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The Role of Artificial Intelligence in Knowledge Management: Strategic Implications and Mechanism Transformation

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Abstract

The adoption of artificial intelligence (AI) has affected all areas of activity in modern companies, including knowledge management systems. The aim of this article is to identify the opportunities for implementing and applying AI in the key stages of knowledge management, namely knowledge creation, storage, processing, and utilization in the development of innovations. In addition, the article proposes a mechanism for transforming knowledge management systems through the integration of AI technologies. The process of developing knowledge-based innovations is inherently multifactorial, as such innovations emerge from the functioning of the knowledge management system and the organization's innovation process. Moreover, organizations differ in their levels of maturity with respect to both knowledge management systems and the organization's innovation process. For this reason, the proposed mechanism for generating knowledge-based innovations accounts for the heterogeneity of potential users and is designed to be adaptable for use by different organizations. The article demonstrates the construction of an applied mechanism for fostering knowledge-based innovations.

Keywords: knowledge management system, knowledge-based innovations, knowledge management mechanism, artificial intelligence, innovation process

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AI在知识管理中的作用：战略层面与机制变革

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摘要

人工智能（AI）的引入已触及现代公司经营活动的所有领域，包括知识管理系统。本文旨在揭示将AI应用于知识管理系统关键环节的可能性：即在创新过程中进行知识的创造、存储、处理与运用。此外，文章还提出了与AI系统应用相关的知识管理系统转型机制。基于知识的创新生成机制具有多因素特性，因为知识驱动的创新成果源于知识管理系统与企业创新流程的协同运作。而且每个企业在知识管理系统成熟度与创新活跃度方面处于不同水平。正因如此，此类创新生成机制必须考虑潜在用户的差异性，并能够适配其中每一类用户的需求。本文章展示了基于知识的应用型创新机制的具体构建过程。

关键词： 知识管理体系、以知识为基础的创新、知识管理机制、AI、创新过程

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Introduction

The impact of information technologies on the knowledge management system (hereinafter referred to as the KMS) has been widely examined in academic research (see, for example, [Tsui, 2005]). In particular, [Duffy, 2019] investigates the influence of deep learning technologies on the ability of algorithms to replicate human cognitive functions, including vision (image recognition), hearing (speech recognition and natural language processing), and decision-making based on advanced data analytics. Other studies [Kaplan, Haenlein, 2019; Canhoto, Clear, 2020] demonstrate that artificial intelligence (AI) technologies – such as supervised machine learning (ML), neural networks, and deep learning – are increasingly being adopted for commercial purposes. The authors of [Brynjolfsson, Mitchell, 2017] emphasize that this AI-driven approach to organizational management differs substantially from traditional knowledge management systems, such as expert systems based on symbolic logic, in which rules are explicitly formulated and embedded by human experts within the KMS [Raisch, Krakowski, 2020].

Since both artificial intelligence and knowledge management are associated with the nature of knowledge and learning, AI technologies have the potential to significantly transform the KMS within organizations [Sanzogni et al., 2017]. This transformation affects two techno-organizational domains. The first concerns the knowledge management system itself, which is directly related to knowledge management in organizations. The second relates to artificial intelligence as a technology capable of imitating human knowledge and learning processes.

Firms should explore the potential role of new artificial intelligence technologies in supporting the organizational activities related to the KMS.

To develop a mechanism for creating knowledge-based innovations, its structure must first be defined. In this context, it is important to consider the nature of knowledge-based innovations, which emerge through analysis of the organization's existing KMS to identify knowledge with innovation potential. When incorporated into the innovation process, such knowledge may lead the organization to the creation of innovations.

Accordingly, the mechanism comprises two core components: the knowledge management system and the innovation process. Within this framework, the KMS should be automated to ensure that all available knowledge is consistently systematized and structured for effective use. In addition, this knowledge should be subject to continuous analysis of its innovation potential. Once such knowledge is identified, it is transferred to the innovation process, providing the organization with the opportunity to create innovations. In the current context, artificial intelligence and related technologies represent the most practical tools for organizing the knowledge management system described above. This enables individual KMS elements to interact with appropriate AI technologies, allowing the system to be configured more effectively to identify knowledge with innovation potential and to support the creation of innovations based on such knowledge.

This approach addresses the adaptability of the mechanism. Less mature KMSs may rely on simpler technologies that nonetheless optimize and improve system performance, thereby increasing the likelihood of innovation. In contrast, more mature KMSs may be fully integrated with advanced AI technologies, which can support even the identification of strategic opportunities.

In view of the above, the study seeks to address the following questions:

– Which approach to defining the elements of the knowledge management system is most appropriate for a mechanism aimed at creating knowledge-based innovations?
– How can the maturity level of the KMS be determined, and which categorization of maturity levels should be applied within the proposed mechanism to enable an organization to select the most suitable modification?

1. Literature Review

The literature review begins by examining existing approaches to defining knowledge management system maturity levels in organizations, which provides a basis for identifying the most comprehensive and appropriate approach to developing a mechanism for knowledge-based innovation.

K. Wiig's Model. Wiig's model is based on the view that knowledge serves as the foundation for effective managerial decision-making within an organization [Wiig, 1997]. The model places primary emphasis on knowledge quality, as well as on the organization's capacity to create, apply, and retain knowledge [Wiig, 2004]. Within this framework, KMS maturity develops through the following stages:

1) Awareness of the importance of knowledge. The organization recognizes the value of knowledge; however, its use remains insufficiently structured and systematized, which results in deficiencies in KMS functioning.
2) Development of knowledge infrastructure. Knowledge becomes structured and categorized, and formal standards within the knowledge management system begin to emerge.
3) Knowledge management as a system. The KMS is integrated into business processes and interacts with IT tools, which improves usability as well as the quality and speed of operations.
4) Strategic and optimized use of knowledge. At this level, the KMS is applied in strategic decision-making. Knowledge management is integrated into innovation activities, organizational culture, and employee training. Knowledge becomes a key organizational asset, and regular assessment of knowledge quality is carried out.

R. Maier's Model. Maier conceptualizes knowledge management system maturity as the level of development of the information and communication infrastructure

that underpins the KMS [Maier, 2013]. This approach is grounded in the assumption that multifunctional processing of large volumes of knowledge is feasible only in the presence of advanced technological capabilities. On this basis, the author distinguishes the following KMS maturity levels:

1) Basic ICT tools. This stage is characterized by the use of standard office applications (e.g., Word, Excel), local document storage, the absence of centralized repositories, and manual knowledge search through interaction with colleagues. At this level, a knowledge management system does not exist in the academic sense, nor is there sufficient infrastructure to support its implementation.
2) Organized ICT infrastructure. At this stage, integrated digital repositories emerge, enabling the creation of knowledge artifacts. Document classification systems are introduced, and the overall structure of the KMS begins to take shape.
3) Integrated KMS. This level involves automation of knowledge processing, the availability of corporate knowledge bases with intelligent search capabilities, and integration with CRM, ERP, and HRM systems.
4) Optimized and intelligent ICT infrastructure. At the highest level, artificial intelligence is integrated into textual knowledge processing through technologies such as NLP and NER, along with semantic search, knowledge graphs, recommendation systems, and decision support systems.

The Four Pillars Model. The Four Pillars Model evaluates the maturity of the knowledge management system through the balanced development of four components rather than through a linear sequence in which each level represents incremental progress over the previous one [Stankosky, 2005]. As emphasized by the author of the model, R. Stankosky, only coordinated and comprehensive development of all four pillars makes it possible to establish a truly mature knowledge management system. These pillars include:

1) Leadership, referring to the presence of managerial support for the development of the knowledge management system;
2) Organization, reflecting the organization's ability to structure and organize knowledge;
3) Technology, defined as the availability of the IT tools required to support an effective and efficient KMS;
4) Learning, encompassing the organization's capacity to develop employee knowledge, retain it, and transfer accumulated knowledge to those employees who require it.

M. Zack's Model. Zack's model determines the maturity level of the knowledge management system based on the extent to which it is embedded in organizational planning processes [Zack, 1999]. Within this framework, three maturity levels are identified:

1) Operational, at which the KMS is used to address localized organizational tasks;
2) Tactical, where the KMS is applied across all organizational business processes;
3) Strategic, at which the KMS is employed in the formulation of organizational strategies.

Based on the analysis of academic literature on knowledge management system maturity models, the author proposes an original KMS maturity model that will be used in the subsequent development of the mechanism for creating knowledge-based innovations. Although the literature offers a wider range of conceptual approaches, the models reviewed above sufficiently capture the fundamental principles required for the continuation of this study.

2. Author's Model of Knowledge Management System Maturity

The author's model of knowledge management system maturity in organizations is presented below:

Implicit level. The implicit level represents the most basic stage, at which no systematized or formalized knowledge management system or supporting technologies are in place. Knowledge and experience reside primarily with individual employees, while any existing codification remains fragmented and limited in scope. Such partial codification does not contribute to either the innovation process or organizational business processes.

Formalized level. At the formalized level, the internal organizational environment fully recognizes the value of the knowledge management system and therefore takes initial steps toward its formalization – that is, toward presenting knowledge in a clear and usable form. At this stage, organizations seek to develop knowledge bases and codify accumulated experience so that employees can access relevant knowledge in specific work situations. However, specialized technologies and complex systems are not yet applied within the KMS, nor is the system integrated into core business processes.

Organized level. The third maturity level is characterized by the presence of an organized knowledge management system supported by sufficient technological capabilities for storing and processing large volumes of data. The system is continuously enriched with newly codified tacit knowledge generated by employees, as well as with knowledge acquired from external sources. At this stage, the KMS is actively used in the routine tasks of operational and middle-level personnel, serving as a reliable source of guidance when needed. In addition, the system is integrated with tools such as CRM platforms. However, at the organized level, the KMS is not involved in managerial decision-making and is not equipped with AI technologies.

Integrated level. The integrated level reflects a situation in which the organization's knowledge management system is supported by artificial intelligence technologies.

AI facilitates structured knowledge organization, enables intelligent search within knowledge repositories, and supports managerial decision-making processes. At this stage, the KMS is integrated into customer value creation processes. In practical terms, the knowledge management system is actively used within the company's core business processes, which ultimately leads to its widespread application across all levels of organizational activity.

Strategic level. At the strategic level, the KMS becomes one of the organization's key instruments for building competitive advantage. The company actively invests financial resources in the development and improvement of its knowledge management system, as the KMS is perceived as a strategic asset. This level of maturity also implies full integration of the KMS into organizational processes, including strategic decision-making. In addition, the system is closely linked to the innovation process, serving as its primary source of new knowledge and ideas.

A schematic representation of the KMS maturity levels is presented in Figure 1.

3. Development of the Knowledge-Based Innovation Mechanism

Following the categorization of KMS maturity levels, it becomes necessary to examine in greater detail the overall concept of the mechanism for creating knowledge-based innovations. At this stage, there is a need to establish – on the basis of theoretical and practical analysis of the research question – a connecting link between the knowledge management system and the innovation process that can generate an additional synergistic effect. Although the findings indicate a close relationship between the KMS and the innovation process, formalizing this relationship may enhance both its potential and its practical applicability. It has also become evident that many organizations are not sufficiently prepared to work effectively with the KMS in order to improve their performance, largely due to the complexity of the issue. This challenge is particularly characteristic of the first two KMS maturity levels. Accordingly, the proposed mechanism should address the identified limitations and provide organizations with practical support in improving the efficiency and effectiveness of their activities.

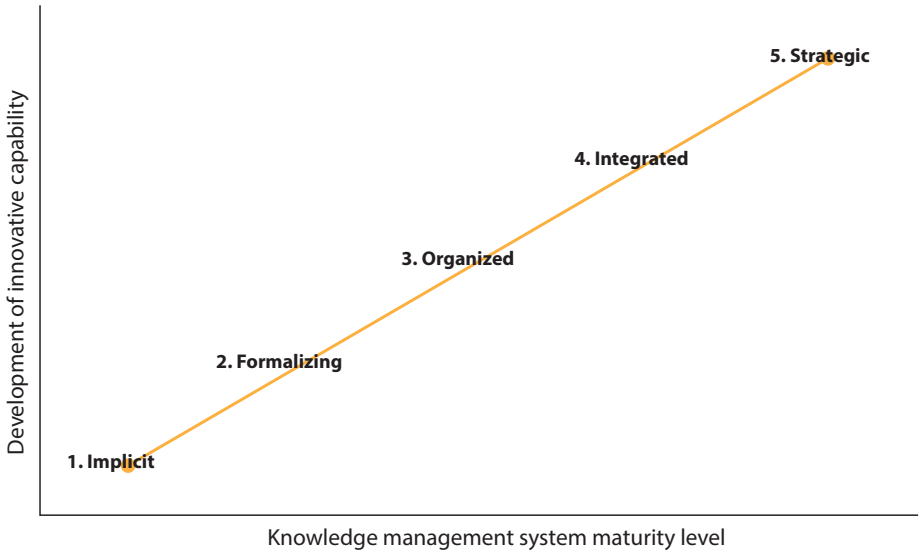
As discussed earlier, artificial intelligence represents the most realistic and appropriate connecting element. This conclusion is supported not only by the empirical component of the present study, but also by the work of internationally recognized scholars whose research was examined in the analysis of KMS maturity models. Contemporary conditions clearly indicate that the presence of artificial intelligence within an organization's technological portfolio will soon determine not only its level of technological development, but also its ability to remain competitive. Beyond its other advantages, AI is a highly practical and adaptive tool capable of responding to specific organizational needs. This flexibility makes it possible to incorporate organization-specific characteristics into the general model of the knowledge-based innovation mechanism, thereby ensuring its applicability across different KMS maturity levels.

Accordingly, the proposed mechanism consists of three components.

Knowledge management system. Within the proposed mechanism, the KMS provides the foundational basis for processes that may result in knowledge-based innovations through the use of various types of knowledge and data related to organizational activities. It is important to note that not all organizations are required to possess a fully developed set of KMS elements in order to apply the mechanism. For example, KMSs at the first two maturity levels remain highly rudimentary; nevertheless, even their integration with AI technologies can optimize a wide range of processes. Such optimization, in essence, represents a form of knowledge-based process innovation.

Artificial intelligence. Artificial intelligence functions as a universal and adaptive analytical component that processes both internal and external knowledge. Its key advantage lies in the ability to rapidly and systematically analyze large volumes of data and convert them into knowledge that is valuable for the organization. In many cases, AI may be integrated into organizational activities as a ready-made external agent, which significantly simplifies implementation and reduces required investment. Interaction between AI and the KMS involves the processing of the full body of available organizational knowledge and information in accordance with the assigned task. Thus, AI performs

Fig. 1. Knowledge management system maturity levels



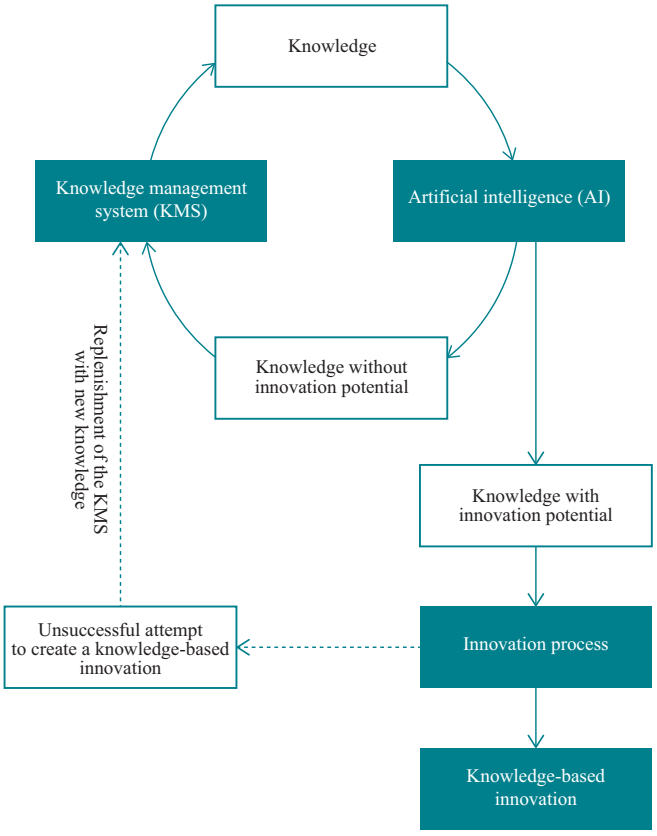
Source: prepared by the author.

task-oriented analysis, thereby increasing productivity and the likelihood of generating new ideas.

Innovation process. The innovation process represents the final stage of interaction between the KMS and artificial intelligence. It is evident that knowledge generated through this interaction will not always lead to innovation, as the development of a universal mechanism for the systematic generation of innovations does not appear feasible. Nevertheless, the proposed mechanism significantly increases these chances.

Figure 2 presents the conceptual framework of the knowledge-based innovation mechanism.

Fig. 2. Conceptual framework of the knowledge-based innovation mechanism



Source: prepared by the author.

The conceptual framework of the knowledge-based innovation mechanism presented in Figure 2 illustrates the continuous interaction between the knowledge management system and artificial intelligence, which enables the large-scale generation of new knowledge and ideas.

To gain a more detailed understanding of how the proposed mechanism operates, it is necessary to examine the manner in which AI interacts with each individual element of the knowledge management system. This, in turn, requires an analysis of existing approaches to defining the set of KMS elements.

Technocentric model. Within the technocentric model, the elements of the knowledge management system are interpreted as components of the information and technological infrastructure. In the works [Becerra-Fernandez, Sabherwal, 2010; 2014], the knowledge management system is conceptualized as a set of technologies supporting four core processes: knowledge creation, storage, transfer, and application. Within this framework, the system includes the following elements:

– knowledge repositories and document and data databases;
– corporate portals and content management systems;
– collaborative editing tools;
– platforms for communication and knowledge sharing;
– expert systems for analytics that support knowledge extraction from data.

The technocentric model provides a detailed representation of the knowledge management system from a technological perspective; however, it does not reflect the full complexity of the KMS, which constitutes its primary limitation.

Sociotechnical model: people, processes, and technologies. The sociotechnical model addresses the limitations of the previous approach by conceptualizing the knowledge management system as an interaction among people, processes, and technologies [Davenport, Prusak, 1998]. A more detailed description of these elements is provided below:

- People are carriers of knowledge and active participants in knowledge creation and exchange processes.
- Processes represent structured activities that organize the creation, codification, storage, dissemination, and application of knowledge in organizational practice.
- Technologies constitute the technological component that enables effective and efficient use of the knowledge management system. This category includes the full range of technologies identified within the technocentric model.

Taken together, this approach offers a practical and applicable representation of KMS elements. Some practitioners additionally introduce a fourth element – strategy – arguing for the need to explicitly distinguish the strategic dimension of knowledge management.

Infrastructure-based model. A key contribution within this approach is the study by [Gold et al., 2001], in which the knowledge management system is described in terms of organizational capabilities. Two groups of such capabilities are identified:

- Infrastructure capabilities, including organizational culture, organizational structure, and technologies;
- Process capabilities, including knowledge acquisition, conversion, application, and protection.

Accordingly, the knowledge management system is formed by these two capability blocks, which function as its core elements.

Following the analysis of the principal approaches to defining the elements of the knowledge management system, it becomes necessary to formulate the approach that will be applied by the author in developing a detailed mechanism for creating knowledge-based innovations. In this context,

combining the sociotechnical and infrastructure-based models appears justified. As a result, the following set of KMS elements is proposed:

– people;
– processes;
– technologies;
– culture;
– strategy.

After defining the set of KMS elements, it is necessary to examine their interaction with artificial intelligence, which forms the basis of the knowledge-based innovation mechanism:

People. People are the primary carriers of knowledge within the organization. For this reason, their interaction with artificial intelligence is particularly promising, as it enables the rapid and structured transformation of tacit knowledge into explicit knowledge, as well as the distribution of knowledge among employees. In addition, AI supports employees in optimizing their professional activities, especially in knowledge search, managerial decision-making, and innovation development. When properly organized, interaction between people and AI can therefore be both rational and productive. The AI technologies relevant to this KMS element include generative models, NLP technologies, recommendation systems, personal assistant systems and chatbots, and adaptive learning systems.

Processes. As noted earlier, processes ensure the circulation, generation, dissemination, application, and storage of knowledge. Their interaction with artificial intelligence can therefore significantly enhance productivity. AI technologies enable more effective processing of large volumes of knowledge for the generation of new knowledge, which directly influences the effectiveness of the innovation process. Beyond its impact on innovation, AI facilitates fast and convenient access to organizational knowledge for all employees who require it and improves the continuous enrichment of the KMS with new knowledge. This, in turn, contributes positively to overall organizational performance. The AI technologies proposed for this element include NLP, semantic search, graph-based AI, predictive analytics, AutoML, and RAG systems.

Technologies. Technologies form the infrastructural foundation of the modern knowledge management system, while artificial intelligence enables further development of this infrastructure by extending its capabilities. For example, AI supports automated data processing, cognitive computing, identification of patterns and relationships, and automated structuring of analytical results. Accordingly, integrating AI with organizational technologies makes it possible to create a highly effective environment in which both computational capacity and innovation potential are strengthened. The AI technologies proposed for integration with this KMS element include LLM-based agents, vector databases, knowledge graphs, AutoML and MLOps platforms, artificial simulations, and digital twins.

Culture. Organizational culture serves as a motivating factor encouraging employees to acquire new knowledge and share it within the organization. At the same time, AI

Table 1
Overview of interactions between knowledge management system elements and AI tools

KMS element	AI function	AI technologies
People	Learning, idea generation, and support in task performance	Generative models, NLP technologies, recommendation systems, personal assistant systems and chatbots, adaptive learning systems
Processes	Automation of organizational processes with optimization of their performance and improvement of efficiency and effectiveness	NLP, semantic search, graph-based AI, predictive analytics, AutoML, RAG systems
Technologies	Development of an automated technological environment	LLM-based agents, vector databases, knowledge graphs, AutoML and MLOps platforms, artificial simulations and digital twins
Culture	Creation of a supportive environment for knowledge acquisition and knowledge sharing, increasing the potential for generating new knowledge for innovation	AI-based collaboration platforms, recommendation systems, AI-supported mentoring tools
Strategy	Enhancement of analytics and planning, enabling more informed managerial decision-making	Predictive analytics, scenario modeling and simulation AI, market intelligence AI, graph-based AI for competence mapping, trend identification systems

Source: prepared by the author.

technologies significantly reduce barriers to interaction among employees and provide convenient platforms that ensure broad access to required knowledge. AI also supports the optimization of mentoring processes and the onboarding of new employees. Potential AI technologies for this element include AI-based collaboration platforms, recommendation systems, and AI-supported mentoring tools.

Strategy. This element of the knowledge management system defines the direction of organizational development in the context of knowledge, innovation, and technology. Accordingly, AI technologies can enhance planning, trend identification, analytical activities, and managerial decision-making. AI tools are particularly valuable at the strategic level, as strategy relies heavily on in-depth analysis. Such analysis can be performed by AI technologies rapidly and with high accuracy in collaboration with human decision-makers – and, increasingly, with reduced human involvement. Relevant technologies include predictive analytics, scenario modeling and simulation AI, market intelligence AI, graph-based AI for competence mapping, and trend identification systems.

An overview of interactions between the knowledge management system and artificial intelligence tools is presented in Table 1.

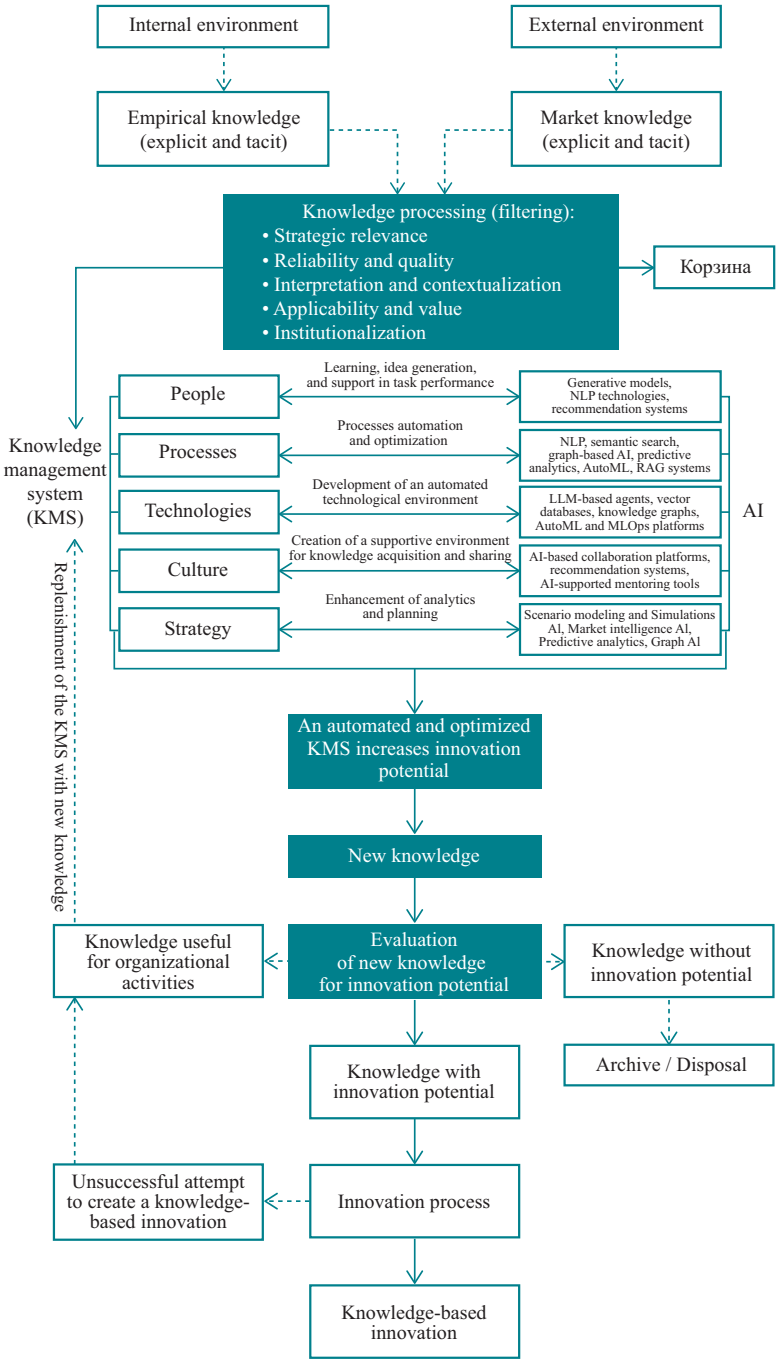
The detailed description of the knowledge-based innovation mechanism is presented in Figure 3.

As shown in Figure 3, once the KMS has been populated with selected knowledge at the filtering stage, interaction between the knowledge management system and artificial intelligence technologies begins. This interaction involves applying a specific set of AI technologies to the relevant elements of the KMS in order to enhance their effectiveness. As a result of integrating AI technologies into each KMS element, the organization obtains an automated and optimized knowledge management system, which increases innovation potential through deeper and more efficient processing and systematization of existing knowledge. The new knowledge generated within the updated KMS is subsequently examined by relevant organizational specialists to assess its innovation potential. At this stage, knowledge is classified into three categories:

1) Knowledge with innovation potential, which is integrated into the innovation process;
2) Knowledge without innovation potential but still useful, which is returned to the organization's KMS for further use;
3) Knowledge without innovation potential and without organizational value, which is transferred to archival storage or discarded.

Knowledge identified as having innovation potential is then used within the innovation process. This may result either in an unsuccessful attempt to create a knowledge-based innovation, in which case the knowledge generated during the process is returned to the KMS due to its practical value, or in a successful attempt leading to the creation of a knowledge-based innovation.

Fig. 3. Detailed description of the knowledge-based innovation mechanism



Source: prepared by the author.

The proposed mechanism was subsequently subjected to verification. For this purpose, a focus group was formed consisting of company specialists responsible for the KMS and involved in organizational innovation processes. In total, seven participants took part in the focus group.

The objective of the verification was to assess the feasibility of applying the proposed mechanism and to identify potential directions for its use.

All focus group participants confirmed the possibility of implementing the proposed mechanism. Potential directions for its application are presented in Table 2.

Thus, the value of artificial intelligence for the KMS lies not only in technological solutions, but also in the development of new infrastructures, a skilled workforce, and transformed organizational processes.

The purpose of the KMS is to connect employees with the appropriate set of resources and knowledge required to create new products and support higher-quality decision-making [Mitchell, 2019]. The expanding capabilities of artificial intelligence and the emergence of advanced functions aimed at achieving these objectives necessitate transformation of the KMS mechanism. Implementation of such a mechanism becomes possible through the development of new skills and competencies among employees. Individuals must cultivate new ways of understanding, working, and interacting with knowledge in order to fully benefit from the use of AI within the KMS. This level of organizational preparedness enables the practical realization of the unique capabilities of artificial intelligence in knowledge management.

Conclusion

The mechanism for creating knowledge-based innovations may contribute both to the theoretical foundations of innovation studies and to practical organizational contexts shaped by contemporary market conditions. Its practical contribution is of particular importance, as current realities lack a universal approach capable of enabling companies of different sizes and operating across diverse market sectors to succeed – or even to substantially increase their chances of success – in such a complex and highly specialized activity as innovation development.

The proposed mechanism requires further refinement and testing under real market conditions, as well as application in organizations representing different industries and varying levels of knowledge management system maturity, before it can be considered fully operational. In this regard, the author intends to continue research into the mechanism for creating knowledge-based innovations.

Table 2
Potential applications of the AI-enabled knowledge management mechanism for knowledge-based innovation

KMS process	Capabilities enabled by AI technologies	Applications within the innovation process
Knowledge creation	Development of predictive analytics using self-learning analytical tools Identification of previously unknown patterns; Analysis of organizational data and identification of relationships generation of new knowledge	Forecasting the sales potential of new products Incremental innovations based on CRM system data
Knowledge storage and retrieval	Collection, classification, organization, storage, and retrieval of explicit knowledge Analysis and filtering of multiple content and communication channels Facilitation of knowledge reuse by teams and individual employees	Knowledge consolidation for the development of new products Extraction of information on shortcomings of previously developed products for their elimination in newly developed products
Knowledge sharing	Connecting employees working on similar problems by strengthening connections within the KMS Support of collective intelligence and shared organizational memory Creation of an integrated view of knowledge sources and bottlenecks Development of more coordinated and interconnected organizational processes	Support for customer and partner feedback mechanisms for expert evaluation of new products Support for real-time knowledge exchange between marketing channels, new product development units, and sales management departments
Knowledge application	Improvement of the use of existing knowledge through identification of new knowledge sources Development of more natural and intuitive system interfaces (e.g., voice assistants) Facilitation of equal access to knowledge for all specialists involved in the innovation process	Chatbot-based support during the development of complex products Creation of user manuals for new products

Source: compiled by the author based on the results of mechanism verification.

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