Leveraging Experience-Based Knowledge for Social Impact Analysis of Research and Development Projects in Banking

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Abstract: Banking projects are diverse and go beyond classic financial products and include advanced customer service tools, analytics, and AI. Large financial institutions are leaders of technological change, increasingly creating internal innovation labs that independently conduct research and development work using specialized teams, which helps them achieve a positive social impact and build a sustainable and stable competitive advantage in the long term, thanks to the rapid adaptation of solutions to changing market requirements. The issues relating to social impact analysis and assessment of R&D projects in banking are new, and a research gap can be noticed in this field. Publications on implementing such projects are mainly focused on their products and the time of delivering innovations to the market, not on the methods of managing project knowledge necessary for social impact analysis processes. There is, therefore, a need to build theoretical and methodological foundations for improving management processes and using experience-based knowledge in this area. This paper aims to propose a model inspired by case-based reasoning (CBR) and generative AI. The model can be helpful in supporting the solution of decision-making problems using historical knowledge, as well as considering the current specificity of projects and their environment. The presentation of the model is supplemented with examples concerning the social impact analysis of R&D projects in the banking sector, which prove that its use can improve the use of experience from such projects.

Keywords: R&D projects in the banking sector, Social impact analysis, Case-based reasoning, Generative AI, Knowledge management in projects

1. Introduction

Financial institutions are open to technological innovations and the financial products they offer are based on advanced IT customer service tools and artificial intelligence (AI) systems. The radical transformation resulting from the integration of such technologies enables the development of e-finance and the implementation of electronic channels that provide customers with efficient and innovative financial services (Najem et al., 2025).

The banking sector is moving away from services developed solely by external research institutions. Larger banks are increasingly establishing specialized internal teams to conduct research and development within their own innovation laboratories. This approach helps them respond quickly to changing environments and market demands, adapt solutions efficiently and flexibly, and achieve positive social impact. This is crucial for operating in accordance with the principles of sustainable development and building a stable, long-term competitive advantage.

For some time, relatively well-known research has been aimed at limiting the importance of solely financial profit and loss analyses and emphasizing the key concept of sustainability in project management, as well as long-term value creation, which relates to tracking the societal impact of projects (Carvalho & Rabechini, 2017). The literature also highlights the importance of stakeholder engagement and the need to consider the sustainability context in the management of research and innovation projects (Santos & Fernandes, 2024). Research issues relating to the implementation of R&D projects in banking and the analysis and assessment of their social impact are relatively new and, therefore, a research gap can be observed. Furthermore, existing studies primarily focus on the products of such projects and the delivery of innovative solutions to the market. Managing project knowledge supporting social impact analysis requires theoretical and methodological research to improve management processes and utilize experience-based knowledge for the social impact analysis of R&D projects in banking.

The use of such knowledge, the management of which can be supported by new IT and AI solutions, in analyzing the social impact of R&D projects should play a significant role in banking. The use of AI supports the functioning of knowledge management systems and improves the organizational performance and knowledge distribution within the organization (Pai et al., 2022). Generally, AI-based systems used to support knowledge management include neural networks, knowledge-based systems, expert systems, knowledge-based decision support systems, case-based reasoning (CBR), and generative AI. The CBR systems enable the use of past knowledge and experience to support decisions when solving new, specific problems. It is advisable to expand the capabilities of the CBR systems with generative AI due to their enormous potential for acquiring diverse knowledge and

flexibility. Hybrid systems allow for better performance and efficiency by combining the strengths of various AI paradigms, including CBR, generative AI and, particularly, large language models (LLM) (Bach et al., 2025).

This paper proposes a model inspired by CBR and generative AI that can be helpful in supporting decision-making by taking into account historical knowledge as well as the current specificity of R&D projects in banking and their environment. The presentation of theoretical considerations regarding the proposed model is enriched with examples of social impact analyses of research conducted within R&D projects in the banking sector. The practical implications of this research may be of interest to project managers and business practitioners.

2. Motivations and Origins of the Experience-Based Knowledge Model

Experience-based knowledge models can support flexible and adaptive solutions that can help meet the challenges of environmental volatility and technological change. Adaptive and agile models often utilize iterative solutions that effectively manage change and can provide a valuable response to the limitations of traditional approaches, which are less effective in conditions of radical change and high uncertainty. The creation of new models is supported by extensive research relating to the development of knowledge management concepts and innovative approaches that support project and organizational success through flexibility, adaptability, and agility.

Adaptability and agility based on knowledge can ensure the building of the ability to adapt to turbulent environmental conditions and create the basis for developing competencies related to assessing the environment and taking advantage of emerging opportunities, thus increasing the organization's chances of survival and achieving market success (Sarta et al., 2021). There is a growing interest in research on improving the adaptability and flexibility of organizations and increasing their resistance to negative external factors because globalization, technological transformations, growing resource shortages, and changing consumer needs pose significant threats to the long-term success and survival of various types of organizations (Yin, 2023).

In the context of flexible functioning and the adaptive capacity of an organization, the concept of responsible development, the ability to shape the future by making ethical decisions and introducing changes that consider the well-being of the most important stakeholder groups, plays an important role (Krajcsák & Bakacsi, 2025). Ethical issues and socially responsible decision-making relate to the social, economic, and environmental impacts of the undertaken activities, including research and innovation. In management theory, adaptability and responsible functioning in the context of achieving positive social impact should be linked to research on effective change management. For example, there is a need to identify challenges and barriers to effective change management, which can be addressed by applying flexible approaches to project management and building monitoring systems and knowledge that support drawing conclusions that guide adaptive changes in implemented activities (Van Assche et al., 2023).

In addition to adaptive methodologies and change management, agile methodologies are also among the inspirations shaping experience-based knowledge models. Their implementation is particularly justified for R&D projects characterized by significant innovation, complexity, and uncertainty. The results obtained as a result of their implementation are multidimensional and difficult to assess. The social impact is relatively difficult to estimate, and doubts may accompany a determination for the comprehensive success of long-term use of research results, for example, in the banking sector. Despite these difficulties, attempts are being made to address them by replacing traditional methodologies with agile solutions. The positive effects of such changes are relatively easily and quickly achieved by improving the efficiency of project teams, which improves the willingness to work, competencies, team stability, and the ability to adapt to the changing needs of research recipients (Ciric Lalic et al., 2022).

In general, the use of agile methodologies is positively perceived by managers for innovative and software projects and, among agile project success measures, not only process efficiency but also sustainable software product quality and stakeholder satisfaction occupy important places (Binboga & Altin Gumussoy, 2024). Sustainability aspects (i.e., social and economic dimensions) are largely based on improving reliability, the software usage life span, improving customer satisfaction, and reducing the long-term costs of software modifications (Khalifeh et al., 2020).

R&D project managers recognize the importance of learning from past experiences and the need to improve management practices aimed at absorbing useful knowledge (Vicente-Oliva et al., 2015). Improvement in this area may involve building experience-based knowledge models supporting flexible and adaptive solutions that can be applied through the implementation of various AI methods, including hybrid solutions inspired by CBR and generative AI.

3. Methodology

The following research question was formulated: What should be the model for a social impact analysis of R&D projects in banking? Based on a literature analysis, the lack and the need for such models were identified, both theoretically and practically. The need for such solutions was also confirmed by observations of R&D projects implemented in the banking sector. The challenges faced by this sector and its specific nature justify undertaking this area of research. The following research methods were used: a literature review, modeling using AI-based methods, observation of selected R&D projects in one of the largest banks in Poland, and case studies.

The modeling process employed solutions inspired by classic CBR supported by LLM, which operated according to a framework that utilized analogous past cases to solve new problems. This was inspired by the typical cycle consisting of the following four stages of experience-based knowledge acquisition: retrieve, reuse, revision, and retention (Lopez De Mantaras et al., 2005). Retrieve involves searching and identifying cases in the database that are most similar to the current problem. Reuse refers to reusing a solution, or parts thereof, found in historical cases for the current situation. Revise involves verifying the correct functioning of the identified solution and suggesting possible corrections. Retain is equivalent to saving a new case in the knowledge base for future use. As subsequent tasks are solved and solutions retained, the case database grows and experience-based knowledge resources increase, becoming increasingly useful in the social impact analysis of R&D projects in banking. According to previous research results for various CBR applications, building hybrid models based on combining CBR with other AI methods, particularly LLM, is recommended for solving complex problems (Bach et al., 2025).

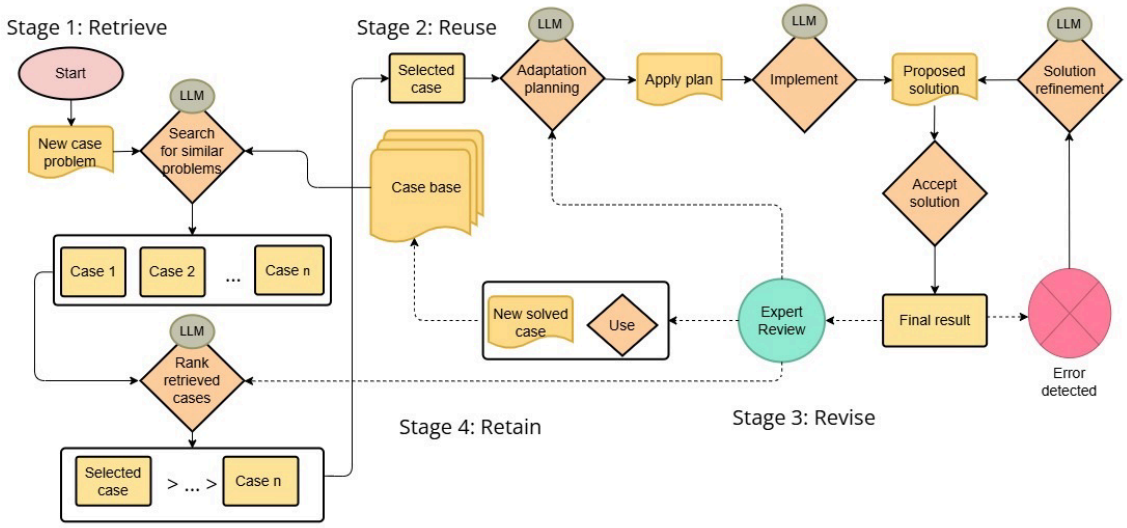
Case studies were used to conduct an initial theoretical validation of the model and lay the foundation for further in-depth research on its practical applications. Three IT R&D projects were selected for the case studies, carried out at a bank that plays a leading role in the Polish market in utilizing public funds for the planning and implementation of such projects. These projects involved developing systems for managing the accuracy and timeliness of bank customer master data using self-learning modeling, developing and launching banking services based on tokens and smart contracts using blockchain technology, and building neural language models supporting the processing and analysis of unstructured data.

In the description of the case studies, particular attention was paid to the following aspects:

- origin, initial motivation, and context of the project,
- project objectives and scope,
- project management methodologies and tools, and IT technologies used,
- how the proposed CBR and generative AI can be used to analyze the research project and shape it to increase social impact,
- possible implementation options for the proposed solutions at major milestones or project phases,
- how lessons learned from the past will be integrated into the current project implementation plan,
- proposed quantitative metrics or qualitative observations that reflect success in achieving positive social impact or difficulties and challenges in this regard,
- identified technical and management challenges,
- conclusions, recommendations, and scalability of the CBR and generative AI solutions.

4. Results and Discussion

Figure 1 presents a model based on the combined use of the CBR and LLM methods for semantic recognition of content contained in a case database that has collected knowledge from previous projects. The model enables the adaptation of the ongoing projects to new challenges, iteratively improving solutions, and then saving approved solutions in the case base.



Source: Own study

Figure 1: CBR and LLM integration for social impact analysis of the R&D projects

The model's operation is based on CBR-inspired stages described in the methodology section, the use of LLM, and it considers the role of human-in-the-loop (expert review). The first stage is retrieve, in which a new task emerges and its specifics are determined: goals, requirements, available data, and constraints. Individual cases in the knowledge base may contain, for example, metadata (i.e., title, date, author, and project domain), a problem description, the solution, the results of applying the solution, and lessons learned from the selected project (Das et al., 2021).

The search module is supported by a linguistic model that searches the existing database of cases for previous solutions that are contextually similar to the current problem. The result is a list of cases, each describing a previously solved problem. The model then selects the best case from several identified by the searching module. This can be undertaken by considering feedback from previous attempts, which are verified during the revise stage. If a particular case has already proven successful in a similar context or has proven ineffective, this affects its suitability classification accordingly. The model analyzes the cases, assessing them both for their similarity and any comments from previous experience. As a result, the case that best fits the given scenario is selected from the set of Case 1, ..., Case n. The selected (as best) case, identified in Figure 1 as the selected case, then moves on to the second stage, i.e., reuse, where it becomes a database that can be adapted to the needs of the current task. At this stage, a module is launched that develops a detailed implementation plan based on the selected case.

The next stage is revise, which verifies whether the results meet expectations. The system then enters a correction and refinement loop, where it makes further adjustments based on error diagnosis. The LLM can analyze what went wrong and implement the corrections. In Figure 1, the 'Accept solution' diamond and the 'Final result' block indicate the moment when the results are verified. If they are unsatisfactory, the next step is 'Solution refinement.' The revise mechanism can be more complex; for example, it can iterate between ranking and implementation attempts multiple times until a suitable case is finally found. The entire process, as part of the revise stage, includes room for human intervention (human-in-the-loop). This allows for the approval of a new case before adding it to the database or for deciding on the sufficient quality of the obtained results. Even in highly automated systems that support the creation of machine models, expert review could be necessary to confirm the compliance of the results with the adopted assumptions, for example, in the area of requirements for achieving social impact. The final stage is retain. When the proposed solution proves effective, a new entry is created in the case knowledge base, containing not only a description of the context and methods used but also information about any challenges and how to overcome them. This allows for future project analyses and evaluations to benefit from an increasingly rich source of experience-based knowledge for social impact analysis.

To conduct an initial theoretical validation of the model and lay the foundation for further in-depth research on its practical applications, three case studies were analyzed. The first case study relates to a project in the area of data quality management, specifically the use of self-learning modeling to manage the accuracy and currency of bank customer data. This project concept arose from the need to build a customer database created using

diverse data and to safeguard its current and accurate nature. The proposed solution should ensure effective management of the accuracy and currency of core customer data. Primarily, the goal is to develop a methodology for data cleansing, duplicate detection, and a model for predicting data aging in the central database. The key technology is self-learning modeling implemented using programming languages (e.g., Python), database management systems, and machine learning platforms. The CBR-inspired solutions proposed in this paper prove useful in identifying effective approaches to ensure data accuracy that, from a social impact perspective, serves to strengthen customer trust in financial institutions and facilitate contacts. A CBR-inspired approach can also be useful during the implementation of the solutions proposed in the project, i.e., during the stages of requirements analysis, management methodology selection, building a central customer database, testing, and monitoring. Generative AI can be useful in identifying inconsistencies and generating synthetic data for algorithm testing. During implementation, generative AI can be used during the stages of data analysis, algorithm testing, and data quality monitoring.

The proposed quantitative metrics that can reflect success in achieving positive social impact include a reduction in customer complaints and the net promoter score (NPS) for measuring customer loyalty and satisfaction. Qualitative metrics include employee feedback, case studies, customer feedback, and other stakeholder feedback. Technical challenges have been identified, stemming from integrating data from multiple sources, ensuring adequate data security in line with regulatory requirements, considering algorithm accuracy, and maintaining database performance. The project can be considered a significant initiative for improving data quality. It is recommended to conduct in-depth empirical research relating to the implementation of a model based on CBR and generative AI to utilize data improvement cases in customer interactions. The quality of the results returned by CBR depends on the size of the case database and the application of the appropriate LLM model. Both technologies improve in quality with increasing scale.

The second case study relates to a project involving the development and launch of banking services based on tokens and smart contracts using blockchain technology. The project was initiated by the need to acquire and gather new knowledge and conduct development work on the operation of tokenization services and smart contracts using blockchain technology. In addition to technical issues, it was deemed necessary to examine the legal framework for applying these technologies in the banking sector. The project focused on developing a new platform for providing financial services using the aforementioned technologies. Solutions inspired by CBR could help identify successful blockchain initiatives from the past. Generative AI, in turn, is useful in supporting modeling in accordance with CBR principles when adapting solutions found in the database for subsequent applications. During the implementation of the proposed solutions, design engineering principles could be applied, i.e., solving current problems by finding analogous cases. During the final product development stage, it may be useful to utilize both positive examples to encourage and negative examples to increase the security of potential customers. The use of generative AI to analyze the legal aspects of using selected technologies in banking is promising. The proposed model could be useful in tracking past blockchain projects that have encountered legal or regulatory issues, providing information about legal challenges and proposed solutions.

The proposed quantitative indicators include the number of customers using blockchain services, transaction volume, and reduction in transaction costs. Qualitative indicators involve customer reviews, expert opinions, and an assessment of the impact on reducing financial exclusion. The challenge here is measuring the social impact of blockchain technology. The following technical challenges were identified: ensuring platform security, achieving scalability, and integrating with existing infrastructure. Selected management issues included coping with changing regulations, building expertise, and shaping user adoption. It is worth noting the positive and negative social impact of this research.

The third case study concerns a project to build neural language models supporting the processing and analysis of unstructured data. The project arose from the need to develop language models for the Polish language in the financial sector, as well as a service platform for analyzing and generating banking-related issues. The project scope includes the creation of a universal platform architecture model, data models, and language models. A model inspired by CBR and generative AI is useful for leveraging lessons learned to develop competencies within a bank, including through knowledge transfer from the research unit participating in the project. The CBR concept can guide the implementation of operational rules and generative AI as an important source of domain knowledge. Increasing social impact is possible by improving accessibility, streamlining customer service, and improving financial literacy. Generative AI can facilitate improved access to diverse knowledge, create personalized solutions, and enrich real-world data through the generation of synthetic data. In the process of integrating lessons learned from the past with the current project implementation plan, a CBR model supported

by LLM could focus on solving emerging problems, for example, by searching for information about the model architectures used, data collection approaches, or model evaluation metrics.

The proposed quantitative indicators include reduced customer service times, an increase in the number of automatically resolved queries, and improved customer satisfaction. Qualitative indicators involve customer and consultant feedback and an assessment of the clarity of information returned by the model. Challenges here include the subjective nature of measuring the quality of model interactions, ensuring objectivity, and mitigating the possibility of prohibited behaviors (e.g., discrimination). Identified technical challenges involve adequate data quality, ensuring platform scalability, and integration with banking systems, while taking into account security requirements. Management challenges relate to the project's novelty and the lack of long-term proven approaches for managing such projects, i.e., learning by doing is a necessity.

The third project represents a strategic investment in AI technologies. Given the novelty and complexity of this field, it is recommended to implement solutions inspired by CBR and supported by generative AI to search for and propose solutions that have already been used. This can help reduce the likelihood of repeating errors that have already been made and whose solutions are known.

In the case of the three selected projects, there were difficulties when separating the effects relating to the social impact resulting from these projects, in the measurement of qualitative indicators that may be distorted by subjectivity, and due to limitations resulting from data privacy regulations. Additional difficulties in assessing social impact stem from the lag between project implementation and the positive changes that can be analyzed and assessed. Furthermore, baseline data on the situation prior to project implementation were sometimes unavailable during research. It is difficult to track changes related to social impact without conducting comprehensive comparative analyses. It is also important to remember the limitations resulting from the often conflicting social, technological, and economic aspects. IT projects that are economically beneficial can negatively impact interpersonal relationships and undermine trust in financial institutions. Openness to new technologies and AI solutions varies across different age groups of stakeholders.

5. Conclusions

The obtained research results provide concrete theoretical and applied implications for the new research area of assessing the social impact of research conducted within R&D projects in the banking sector. The latter is moving away from relying solely on research results conducted by external research institutions. Establishing internal research teams within banks and their own innovation laboratories helps them respond quickly to changing environments and market demands, adapt solutions efficiently and flexibly, and achieve positive social impact. This is crucial for operating in accordance with the principles of sustainable development and building a stable and long-term competitive advantage.

The proposed model, inspired by CBR and generative AI, addresses the unmet needs among theoreticians and practitioners of R&D project management in the banking sector and financial institutions. The achievements resulting from the research described here are noteworthy, especially due to the paucity of such research studies, and are clearly visible in the context of rapidly evolving technologies and the field of R&D project management. The proposed model makes an important contribution to the development of methodological foundations supporting the resolution of problems relating to social impact analysis and evaluation of R&D projects, particularly the development of applications of AI technologies that drive project knowledge management and solutions that improve the use of these technologies in experience-based knowledge processes. The research results also provide a sound basis for subsequent in-depth research on the implementation and validation of the proposed model.

The usefulness of CBR in societal impact analysis of R&D projects stems from the way it leverages past experience and the ability to build and practically utilize a database of experience-based knowledge. CBR allows for the reuse of proven solutions that have previously proven effective in solving similar problems. This is, therefore, a simple way to avoid or reduce errors in new attempts to solve similar problems. Adaptation and revision mechanisms enable the verification and improvement of suitable cases from the database, as well as their corrections if necessary. Proposed solutions become increasingly accurate as the experience-based knowledge pool increases. These resources enable forecasting and simulation of new solutions, improving their accuracy and social efficiency. Drawing on knowledge resources relating to specific past cases allows for the justification and explanation of obtained results with precedents. The proposed model supports learning from past experience and prevents the repetition of errors, facilitating reliable, well-considered, and well-founded decision-making. This research allows for the formulation of recommendations regarding future actions. First

and foremost, it is necessary to conduct research on a larger research sample, i.e., a larger number of projects implemented by various financial institutions. It is also advisable to expand the scope of the research to include financial institutions in various countries. Obtaining results from a larger number of cases enables comparative studies. It is also worth considering other AI methods that could be applied in systems that support the social impact analysis of R&D projects.

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AI declaration: Selected AI tools were used in the computer modeling described in this paper.

References

Bach, K., Bergmann, R., Brand, F., Caro-Martínez, M., Eisenstadt, V. et al. (2025). Case-Based Reasoning Meets Large Language Models: A Research Manifesto For Open Challenges and Research Directions. https://hal.science/hal-05006761v1/file/main.pdf

Binboga, B., & Altin Gumussoy, C. (2024). Factors Affecting Agile Software Project Success. *IEEE Access*, *12*, 95613–95633. https://doi.org/10.1109/access.2024.3384410

Carvalho, M. M., & Rabechini, R. (2017). Can project sustainability management impact project success? An empirical study applying a contingent approach. *International Journal of Project Management*, *35*(6), 1120–1132. https://doi.org/10.1016/j.ijproman.2017.02.018

Ciric Lalic, D., Lalic, B., Delić, M., Gracanin, D., & Stefanovic, D. (2022). How project management approach impact project success? From traditional to agile. *International Journal of Managing Projects in Business*, *15*(3), 494–521. https://doi.org/10.1108/ijmpb-04-2021-0108

Das, R., Zaheer, M., Thai, D., Godbole, A., Perez, E., Lee, J. Y., Tan, L., Polymenakos, L., & McCallum, A. (2021). Case-based Reasoning for Natural Language Queries over Knowledge Bases. *Proceedings of the 2021 Conference on Empirical Methods in Natural Language Processing*. Proceedings of the 2021 Conference on Empirical Methods in Natural Language Processing, Online and Punta Cana, Dominican Republic. https://doi.org/10.18653/v1/2021.emnlp-main.755

Khalifeh, A., Farrell, P., Alrousan, M., Alwardat, S., & Faisal, M. (2020). Incorporating sustainability into software projects: A conceptual framework. *International Journal of Managing Projects in Business*, *13*(6), 1339–1361. https://doi.org/10.1108/ijmpb-12-2019-0289

Krajcsák, Z., & Bakacsi, G. (2025). The three levels of organizational change to build future potential organizations. *International Journal of Innovation Science*, *17*(3), 630–649. https://doi.org/10.1108/ijis-08-2023-0173

Lopez De Mantaras, R., Mcsherry, D., Bridge, D., Leake, D., Smyth, B., Craw, S., Faltings, B., Maher, M. L., Cox, M. T., Forbus, K., Keane, M., Aamodt, A., & Watson, I. (2005). Retrieval, reuse, revision and retention in case-based reasoning. *The Knowledge Engineering Review*, *20*(3), 215–240. https://doi.org/10.1017/s0269888906000646

Najem, R., Bahnasse, A., Fakhouri Amr, M., & Talea, M. (2025). Advanced AI and big data techniques in E-finance: A comprehensive survey. *Discover Artificial Intelligence*, *5*(1). https://doi.org/10.1007/s44163-025-00365-y

Pai, R. Y., Shetty, A., Shetty, A. D., Bhandary, R., Shetty, J., Nayak, S., Dinesh, T. K., & D'souza, K. J. (2022). Integrating artificial intelligence for knowledge management systems – synergy among people and technology: A systematic review of the evidence. *Economic Research-Ekonomska Istraživanja*, *35*(1), 7043–7065. https://doi.org/10.1080/1331677x.2022.2058976

Santos, J. M. R. C. A., & Fernandes, G. (2024). Prioritizing Stakeholders in Collaborative Research and Innovation Projects Toward Sustainability. *Project Management Journal*, *55*(4), 423–440. https://doi.org/10.1177/87569728241231266

Sarta, A., Durand, R., & Vergne, J.-P. (2021). Organizational Adaptation. *Journal of Management*, *47*(1), 43–75. https://doi.org/10.1177/0149206320929088

Van Assche, K., Beunen, R., Duineveld, M., & Gruezmacher, M. (2023). Adaptive methodology. Topic, theory, method and data in ongoing conversation. *International Journal of Social Research Methodology*, *26*(1), 35–49. https://doi.org/10.1080/13645579.2021.1964858

Vicente-Oliva, S., Martínez-Sánchez, Á., & Berges-Muro, L. (2015). Research and development project management best practices and absorptive capacity: Empirical evidence from Spanish firms. *International Journal of Project Management*, *33*(8), 1704–1716. https://doi.org/10.1016/j.ijproman.2015.09.001

Yin, Y. (2023). Strategic management of companies' adaptive behavior. *Managerial and Decision Economics*, *44*(2), 1029–1039. https://doi.org/10.1002/mde.3729