

Table 1 gives averaged survey data on the use of additional competencies that were conducted during research.

In the course of the research, diagrams of priorities were constructed for each of the 8 areas (Table 1) with a division into groups of lecturers and students.

In Fig. 5, the gap between students' and lecturers' assessments was clearly highlighted on the example of the section «Big data and analytics».

Table 1

Areas of the field of enhanced competences of IT specialists under the influence of the exponential growth of artificial intelligence and digitalization

No.	Domain	Development priority (values 1–10)
1	Artificial intelligence and machine learning:	8.66
	Understanding of basic concepts and methods of machine learning	8
	Skills in working with tools and platforms for the development and implementation of AI models	9
	The ability to apply AI algorithms to solving specific tasks in creation	9
2	Big data and analytics:	8.33
	Ability to process and analyze large amounts of data	8
	Knowledge of data analytics technologies and tools	8
	Skills of interpreting the results of data analysis for making business decisions	9
3	Internet of Things (IoT):	7.33
	Understanding IoT principles and technologies	8
	Skills in working with IoT devices and sensors	7
	Knowledge of IoT communication and security protocols	7
4	Cyber Security:	8.66
	Ability to protect information and resources from cyber attacks	9
	Knowledge of modern methods of ensuring cyber security	8
	Monitoring and responding to cyber threats	9
5	Cloud technologies:	8.66
	Skills in working with cloud platforms (e.g., AWS, Azure, Google Cloud)	9
	Understanding the concept of virtualization and containerization	9
	Ability to design, implement and manage cloud solutions	8
6	Software development:	8
	Development skills using modern programming languages	7
	Knowledge of development methodologies such as DevOps and Agile	9
	Automation of application deployment and management processes	8
7	Communication skills and teamwork:	9.66
	Interaction with other specialists and business representatives	10
	Ability to effectively communicate and explain complex concepts	9
	Work in a flexible and dynamic environment	10
8	Self-learning and adaptation skills:	8
	Willingness to constantly update your skills and knowledge	8
	Ability to quickly learn new technologies and methods	8

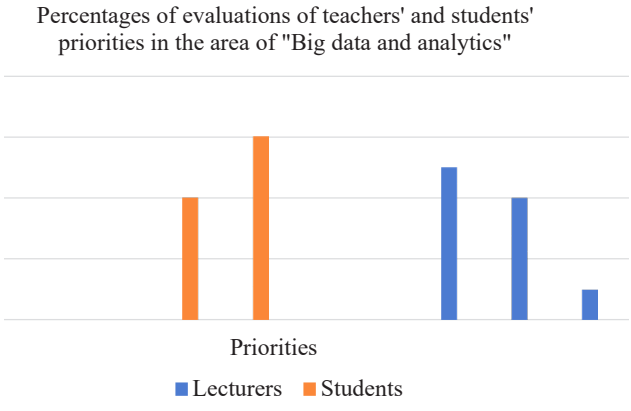

Fig. 5. Generalized analysis of lecturers' and students' evaluations from the section «Big data and analytics»

A gap was found in the evaluations of lecturers and students. In order to find out the reasons for the gap, the students were offered to take the «Business Analytics» course.

In Fig. 6, the gap between students' and lecturers' assessments on the example of the section «Big Data and Analytics» significantly decreased after listening to the «Business Analytics» course.

In the process of conducting the case, a large number of charts were constructed, which reflected individual sections related to the study. An example of such results is shown in Fig. 5, 6.

The second step of the case was the construction and analysis of «supplemented competencies». An example of such competencies with an assessment of the benchmark and the existing level in the team of project managers is given in Table 2.

Assessments of the benchmark and the existing level of competence of project managers were performed according to the IPMA ICB 4.0 model [18]. The assessment procedure involves self-assessment, assessment in the interview process, and general assessment by assessors.

A graphic representation of the added competencies with the benchmark assessment and the existing level in the team of project managers at the beginning of the research is shown in Fig. 7.

This step of the case shows that a management team that uses artificial intelligence is not effective and needs special training. We see the highest gaps in team competencies in understanding AI technologies and innovation. For this team, a 40-hour training program was developed and implemented, based on the results of which a re-assessment of competence was carried out. The results are shown in Fig. 8.

The third step of the case was related to the analysis of advantages in time, quality, and cost of decisions when applying artificial intelligence, regarding the management of innovative projects. The analysis of the gain in time, quality, and cost of management processes before and after the application of AI is given in Table 3.

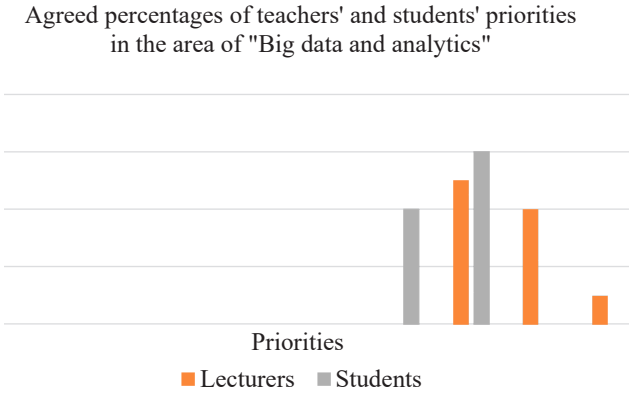

Fig. 6. Generalized analysis of lecturers' and students' assessments from the section «Big data and analytics» after the course «Business analytics»

Table 2

An example of «supplemented competencies» of competencies with a benchmark assessment and the existing level in the team of project managers at the beginning of the research

No.	Supplemented competencies	Benchmark on a 10-point scale	Available level of competence on a 10-point scale
1	Technical competencies	6.5	3.5
1. 1	Understanding AI technologies. Deep knowledge and understanding of core AI concepts, models, and algorithms, including machine learning, deep learning, natural language processing and computer vision	7	4
1. 2	Integration of AI with business processes. Ability to integrate AI technologies into existing business processes and IT infrastructure to increase efficiency and automate tasks	6	3
2	Management competencies	6	5
2. 1	Strategic planning. Ability to develop long-term strategies for the implementation and use of AI in projects, defining key goals and performance indicators	5	5
2. 2	Management of analysis of situations in projects, preparation, and decision-making. Skills of analyzing situations in projects, preparation and decision-making necessary for the successful integration of AI	7	5
2. 3	Assessment of risks and opportunities. Ability to identify, analyze and manage risks and opportunities associated with the implementation and use of AI technologies in projects	6	5
3	Adaptive and innovative competencies	6.5	4
3. 1	Adaptability. Willingness and ability to quickly adapt to changes in the technological environment and project requirements	6	4
3. 2	Innovativeness. The ability to generate new ideas and approaches to solving problems using the capabilities provided by artificial intelligence	7	4

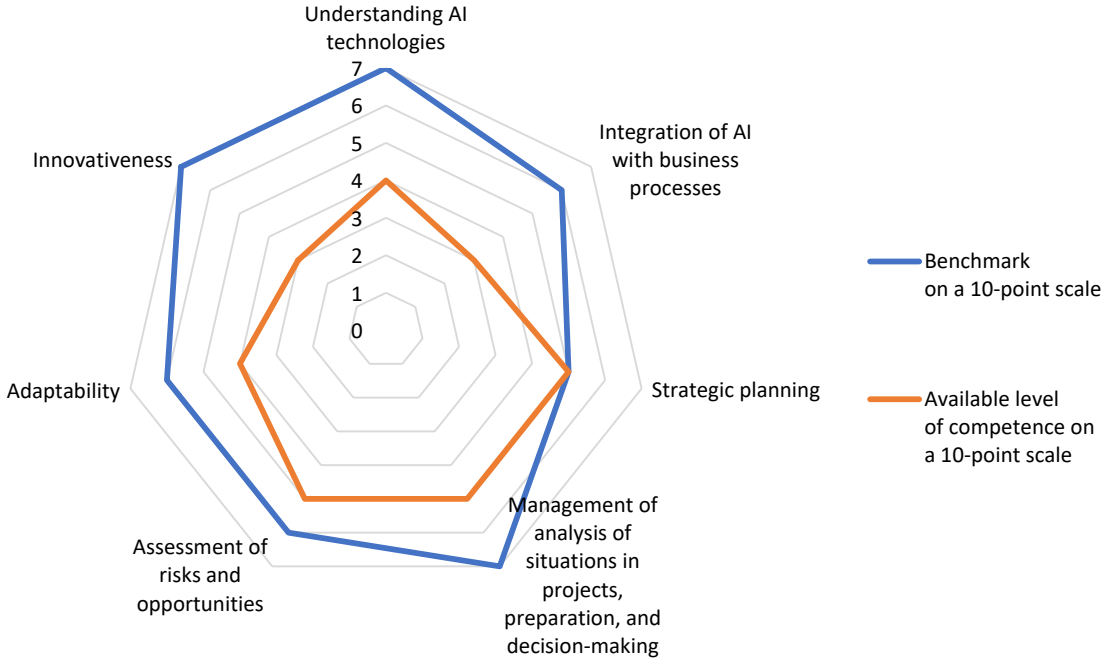

Fig. 7. Graphic representation of added competencies with benchmark assessment and existing level in the team of project managers at the beginning of research

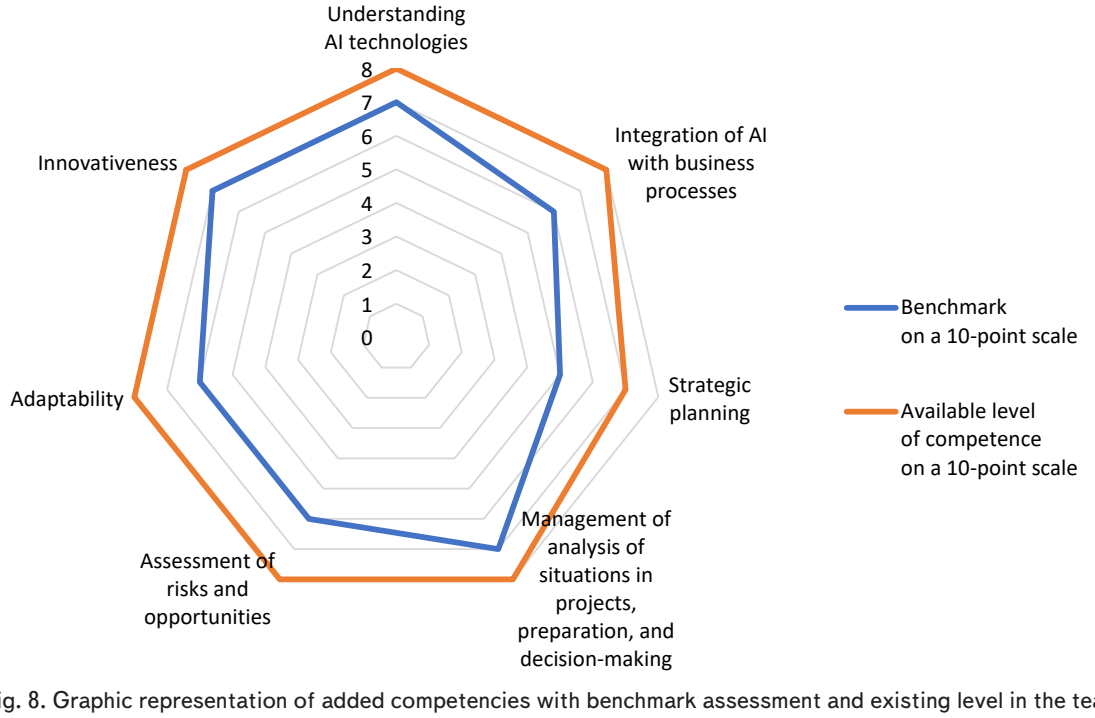

Fig. 8. Graphic representation of added competencies with benchmark assessment and existing level in the team of project managers after the training

Table 3

Analysis of the gain in time, quality, and cost of management processes before and after the application of AI

The name of the process	Time before AI application, minutes	Time after applying AI, minutes	Gain in time, by times	Quality of AI solutions	The cost of AI project
Construction of the project charter	320	10	32	Higher	No effect
Analysis of deviations from time, cost, and quality of the project	16	2	8	Higher	Lower
Project behavior forecasting	30	5	6	Higher	Lower
Construction of the project WBS	240	10	24	Higher	Lower

Our analysis was performed on one of the IT projects related to the security system in the city of Kyiv. Experiments and surveys of users of the proposed approach show the possibility of reducing the response time to critical situations in projects by several times and improving the quality of management of innovative projects owing to enhanced AI competencies.

6. Discussion of results of investigating syncretic control systems using artificial intelligence

The scientific results reported in this study are obtained in the form of a complete system that includes a conceptual, framework model, and method of syncretic management with defined success factors. The model framework provides integration of syncretic management with artificial intelligence systems owing to the added competencies that expand the system of syncretic management competencies. The formalized model allows for the integration of various management methodologies of innovative projects within budgets. The step-by-step method of modeling the conceptual basis of syncretic management enables the integration of various methodologies and knowledge systems for the management of innovative projects. Syncretic project management, which is integrated with artificial intelligence systems, is a feature of the approach.

A review of existing scientific works [3, 6] in this area shows that the processes of integration of syncretic project management with modern artificial intelligence systems have not yet been investigated. Existing scientific works focus on individual elements of syncretic management without integration with artificial intelligence systems [10, 12, 13]. In contrast to the existing models and methods, the principle of «supplemented competences» was introduced, which ensures the integration of syncretic management methodologies and artificial intelligence.

To confirm the results of the research, a case was considered regarding the impact of artificial intelligence on changes in the landscape of IT project management specialist competencies [7, 8]. The peculiarity of the case is the fact that three countries and university IT specialists were selected. At the same time, estimates of the impact of artificial intelligence on changes in the landscape of competencies of different countries coincided with a deviation of 10 percent.

Artificial intelligence affects the need to review the competencies of all roles in the implementation of syncretic management of innovative projects. At the same time, the application of the principle of augmented competencies, similar to augmented reality, made it possible to integrate syncretic management methodologies with artificial intelligence systems in the processes of situation analysis, preparation, and decision-making regarding project management.

The proposed models and method ensure productive application of syncretic management of innovative projects in the environment of artificial intelligence. The implemented case proves this thesis.

The processes of integrated syncretic management of innovative projects have significantly accelerated over time without losing the quality of the results. In most of the answers, the respondents pointed to a significant increase in the quality of decisions regarding the management of innovative projects.

In the course of research, shortcomings were identified related to the dynamism in the development and applications of artificial intelligence and the complexity of syncretic management systems, which by definition form various interfaces between project management methodologies.

Research is planned to continue in connection with the emergence of artificial general intelligence (AGI) in 2024. Expectations for the appearance of ChatGPT 5 will require additional research in this area involving more countries, universities, IT companies, and specialists.

7. Conclusions

1. An approach and a model of syncretic management of innovative projects with artificial intelligence have been developed. A syncretic approach to management seeks to strike a balance between technological progress and ethical responsibility. By integrating these principles into project management, organizations can not only harness the transformative power of AI but also help create a sustainable and inclusive future for AI. This framework is not a static solution but a dynamic guide that evolves with the AI landscape to ensure sustainability and success in the face of unprecedented growth and change. The model is a conceptual basis for building specific mathematical functions and algorithms. The inputs depend on your specific field of expertise, the goals of the innovation project, and the available data. The proposed mathematical model is a component of the strategic vision of syncretic project management. The purpose of the model is to increase the expected value of innovative projects based on artificial intelligence, taking into account their consistency with the organization's goals and success criteria.

2. The proposed conceptual and framework models of the syncretic management system ensure the implementation of a comprehensive strategy for solving problems and using opportunities associated with innovative projects under the conditions of rapid development of artificial intelligence. By combining interdisciplinary collaboration, flexible methodologies, ethical considerations, and strategic planning, organizations can create an environment conducive to successful AI-driven initiatives. Strategic planning, including futurism and risk management, is essential for anticipating and addressing the challenges of uncertainty inherent in the field of AI. It is also important to recognize the need for compliance with regulatory requirements and the involvement of legal expertise to ensure compliance of projects with applicable standards, strengthening trust and accountability.

3. The application of models and methods emphasizes the importance of integrating syncretic management with artificial intelligence systems, adapting to rapidly evolving technology and market landscapes. Collaborative elements such as strategic partnerships and open-source collaborations underscore the interconnected nature of the AI ecosystem. Bringing in external expertise and contributing to industry initiatives accelerates innovation and fosters a collective approach to solving common problems.

Conflicts of interest

The authors declare that they have no conflicts of interest in relation to the current study, including financial, personal, authorship, or any other, that could affect the study and the results reported in this paper.

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Data availability

All data are available in the main text of the manuscript.

Use of artificial intelligence

The authors confirm that they did not use artificial intelligence technologies when creating the current work.

References

1. PMBOK® Guide (2021). Project Management Institute.
2. A Guidebook of Program and Project Management for Enterprise Innovation P2M (2014). Project Management Association of Japan.
3. Haefner, N., Wincent, J., Parida, V., Gassmann, O. (2021). Artificial intelligence and innovation management: A review, framework, and research agenda. Technological Forecasting and Social Change, 162, 120392. https://doi.org/10.1016/j.techfore.2020.120392
4. Lokhande, A. (2022). Use of Artificial Intelligence Smart Tools in Projects. 2022 8th International Conference on Smart Structures and Systems (ICSSS). https://doi.org/10.1109/icsss54381.2022.9782273
5. Reim, W., Åström, J., Eriksson, O. (2020). Implementation of Artificial Intelligence (AI): A Roadmap for Business Model Innovation. AI, 1 (2), 180–191. https://doi.org/10.3390/ai1020011
6. Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., Duan, Y. et al. (2021). Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. International Journal of Information Management, 57, 101994. https://doi.org/10.1016/j.ijinfomgt.2019.08.002
7. Bushuyev, S., Bushuyeva, N., Bushuieva, V., Bushuiev, D. (2022). SMART intelligence models for managing innovation projects. CEUR Workshop Proceedings, 3171, 1463–1474. Available at: https://ceur-ws.org/Vol-3171/paper102.pdf
8. Trach, R., Bushuyev, S. (2020). Analysis communication network of construction project participants. Scientific Review Engineering and Environmental Studies (SREES), 29 (3), 388–396. https://doi.org/10.22630/pniks.2020.29.3.33
9. Bushuyev, S., Onyshchenko, S., Bushuyeva, N., Bondar, A. (2021). Modelling projects portfolio structure dynamics of the organization development with a resistance of information entropy. 2021 IEEE 16th International Conference on Computer Sciences and Information Technologies (CSIT). https://doi.org/10.1109/csit52700.2021.9648713
10. Herremans, I. M., Nazari, J. A., Mahmoudian, F. (2015). Stakeholder Relationships, Engagement, and Sustainability Reporting. Journal of Business Ethics, 138 (3), 417–435. https://doi.org/10.1007/s10551-015-2634-0
11. Lado, A. A., Boyd, N. G., Hanlon, S. C. (1997). Competition, Cooperation, and the Search for Economic Rents: A Syncretic Model. The Academy of Management Review, 22 (1), 110. https://doi.org/10.2307/259226
12. Martinez, F., Peattie, K., Vazquez-Brust, D. (2019). Beyond win–win: A syncretic theory on corporate stakeholder engagement in sustainable development. Business Strategy and the Environment, 28 (5), 896–908. https://doi.org/10.1002/bse.2292
13. Mukhuty, S., Upadhyay, A., Rothwell, H. (2022). Strategic sustainable development of Industry 4.0 through the lens of social responsibility: The role of human resource practices. Business Strategy and the Environment, 31 (5), 2068–2081. https://doi.org/10.1002/bse.3008
14. Murphy, M., Arenas, D., Batista, J. M. (2014). Value Creation in Cross-Sector Collaborations: The Roles of Experience and Alignment. Journal of Business Ethics, 130 (1), 145–162. https://doi.org/10.1007/s10551-014-2204-x
15. Powell, M., Gillett, A., Doherty, B. (2018). Sustainability in social enterprise: hybrid organizing in public services. Public Management Review, 21 (2), 159–186. https://doi.org/10.1080/14719037.2018.1438504
16. Rey-Garcia, M., Mato-Santiso, V., Felgueiras, A. (2020). Transitioning Collaborative Cross-Sector Business Models for Sustainability Innovation: Multilevel Tension Management as a Dynamic Capability. Business & Society, 60 (5), 1132–1173. https://doi.org/10.1177/0007650320949822
17. Muntean, M. (2018). Business Intelligence Issues for Sustainability Projects. Sustainability, 10 (2), 335. https://doi.org/10.3390/su10020335
18. Individual Competence Baseline for Project, Programme & Portfolio Management. Available at: https://products.ipma.world/wp-content/uploads/2016/03/IPMA_ICB_4_0_WEB.pdf