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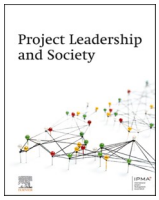

Review

Hybrid project management: Scoping review

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ABSTRACT

The hybrid project management (HPM) approach aims to leverage the strengths of various methodologies while mitigating their weaknesses, thereby supporting project managers in achieving project success. However, there is limited comprehensive knowledge about the practical implementation of HPM in organizations. This paper seeks to bridge the gap in academic literature regarding HPM, as examined in Web of Science and Scopus, and to investigate the existence and application of HPM in practice. The authors analyze the significance, benefits, and drawbacks of different project management methodologies. The research follows PRISMA guidelines, addressing five specific research questions to ensure a systematic, transparent, and rigorous process. The findings are presented in structured tables, offering a thorough understanding of the subject. This study provides a foundational basis for future research on HPM, particularly within the business administration field. It focuses exclusively on hybrid methodologies relevant to business products and service development areas, excluding unrelated hybrid approaches. In summary, this paper aims to enhance the understanding and application of HPM, offering valuable insights for both academic and practical advancements in project management.

1. Introduction

The goal of using a hybrid project management approach is to benefit from the strengths of each methodology and avoid weaknesses at the same time (Hayata and Han, 2011), to fully support project managers achieving project success. There is only fragmented knowledge regarding implemented practice of hybrid project management (HPM) methodology in organizations.

A project methodology is like a detailed instruction manual for project managers, offering step-by-step guidance on how to run a project, whereas an approach is more like a general strategy or plan without as much specific detail. The definition of project management methodology for our study is taken from A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Sixth Edition (Project Management Institute [PMI], 2017, p. 28), which states that "A methodology is a system of practices, techniques, procedures, and rules used by those that work in a discipline." Examples of project management methodologies might include Prince 2, Scrum, Kanban, and Rational Unified Process (Chin and Spowage, 2010). Majority of articles contain proposals of the several major approaches to manage projects. Traditional and agile approaches are well established in research and practitioner literature; the hybrid approach is emerging. There is a trend towards combining agile and traditional project management practices. The benefits of using a combination of agile and waterfall approaches have not yet been widely studied, so it is difficult to measure the impact of adopting this approach in organizations. Guidance on the choice of the most appropriate project management approach is largely theoretical or based on the experience and directives of companies. Hybrid approaches to project management are currently essential for companies to cope with different organizational cultures, specific processes, contractual requirements of clients and project specificities (Azenha Copola et al., 2021). Specific hybrid project management methods are mentioned in only few studies (Barbosa and Saisse, 2019; Braganca et al., 2023; Costantini et al., 2021; Leong et al., 2023; Sithambaram et al., 2021).

There is a growing tendency to combine agile and traditional project management methodologies especially in the development of information technology-based products and services, aimed at enhancing agility. Although there are, in the literature, proposals for hybrid models as a combination of traditional and agile approaches, but there are no studies examining and analyzing the hybrid approach in organizations to achieve project success. Selecting the most suitable project management approach remains predominantly theoretical, lacking empirical

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validation from companies' experiences. Most companies depending on their products and internal procedures, stand on traditional or agile project management framework, nothing between these two. The authors' scoping review study provides a solid foundation and fundamental insights for future research endeavors in hybrid project management, particularly within the area of business administration, as the authors specifically concentrate on methodologies relevant to business products and service development, and project management, the authors' targeted focus area. Hybrid project management is crucial to study now due to its ability to combine the strengths of traditional and agile methodologies, making it adaptable to complex and dynamic project environments. Its increasing adoption in various industries highlights the need to understand its implementation and optimization. The balance it provides between structure and flexibility is essential for projects with strict regulatory requirements and dynamic stakeholder needs. Additionally, hybrid approaches have been shown to enhance project outcomes, making their study vital for evolving project management practices and ensuring successful project delivery.

The concept of hybrid project management, which combines traditional and agile methodologies, is relatively new and underexplored in academic literature. One key point as research support for this assertion is the limited empirical evidence. Niederman and co-authors (2018) highlight the scarcity of empirical studies on the effectiveness of hybrid project management compared to traditional or agile approaches (Niederman et al., 2018). Another key reason is the recent emergence of the topic, as most publications on hybrid project management have emerged in the past five years, indicating that the academic community has only recently begun to explore this area in the past decade. Last key point is the focus on software development. Keyword and abstract analysis show a predominance of agile software development-related discussions, underscoring the limited scope of existing research (Amajuoyi et al., 2024). The focus of existing studies is primarily on software development, indicating a limited scope. Sommer (2024) in his journal emphasizes the need for more comprehensive research to understand the broader implications and effectiveness of hybrid project management methodologies.

The objective of this paper is to identify and fill the gap that exists related to hybrid project management in academic literature examined in Web of Science and Scopus and to explore if there is in practice any type hybrid project management approach. The authors are exploring the importance of different project managements methodologies' characteristics, benefits and drawbacks. It collects and structures all relevant articles related to project methodologies evaluation or analysis published and found in academic literature. The paper presents all articles in a table for future reference and analysis narrowed down to research area and study type of project methodologies. The study examines existing research papers and focuses on highlighting major characteristics of the two main categories, traditional and agile, their concepts through advantages and disadvantages representing major gaps in their practice. After Introduction, the structure of the paper consists of presentation of the Research method, Result of Articles, Results and closing with Conclusion.

The authors have collected the main characteristics of project management methodologies analyzed in the academic literature to see how they emerged and developed during past decades. Project management has become indispensable across industries for successful project delivery. Regardless of sector or project size, project management methodologies (PMM) enhance the likelihood of meeting goals. Researchers widely concur that suitable PMMs boost project success. Authors highlight various advantages of PMM including clarifying goals, enhancing efficiency, fostering adaptability, improving planning and risk management, ensuring standardization, enhancing communication, optimizing deliverables, integrating tools and knowledge, and maximizing lessons learned. (Chin and Spowage, 2010).

The analysis of the academic literature shows that research materials can be found in a wide range of scientific disciplines (medicine and healthcare, construction and engineering, social sciences, etc.), having in focus specific projects. However, project management and hybrid project management methods are limited in these materials. Construction projects and are not extensively analyzed in academic literature. only one study investigates the implementation of an agile hybrid approach in construction. A survey including construction professionals revealed a need for project performance improvement, lack of awareness of agile methods. The study suggests an agile integration framework for the construction industry to enhance project performance (Ozorhon et al., 2022). One study investigates the latest PMBOK Guide and its application in the construction industry, that falls more into traditional project management methods. Using text mining and surveys, the study analyzes the related content and experts' opinions. The results show the construction industry's unique project types and phases are revealing the potential applicability of project performance domains and compatibility of traditional project management principles (Faraji et al., 2022). Project management in healthcare and medicine projects and are not analyzed in academic literature at all. Authors found only one article, which discusses the evolving role of laboratory managers and highlights the importance of an efficient project management plan for reorganizing, consolidating, and automating laboratory services (Lippi and Mattiuzzi, 2019). In the field of social science research, a book has been published recently, that focuses on the importance of project management techniques for social science research projects, emphasizes the importance of project planning and design, and explains the use of tools (Satapathy and Kumari, 2024). As can be seen from these publications, the term 'project management' is only mentioned in its traditional and agile way of appearance, hybrid not extensively analyzed at all. Therefore, the uniqueness of the authors present research and scoping review lies on the fact that they have concentrated on project management subject area in academic literature, and to fill the missing gap, the research analyses only those scientific publications where hybrid project management methodologies are the central element of the studies.

This scoping review, conducted based on PRISMA guidelines, ensures a systematic, transparent, and rigorous process, resulting in a structured presentation of findings. The study situates itself within the broader project management literature by addressing the need for empirical validation of hybrid methodologies, which is currently lacking. The increasing complexity and rapid changes in project environments make the exploration of hybrid methodologies particularly relevant today. The importance of the article for project managers is a real gap filler in terms of structured exploration of the practical application of mixed project management methodologies, which results in identification and discussion of five different hybrid methodologies, their benefits, and limitations.

2. Research method

The search and selection of literature took place in several steps. A database search was performed through Scopus and Web of Science. The search was not limited by a specific year of publication but documents till end of 2023 were examined. Only studies in English were included. Full texts were read from start to finish. In order to confirm the data validation, the research in parallel was conducted by the authors.

Firstly, the search with the search string yielded 289 articles in Web of Science and 658 in Scopus (Fig. 1). After extracting these into excel, applying a filter that removes duplicates received 710 results. Articles were screened by filtering "hybrid" and "project management" receiving 502. These have been reviewed for relevancy by analyzing the title and the abstract, 437 have been excluded, 65 were shortlisted. In total 23 were categorized as not found, not in English language and no full text received from author. Finally, 42 articles were listed as suitable, clearly containing project management and 36 containing hybrid project management, noted in the title, keywords and abstract. Next step was to analyze the full text and relevant content of the suitable articles.

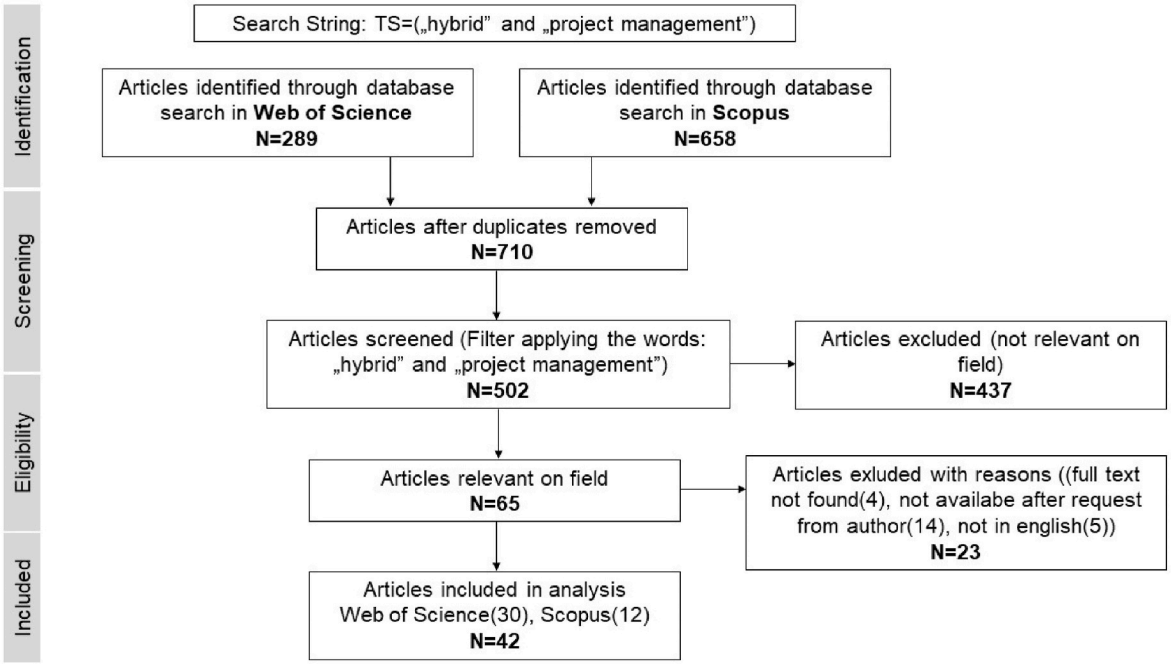

Fig. 1. Systematic literature review process, result of findings in Scopus and Web of Science after data clean-up
Source: Own Editing (2024).

Through the process of selecting articles, all articles retrieved in a list have been reviewed based on their relevancy on the field of evaluation of project management methodologies examining their title and content, in order to exclude subjects by three guidelines.

(a) Filtering using the same keywords: The process of filtering articles using the same keywords initially used for identification may indeed seem counterintuitive at first glance. However, this step is crucial for refining the search results. The initial keyword search is deliberately broad to capture a wide range of articles that may be relevant. The subsequent filtering involves a more detailed analysis, where articles are reviewed to determine their actual relevance to the specific focus of the study. This could involve ensuring that "hybrid" and "project management" are not just mentioned in passing but are central to the study's context. This approach is necessary to ensure that the final selection of articles is directly aligned with the research objectives.
(b) Rationale behind exclusion: The exclusion of 437 articles was based on maintaining the quality and relevance of the literature review. In order to ensure the eligibility of articles for inclusion, the authors presented the Inclusion and Exclusion criterias to justify the methodology section, providing clearer insight into how decisions were made when narrowing articles.
(c) Reliability and validity concerns: To address concerns about reliability and validity, it's important to emphasize that the filtering process involved multiple stages of review, including initial screening, abstract review, and full-text analysis. Each stage was conducted systematically to reduce bias and ensure that the final selection was both comprehensive and relevant. While the selection process might seem complex, it is designed to ensure that the final set of articles is both high-quality and directly relevant to the research questions.

In terms of limitations and risks, bias might be adopted from analyzed studies, being aware that this scoping review relies on available content and context. Many articles, particularly case studies, tend to highlight positive outcomes when using hybrid project management (HPM) method, however there are no case studies including qualitative analysis related to proven project success due to a hybrid approach, because there is not widely applied yet. In order to assess certainty (or confidence) in the body of evidence as an outcome, the authors clearly formulated in the research questions to define the HPM as clear as possible and to find advantages and disadvantages that can be easily interpreted. Beside these goals, the authors would also like to collect every variation of combined methods as an outcome of this research.

3. Result of articles

The authors introduced three categories for the project management main categories, such as TPM for Traditional Project Management, APM for Agile Project Management and HPM for Hybrid Project Management. In Appendix 1 for each and every article the authors indicated the main project methodology categories that are in focus of those articles. The authors refer to these abbreviations in the whole paper, including tables.

From the total 42 articles 6 contain "hybrid project management" in their title, 4 contain "hybrid approach" not necessarily related to project management, but more to a narrowed element, such as risk assessment or time-cost challenges. These were deeply analyzed in order to identify precisely #RQ1. Some studies did not appear to meet the targeted inclusion criteria (Table 1), but which were excluded, as those relate more to.

Table 1
List of inclusion and exclusion criteria.

Inclusion criteria	Exclusion criteria
Agile and traditional methods are analyzed	The article text is not in English
HPM methods are a significant party of the study	There is no full text of the article available
One or more hybrid methods are described using combination of different methods	Full text has been requested from authors, but not received
The advantages or disadvantages of HPM are discussed	The article does not address any research question closely related to HPM

Source: Own Editing (2024)

- qualitative and quantitative project risk assessment (Barghi and Sikari, 2020),
- project success criteria - an exploratory study on the influence of the variables project typology and type of stakeholder (Borges and De Carvalho, 2015),
- prediction of project success using artificial intelligence (Ko and Cheng, 2007),
- the hybrid IT project manager - one foot each in the IT and business domains (Ko and Kirsch, 2017),
- new risk analysis tool is proposed that handles the project flexibility and the dependency of the risk factors (Kosztyan et al., 2020),
- hybrid time-quality-cost trade-off problems (Kosztyan and Szalkai, 2018),
- analyzing through case studies if management basics affected when using agile methods (McMahon, 2006),
- project time–cost trade-off scheduling (Mokhtari et al., 2010),
- decision support framework that integrates up-to-date metrics data with simulation models to support the software development process (Raffo, 2005),
- hybrid-directional planning: improving improvement heuristics for resource-constrained project scheduling (Ying and Lin, 2009).

The selection and analysis of articles was guided by five research questions determined, found in Table 2. During the search and analysis of academic literature, the individual articles were manually reviewed and searched for relevant content related to the research questions. The literature was then systematically categorized with regard to the research questions using a spreadsheet to track the selection process and facilitate the subsequent detailed comparison and discussion.

4. Results

Traditional project management (TPM) involves very disciplined liner process, upfront planning (Agbejule and Lchtincva, 2022). It has well-defined stages, such as requirements, design and planning, implementation, verification and finally maintenance (Almedia, 2021). With this approach, distinct project lifecycle phases are easily recognizable. Tasks are completed one after another in an orderly sequence, requiring a significant part of the project to be planned up front (Haas, 2007). This is like planning an entire building before construction starts, unlike building one piece at a time. Traditional project management forces the client to define exactly what they want (Wysocki, 2019), then it needs to be well specified under the control of the project manager, before any meaningful planning or work can be done. Interestingly, those who prefer and support agile methods, understand the need of traditional tools to keep overall awareness they nevertheless present an individual assertiveness in particular cases (Bogumil, 2020).

The *waterfall project methodology* (Bianchi et al., 2022; Pervoukhin et al., 2020) is a traditional linear approach that assumes projects are predictable and all activities can be systematized in a detailed plan at the beginning of the project, delivered sequentially avoiding the occurrence of major changes (Bianchi et al., 2022). This methodology excels when project goals are clearly understood and non-negotiable (Van Der Steren and Golding, 2018), preferred for large-scale and safety critical projects with known upfront requirements (Siddique and Hussein, 2014). Most of the articles provide insight into the characteristics of waterfall project management and its comparison with agile methodologies, offering a comprehensive understanding of their strengths and limitations.

Table 2
Research questions.

#RQ1	What is the definition of hybrid project management?
#RQ2	How can project management methodologies be categorized?
#RQ3	Which methodologies are taken into consideration when using a combination/mix of them?
#RQ4	What are the advantages and disadvantages of hybrid project management combinations?
#RQ5	What type of projects or industries is hybrid project management suitable for?

Source: Own Editing (2024)

PRINCE2 project methodology (PRojects IN Controlled Environments) (Almeida, 2021) is a widely recognized project management methodology originating from the European community since the late 90's. It emphasizes satisfying business needs and treats the project as a temporary organization delivering business products (Gunawardena, 2022). The PRINCE2 methodology is a widely adopted project management approach used in both government and private sectors worldwide (Coppola & D'Ambrogio, 2016) and its main characteristic is that it is a product-based planning method that divides projects into manageable stages to administer project risk more efficiently (Naik and Jenkins, 2019). It encompasses principles, themes, processes, and the project environment and is justified by a business case (Delgado et al., 2020). This method is mentioned only in one article, highlighting its appliance in process based controlled environments (Almedia, 2021).

Lean project management (AbuKhamis and Abdelhadi, 2022; Ershadi et al., 2021) is a methodology that applies Lean Management principles to project management, aiming to improve efficiency and effectiveness (Erne, 2022; Hüsselmann, 2023). Lean concept is widely used for quality improvement and business management, as this strategy's aim is to remove waste in any system (AbuKhamis and Abdelhadi, 2022), focusing on elimination of losses and successful delivery of projects (Leach, 2005). Lean can result in significant savings and profitability for companies by reducing cycle times and increasing customer satisfaction (Kliem, 2015) by maintaining sustainability and decreasing the negative environmental impact (Ershadi et al., 2021). While Lean project management shares some principles with agile methodologies, such as continuous improvement and customer focus, it is more closely associated with traditional project management in its structured approach to planning, execution, and control. However, organizations can integrate Lean principles into both traditional and agile project management approaches to improve efficiency, reduce waste, and enhance value delivery. This methodology is not used widely, because agile methodologies spread around in the past decade.

Stage-Gate Model (Barbosa and Saisse, 2019; Conforto and Amaral, 2016; Zasa et al., 2021) focuses on the effort dedicated to the initial planning phase to identify and detail requirements and product specifications (Vinekar et al., 2006). The stage-gate model presents an overall and unified vision, which facilitates communication between team members (Conforto and Amaral, 2016). Planning and validation are mentioned as the two main elements of the method (Zasa et al., 2021) through a system of interconnected stages (execution phases) and gates (validation points). Articles mention, that combined with agile practices, it supports the use of agile principles, such as promoting a team's self-discipline and process flexibility to allow experimentation and iterative development, using multiple planning and execution levels.

Agile methodologies (APM) are the most widely discussed and rising methods in the past two decades. Agile approaches help to minimize this risk by segmenting the project in smaller phases, where the requirements are specific to each phase and changing them will not impact the other phases (Cabeças, 2022). The "agile" terminology for software development emerged in 2001, as a response to the traditional models of software development (Machado et al., 2015). The most important concept of agile is the "Agile Manifesto" (Beck et al., 2001), which defines important characteristics of the model. Among those, the following principles can be stated.

- Individuals and interactions over processes and tools.
- Functional software over comprehensive documentation.
- Customer collaboration over contract negotiation.
- Responding to change over following a plan.

Kanban (Almeida, 2021; Azenha Copola et al., 2021; Gemino et al., 2021; Suarez-Gomez and Hoyos-Vallejo, 2023) is an agile concept colonizing the project management landscape. The well-known Kanban board, aims to visualize progress, developing a work breakdown structure to define scope, or using a risk register to manage risks (Hoda et al., 2017). It is considered to guarantee better performance in services and operations nature of projects (Suarez-Gomez and Hoyos-Vallejo, 2023). The much-hyped process management tool was first introduced as an integral part of the just-in-time lean manufacturing production paradigm introduced at Japanese auto giant Toyota in the early 1950's (Hollingsworth, 2011). Kanban method has gained wide acceptance in various industries, including software and manufacturing, due to its focus on fast production, continual user feedback and minimizing average production time and costs. Kanban nowadays is mainly used in software development that emphasizes real-time workflow, transparency and continuous improvement (Gong et al., 2017). It empowers team members to self-commit, improving stakeholder expectations and motivation (Kumar et al., 2022). Kanban focuses on fast production, rapid user feedback and continual interaction (Ahmad et al., 2016). Challenges in Kanban involve balancing development and testing, monitoring progress and lack of experience with Kanban boards (Nakazawa and Tanaka, 2016). There are some proposed solutions that include an enhanced software project monitoring task model and a web-based digital Kanban tool with Work in Progress (WIP) visualization and limitation (Ahmad et al., 2018). Kanban is compared with Scrum, another agile method, with results suggesting that both methods lead to successful projects, but Kanban may be better at managing project schedules (Lei et al., 2017) and it is increasingly popular in the software industry.

The *Scrum* framework (Afshari and Gandomani, 2022; Bose et al., 2023; Drury-Grogan, 2014; Hoda et al., 2017; Machado et al., 2015; Suarez-Gomez and Hoyos-Vallejo, 2023; Zuzek et al., 2020) is known for its flexibility and adaptability, making it suitable for empirical-based project development (Sassa et al., 2023). Scrum is the most popular method of agile software development by emphasizing project management (Afshari and Gandomani, 2022). Having some specific aspects, such as two-four weeks long sprints as development cycles, daily stand-ups as status reporting format and team collaboration, enhances the likelihood of successful software implementation (Bose et al., 2023), being ready to adapt any changes. The planning of activities goes through an iterative (non-liner) framework, allowing flexibility for changing requirements (Drury-Grogan, 2014), making it suitable for managing the uncertainties and complexities of software development projects (Wiboonrat, 2016). Most companies implement agile practices for applying Scrum into physical product development (Zuzek et al., 2020). Scrum, is a well-known agile framework, that has been successfully combined with traditional project management in large development programs, resulting in on-time and on-budget project delivery (Dingsoyr et al., 2019). Scrum in many articles is highlighted as an alternative approach to traditional project management, offering new framework beyond the currently popular agile methods. Based on the analyzed abstracts, it is evident that Scrum project management is a widely discussed topic in the academic literature, and provides substantial evidence of the successful integration of Scrum with traditional project management, highlighting its benefits in terms of project delivery, adaptability and communication improvement.

Extreme programming (Afshari and Gandomani, 2022; Bose et al., 2023) is an agile method for software development that ensures customer satisfaction, better software quality, and efficient project management through continuous discussion and integration of new features and ideas (Shrivastava, 2021). "Extreme Programming (XP) can be used to improve a team's productivity" (Bose et al., p.41). The use of extreme programming practices such as pair programming, unit tests, daily stand-ups, weekly cycles, release planning and feedback loops, has been shown to increase the human factor output and generate promising ideas about complex design issues in large-scale distributed systems (Abdullah and Abdelsatir, 2013). In conclusion, extreme programming has been applied mainly in software development (Afshari and Gandomani, 2022), but did not reach the popularity of scrum, it has very few citations in academic literature.

And finally, as a result of our research, that shows there is a need to combine elements from more methods, the authors analyzed the acceptance and existence of *hybrid project management* (HPM). When analyzing the relevant literature, it was noticeable that most articles refer to combination/mix of agile and traditional project management methodologies, in order to benefit from the advantages of both methodologies. One study (Braganca et al., 2023) presents a proposal to manage communication in a virtual project team, adapting concepts from traditional and agile approaches into a hybrid framework (Bragança et al., 2023). Understanding HPM approaches and their adoption remains limited, with few studies focused primarily on software product development (Costantini et al., 2021), no content proves that organizations have an official hybrid project management framework, rather that project managers bring together the traditional approach with components of the agile approach for individual parts of the projects.

Currently, hybrid (i.e., combinations of traditional and agile) approaches are becoming increasingly popular, however these approaches lack a principled foundation and algorithmic treatment (Kosztyán and Szalkai, 2018), in this way, the project management approach can be individually adapted to the needs, using the best aspects from both worlds. Most of articles mention HPM, but that is a theory-based model, that prescribe specific actions (Kosztyan et al., 2020), and very little research has been conducted to determine why hybrid initiatives are more effective. One article (Leong et al., 2023) examines the distinctions between traditional and agile project management and how the two techniques might be combined to create a hybrid approach to product development. Given the limited information available, it is evident that while there is substantial interest and ongoing research in hybrid project management, there is still a need for more comprehensive understanding and structured methodologies to guide its implementation. While the abstracts provide insights into benefits and challenges of hybrid project management, they do not offer a single concise definition. Summarizing the above for #RQ1, the definition of hybrid project management involves combining traditional and agile project management techniques to leverage the strengths of each and mitigate their weaknesses (Reiff and Schlegel, 2022). Hybrid project management integrates predictive and adaptive management, gaining relevance due to the impact of agility and the need for flexibility based on project nature and context (Vila Grau and Capuz Rizo, 2022).

Based on analysis of the examined literature, project management methodologies can be categorized into two groups, showing in Table 3, receiving the answer for #RQ2.

Findings related to #RQ3 indicate that there is an emerging tendency for specifying hybrid project management methodologies, since most of studies already contain a general proposal for a combination of two approaches of Agile & Traditional (HPM), depending the affected industry area or project concerned.

Hybrid project management is suitable for projects and industries that require a balance between structure and flexibility, innovation and discipline and adaptation to changing circumstances. By combining different methodologies or approaches, project management professionals and organizations can tailor their project management practices to suit the specific needs and constraints of their projects and industries such as Information Technology (software and product development, marketing and advertising), Research and Development (pharmaceuticals, biotechnology, and scientific research), Supply Chain and Logistics (warehouse management systems implementation, and logistics improvements) (#RQ5).

The selection of industries such as Information Technology, Research and Development, and Supply Chain and Logistics for the discussion of hybrid project management is based on the unique characteristics and

Table 3
Traditional project management and agile project management.

Traditional		Agile	
Waterfall model (Bianchi et al., 2022; Pervoukhin et al., 2020)	A linear approach where each phase flows sequentially from initiation to closure, with little room for iteration or change.	**Kanban** (Almeida, 2021; Azenha Copola et al., 2021; Gemino et al., 2021; Suarez-Gomez and Hoyos-Vallejo, 2023)	A visual management method that focuses on workflow visualization, limiting work in progress, and continuous improvement. Work items are represented as cards on a Kanban board and teams use visual cues to manage and prioritize their work.
PRINCE2 (Projects IN Controlled Environments) Almeida (2021)	A process-based methodology that divides the project into manageable stages, each with defined inputs, outputs and activities.	**Scrum** (Afshari and Gandomani, 2022; Bose et al., 2023; Drury-Grogan, 2014; Hoda et al., 2017; Machado et al., 2015; Suarez-Gomez and Hoyos-Vallejo, 2023; Zuzek et al., 2020)	An iterative framework that emphasizes collaboration, transparency, and frequent inspection and adaptation. It divides work into short, fixed-length iterations called sprints, with regular feedback loops and ceremonies such as daily stand-ups, sprint planning, sprint reviews and retrospectives.
Lean (AbuKhamis and Abdelhadi, 2022; Ershadi et al., 2021)	Originates from Lean manufacturing principles, which focus on maximizing value while minimizing waste. In the context of project management, Lean emphasizes efficiency, continuous improvement and eliminating non-value-adding activities.	**Extreme Programming (XP)** (Afshari and Gandomani, 2022; Bose et al., 2023)	An agile software development methodology that emphasizes practices such as test-driven development, pair programming, continuous integration and collective code ownership to improve software quality and responsiveness to changing requirements.
Stage-Gate (Barbosa and Saisse, 2019; Conforto and Amaral, 2016; Zasa et al., 2021)	Dedicates importance on the initial planning phase to identify and detail requirements and product. Planning and validation are mentioned as the two main elements of the method through a system of interconnected stages (execution phases) and gates (validation points).		

Source: Own Editing (2024)

demands of these fields, which make them particularly well-suited for hybrid approaches and are mentioned in analyzed articles. These industries are particularly suited for hybrid project management due to their need for both flexibility and structure to manage complex, dynamic, and often high-stakes projects. IT projects often require agility to adapt to rapidly changing requirements while maintaining control over large-scale implementations. R&D projects benefit from the adaptive nature of agile methods during experimentation but also need the rigor of traditional management for compliance and documentation. In Supply Chain and Logistics, the need for detailed planning and coordination is balanced by the ability to quickly respond to disruptions, making a hybrid approach ideal for these dynamic environments. The hybrid approach provides the necessary adaptability to handle changes and innovation while ensuring that the project remains aligned with essential goals, timelines and regulations.

The advantages of hybrid project management include the ability to customize methods to meet project and stakeholder needs, manage risk effectively and achieve better outcomes, while challenges include the difficulty in understanding the differences or similarities of hybrid methodologies and the fragmented knowledge about prerequisites and success factors for implementing hybrid project management (#RQ4).

In Table 4, hybrid/mixed project management approaches identified in articles have been shortlisted, with their benefits and limitations.

Summarizing all the above, findings and answers for formulated research questions are presented in Table 5.

5. Conclusion

5.1. Key findings and contributions to project management literature

This study has thoroughly examined the essential characteristics of traditional and agile project management methodologies, providing a detailed analysis of their respective strengths and weaknesses. This comprehensive evaluation offers valuable insights that contribute significantly to the understanding and application of these methodologies in diverse project environments in business administration field, including mainly business products and service development areas.

Traditional project management methodologies are characterized by a sequential approach, where projects follow a linear progression through distinct phases such as initiation, planning, execution, monitoring, and closure. Each phase must be completed before moving on to the next, ensuring a structured and orderly process. There is a significant emphasis on upfront planning, with comprehensive definitions of project requirements, scope, schedule, and resources established at the beginning. This approach often involves working with fixed scopes and requirements, aiming to minimize changes once the project is underway. Documentation plays a critical role, with detailed project plans, requirements documents, and progress reports being regularly generated and maintained. Additionally, traditional project management typically operates within a hierarchical structure, where clear roles and responsibilities are defined for project managers, team members, and stakeholders.

In contrast, agile project management methodologies are iterative and incremental, breaking down projects into smaller increments or iterations. This allows for continuous feedback and improvement throughout the project lifecycle. Agile methodologies prioritize customer collaboration, ensuring that the project delivers value and meets customer expectations through regular involvement and feedback. Adaptive planning is a key characteristic, with agile projects embracing change and adjusting plans and priorities as needed to deliver the highest value. Agile teams are typically cross-functional, comprising members from different disciplines who work collaboratively to deliver results. There is a strong emphasis on individuals and interactions, valuing face-to-face communication and collaboration among team members to promote trust, transparency, and shared ownership of the project. Agile teams also strive for continuous delivery,

Table 4
The advantages and disadvantages of project management methods.

Combination	Advantages/Benefits	Disadvantages/Limitations
Waterfall (Traditional)& Scrum (Agile)(Afshari and Gandomani, 2022)	• Maintain the structured approach of Waterfall while incorporating Agile's Scrum *flexibility*. • Better *risk management* as potential issues can be identified early and addressed promptly. • Waterfall provides *clear milestones and* deliverables; Scrum iterations help to set and monitor expectations with regular progress updates. • Waterfall's structured reporting and documentation can facilitate better communication with *stakeholders;* while Scrum's iterative cycles allow for their continuous involvement and feedback.	• Combining these two methodologies can introduce *complexity*, potentially leading to confusion among team members. • Waterfall and Scrum often have different cultures and mindsets, integrating them requires significant *cultural adaptation.* • Implementing and maintaining two methodologies simultaneously can be *resource*-intensive, requiring additional training, coordination, and overhead costs.
Stage-Gate (Traditional)& Agile (Barbosa and Saisse, 2019; Conforto and Amaral, 2016; Zasa et al., 2021)	• Combining Stage-Gate's structured stages with Agile's *flexibility* offers a balanced project management approach. • Stage-Gate emphasizes *risk assessment* at each stage of the project. Combined with Agile helps teams address risks early, preventing costly delays. • Integrating *customer feedback* at key project stages ensures a customer-centric product development approach. • Stage-Gate and Agile together enable faster decision-making, shorter development cycles, and *continuous value delivery* to customers.	• Merging Stage-Gate and Agile can be *complex* due to differing processes and decision points, potentially straining resources. • Stage-Gate's and Agile's *different cultures* may cause resistance or confusion among team members. • Stage-Gate's extensive documentation and reporting at each stage of the project may conflict with Agile's preference for working software over comprehensive documentation, posing challenges in achieving balance.
Agile-Concurrent hybrid (Zuzek et al., 2020)	• Offers a high degree of *flexibility*, allowing teams to adapt quickly to changing requirements. • Enable *early identification and mitigation of risks* through iterative development cycles. • Promote *collaboration* among cross-functional teams, fostering communication, transparency. • Agile-Concurrent hybrids prioritize delivering value to customers through frequent iterations and continuous feedback, resulting in higher levels of *customer satisfaction* and product quality.	• Agile-Concurrent hybrids can introduce *complexity* due to the integration of multiple agile methods and coordination of activities, which may require additional training and resources. • Adopting Agile-Concurrent hybrids may require a mindset change and *cultural adaptation* within the organization. • *Measuring progress and performance* in Agile-Concurrent environments can be challenging, as the dynamics of iterative development might differ.
Scrum (Agile) & XP-Extreme Programming (Agile) Bose et al. (2023)	• Combining Scrum and XP allows a *flexible* approach in software development with Scrum's iterative framework and XP places a strong emphasis on quality. • Both Scrum and XP promote *continuous improvement.* Scrum encourages reflection and adaptation through regular retrospectives, while XP emphasizes ongoing refinement of development practices. • The combination of Scrum and XP enables *close collaboration with stakeholders and customers* throughout the development process, by incorporating feedback early and often.	• Combining Scrum and XP can be complex, requiring teams to balance between their different practices and processes. Overemphasizing specific XP practices may lead to unnecessary *complexity*. • Scrum and XP have *different cultures and mindsets,* which may lead to resistance or confusion among team members. • Implementing and maintaining a hybrid of Scrum and XP methodologies may require *additional resources,* including time, training and infrastructure.
Scrum (Agile) & Kanban (Agile) Suarez-Gomez and Hoyos-Vallejo (2023)	• Combining Scrum and Kanban allows *flexibility* to project management with Scrum's iterative sprints and Kanban's continuous flow of work. • Kanban's visual board provides *transparency* and clarity into the status of deliverables. When integrated with Scrum, teams can use Kanban boards to visualize sprint backlogs, track progress, and identify bottlenecks, enhancing communication and collaboration. • Kanban's focus on *continuous delivery* flow and limiting work in progress (WIP) by eliminating waste in the development process complements Scrum's iterative delivery model. • The combination of Scrum and Kanban promotes *efficiency* by allowing teams to prioritize work, visualize dependencies, and manage resources effectively.	• Combining Scrum and Kanban may introduce *complexity*, as teams must balance between the different practices and processes associated with each methodology. • Scrum and Kanban have *different cultures and mindsets,* which may lead to resistance or confusion among team members when combining them. • Scrum defines specific roles such as Scrum Master, Product Owner, and Development Team, while Kanban does not prescribe specific roles. When combining the two methods, teams may experience *role ambiguity* or overlap in role responsibilities, leading to confusion or inefficiencies. • Scrum operates on fixed-length sprints, while Kanban focuses on continuous flow which leads to *cadence misalignment.*

Source: Own Editing (2024)

providing working software or tangible outcomes early and often to stakeholders.

This review identified various hybrid models, but these are often tailored to specific areas or organizations. A general, practical hybrid

Table 5
Research questions – findings result.

#RQ1	What is the definition of hybrid project management?	The definition of hybrid project management involves combining traditional and agile project management techniques to leverage the strengths of each and mitigate their weaknesses (Reiff and Schlegel, 2022). Hybrid project management integrates predictive and adaptive management, gaining relevance due to the impact of agility and the need for flexibility based on project nature and context (Vila Grau and Capuz Rizo, 2022).
#RQ2	How can project management methodologies be categorized?	They can be categorized into two main categories, such as Traditional (including Waterfall, Prince2, Lean, Stage-Gate) and Agile (including Scrum, Kanban, Extreme Programming), presented in Table 4.
#RQ3	Which methodologies are taken into consideration when using a combination/mix of them?	Findings indicate that there is an emerging tendency for specifying hybrid project management methodologies, since most of studies already contain a general proposal for a combination of two approaches of Agile & Traditional (HPM), presented in Table 4.
#RQ4	What are the advantages and disadvantages of hybrid project management combinations?	The advantages of hybrid project management include the ability to customize methods to meet project and stakeholder needs, manage risk effectively and achieve better outcomes, while challenges include the difficulty in understanding the differences or similarities of hybrid methodologies and the fragmented knowledge about prerequisites and success factors for implementing hybrid project management. In Table 4, hybrid/mixed project management approaches identified in articles have been shortlisted, with their benefits and limitations.
#RQ5	What type of projects or industries is hybrid project management suitable for?	Hybrid project management is suitable for projects and industries that require a balance between structure and flexibility, innovation and discipline, and adaptation to changing circumstances. By combining different methodologies or approaches, project management professionals and organizations can tailor their project management practices to suit the specific needs and constraints of their projects and industries such as Information Technology (software and product development, marketing and advertising), Research and Development (pharmaceuticals, biotechnology, and scientific research), Supply Chain and Logistics (warehouse management systems implementation, and logistics improvements).

Source: Own Editing (2024)

model is still lacking, highlighting the need for systematic tailoring of these models. Future research should focus on developing universal, easy-to-use frameworks to help organizations select and design fit-to-purpose methods for each project. Cicmil and co-authors (2006) noted that despite extensive literature on traditional project management, there is a lack of understanding about the real-world practice of managing projects (Cicmil et al., 2006). This observation also applies to Hybrid Project Management (HPM), as many researchers emphasize the need for empirical and qualitative studies to understand how HPM is actually adopted and used in practice.

Only one paper aims to enhance the understanding of project management in Research & Development & Innovation (R&D&I) projects. The study identifies the top-10 'most used' and 'most useful' PM practices, emphasizing the importance of the project 'Initiation' phase. It also highlights a set of 'must have' PM practices that exhibit a perfect fit, suggesting their consistent implementation impacts successful project outcomes. The paper explores the causes behind the 'use misfit' of the remaining practices and identifies leadership as a key strategy to address these misfits (Fernandes et al., 2024). This study does not recommend hybrid way of combining best PM practices, it highlights PM best practices only mentioned generally. This new scoping review on HPM contributes to earlier studies in a unique way. The authors were able to clearly present hybrid PM approaches in Table 4., that are found in the currently available academic literature. This provides a foundation for future research, makes future research easier, identifies existing HPM practices, offers a framework for comparative analysis, and stimulates new research questions, thereby advancing the field of hybrid project management.

Marnewick and co-authors (2024) emphasizes the need for diverse research methods in project management beyond traditional approaches like case studies, interviews, and surveys (Marnewick et al., 2024). It highlights the potential of Soft Systems Methodology (SSM) to enhance project management knowledge. The study demonstrates how SSM can clarify complex concepts, messy situations. By knowing from this HPM scoping review what HPM methods have been emerged in the past decade, it can serve as a great baseline for future research. This baseline can help identify gaps in existing models, and develop new frameworks that are more universally applicable. It also provides a foundation for empirical and qualitative studies to understand the real-world adoption and effectiveness of hybrid project management practices.

5.2. *Limitations and future research recommendations*

The authors' research acknowledges limitations, including potential constraints on generalizability and the influence of biases from prior studies. The authors have addressed a systematic literature review by excluding threats such as search term accuracy and database selection and defining clear inclusion and exclusion criteria. While the authors' study focused on the Web of Science and Scopus databases for its quality, integrating additional databases and grey literature could yield further insights. However, the authors' transparent research design enhances replicability and ensures rigor. Despite its potential, this research faces other limitations that require attention. One key aspect is the necessity to test the HPM frameworks in practical scenarios. While the theoretical synergy between agility and traditional method appears promising, empirical evidence is needed to substantiate this assumption. Traditional project management methods are not easy to accept in software development, it does not provide flexibility in terms of changes. Developers need details of the approved specification and requirements, which definitely is the strengths of waterfall methodology, but it can be suitable for projects which do not need intense communication. HPM methods can be as well contextually generalized. Not all business development projects can be managed using a single method.

This recent study provides a base for future research work, based on results the authors can formulate further research areas, that can relate to examination of application and adaptation of hybrid project management in different industries, explore the challenges and barriers organizations face when adopting hybrid project management, investigate the impact of hybrid project management on team dynamics, leadership, and communication, conduct studies to track the effects of using hybrid project management in organizations. The authors also formulated few research questions related to this study that can be addressed in future studies, for instance how do organizations tailor hybrid methodologies

to fit specific project types and environments, what specific tools and techniques are most commonly used in hybrid project management, how does the adoption of hybrid project management affect team collaboration and communication, what are the long-term outcomes of hybrid project management on organizational performance and project success?

6. Policy implications

Study results show heterogeneity, hybrid methods usually incorporate the best of both worlds, without differing project types, focusing on the expected outcomes prior to selecting the appropriate method to use. Agile PMs need to also be familiar with traditional methods, so that they will be best positioned in determining the level of mix of methods. In general, the *Structured Planning, Robust Risk Management and Measurement and Metrics* are most frequently used elements from traditional project management, other elements are mostly incorporated from agile methodologies, such as *Continuous Improvement, Stakeholder Engagement, Iterative Delivery, Flexibility in Tools and Techniques, Empowered Cross-Functional Teams, Adaptability*. When choosing the project management methodology, it is essential to identify project characteristics, including.

- determine project size, scope, budget, duration,
- determine complexity, technological requirements,
- regulatory requirements (as some industries like healthcare, finance have strict regulations),
- quality standards (certain industries may have specific quality standards or certifications that need to be followed).

Tailoring the methodology, it is important to fit the specific needs of the project and industry, define the processes, tools, techniques that align with project characteristics and industry requirements, establish roles and responsibilities tailored to the project team and stakeholders that depends a lot on the company's culture in terms of daily operation. In order to increase efficiency and project success, project managers must adapt the methodology as necessary based on changes in project requirements, industry standards or organizational needs, provide training and support to project teams on the selected methodology to ensure understanding and adoption, foster a culture of continuous learning and improvement within the organization regarding project management practices.

As a summary and conclusion of the results, the authors collected the most frequently considered guidelines from different project methodologies can be an initial framework for project managers when planning and design a project in practice.

- *Agile Principles:* Embrace agile principles such as customer collaboration, iterative development, and responding to change. This fosters flexibility and adaptability throughout the project lifecycle.
- *Structured Planning:* Incorporate structured planning elements from traditional methodologies to ensure thorough upfront planning and clear project objectives.
- *Continuous Improvement:* Implement mechanisms for continuous improvement, drawing from Lean principles and agile retrospectives. Encourage regular reflection and refinement of processes to enhance efficiency and effectiveness.
- *Stakeholder Engagement:* Prioritize stakeholder engagement and communication, leveraging techniques from both agile and traditional methodologies to ensure alignment and satisfaction.
- *Iterative Delivery:* Adopt iterative delivery approaches to enable early and frequent delivery of value to stakeholders, while maintaining quality standards and managing risks effectively.
- *Flexibility in Tools and Techniques:* Allow flexibility in selecting tools and techniques based on project requirements and team preferences. Utilize a mix of traditional and agile tools to support project planning, tracking and collaboration.
- *Empowered Cross-Functional Teams:* Foster cross-functional teams with empowered decision-making authority, enabling faster problem-solving and innovation.
- *Risk Management:* Integrate robust risk management practices, drawing from traditional methodologies, to identify, assess, and mitigate risks throughout the project lifecycle.
- *Measurement and Metrics:* Establish clear metrics and Key Performance Indicators (KPIs) to measure project
- *Adaptability:* Remain open to adaptation and evolution of the project management approach based on lessons learned and changing project dynamics.

By combining the best practices from various methodologies into a hybrid approach, this guideline provides a flexible and balanced framework that can be tailored to suit the unique needs of different projects and organizations. No set-in stone HPM is available for specific projects, it is the project manager's knowledge and responsibility to adapt combined methods, depending on the project type and its special characteristics.

CRediT authorship contribution statement

Blanka Székely: Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Szilvia Erdeiné Késmárki-Gally:** Writing – review & editing, Validation, Supervision, Methodology. **Zoltán Lakner:** Writing – review & editing, Validation, Supervision, Methodology.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix

Appendix 1

List of articles as a result of systematic review

Categ.	Reference list serial Nr.	Authors	Publ. Year	Research area and Study type	Article Title
TPM	2	AbuKhamis & Abdelhadi	2022	Agile and Lean project methodology	A Critical Analysis of Agile and Lean Methodology to Fulfill the Project Management Gaps in Nonprofit Organizations (NPOs)
APM, HPM	3	Afshari & Gandomani	2022	Risk management in project management	A novel risk management model in the Scrum and extreme programming hybrid methodology
TPM, APM, HPM	4	Agbejule & Lchtincva	2022	Project management techniques	The relationship between traditional project management, agile project management and teamwork quality on project success
TPM, APM	8	Almeida	2021	Agile project management	Management of non-technological projects by embracing agile methodologies
TPM, APM	9	Azenha Copola et al.	2021	Hybrid project management methods	The Role and Characteristics of Hybrid Approaches to Project Management in the Development of Technology-Based Products and Services
HPM TPM	10	Barbosa & Saisse	2019	Hybrid project management methods	Hybrid Project Management for Sociotechnical Digital Transformation Context
N/A	11	Barghi & Sikari	2020	Risk management in project management	Qualitative and quantitative project risk assessment using a hybrid PMBOK model developed under uncertainty conditions
TPM, APM, HPM	13	Bianchi et al.	2022	Project management practices	Recommendation of Project Management Practices: A Contribution to Hybrid Models
TPM, APM	14	Bogumil	2020	Project management practices	Dissimilarities between applied methods of project management impacting regression in business processes and technical architecture
N/A	15	Borges & De Carvalho	2015	Project success	Project success criteria: An exploratory study on the influence of the variables project typology and type of stakeholder
APM, HPM	16	Bose et al.	2023	Hybrid project management methods	Hybrid Scrum-XP: A Proposed Model based on Effectiveness of Agile Model on Varieties of Software Companies in Bangladesh
HPM, TPM, APM	17	Braganca et al.	2023	Project communication management	Hybrid project management solutions with multi-geographical teams
TPM, APM	18	Cabecas	2022	Project management practices	Evolution of Project Management in the Digital Economy
TPM, APM	19	Car-Pusic et al.	2020	Hybrid project management methods	Development of a Hybrid Agile Management Model in Local Self-Government Units
TPM, APM	21	Ciric et al.	2022	Project success	How project management approach impact project success? From traditional to agile
TPM, APM, HPM	22	Conforto & Amaral	2016	Hybrid project management methods	Agile project management and stage-gate model-A hybrid framework for technology-based companies
APM	23	Conforto et al.	2014	Agile project management	Can Agile Project Management Be Adopted by Industries Other than Software Development?
HPM	25	Costantini et al.	2021	Hybrid project management methods	Using complexity and volatility characteristics to guide hybrid project management
APM	28	Drury-Grogan	2014	Project success	Performance on agile teams: Relating iteration objectives and critical decisions to project management success factors
TPM	30	Ershadi et al.	2021	Hybrid project management methods	Selection and performance estimation of Green Lean Six Sigma Projects: a hybrid approach of technology readiness level, data envelopment analysis, and ANFIS
TPM, APM, HPM	31	Gemino et al.	2021	Project success	Agile, Traditional, and Hybrid Approaches to Project Success: Is Hybrid a Poor Second Choice?
APM	35	Hoda et al.	2017	IT project management/ Software engineering	Systematic literature reviews in agile software development: A tertiary study
HPM	39	Ko & Cheng	2007	Project success	Dynamic prediction of project success using artificial intelligence
N/A	40	Ko & Kirsch	2017	IT project management/ Software engineering	The hybrid IT project manager: One foot each in the IT and business domains
N/A APM	41	Kosztyan et al.	2020	IT project management/ Software engineering	Survive IT! Survival analysis of IT project planning approaches
N/A APM, HPM	42	Kosztyan & Szalkai	2018	Project management practices	Hybrid time-quality-cost trade-off problems
HPM, TPM, APM	46	Leong et al.	2023	Project management techniques	Hybrid Project Management between Traditional Software Development Lifecycle and Agile Based Product Development for Future Sustainability
APM	47	Machado et al.	2015	Agile project management	Project management aided by verbal decision analysis approaches: a case study for the selection of the best SCRUM practices
APM, HPM	48	Maier & Emmerich	2022	Project management practices	Agile or Traditional Project Organization: A Quantitative Assessment of Decision Criteria among Firms in the DACH Region
N/A	49	Marnewick & Marnewick	2023	Project management practices	Project managers' ability to explore and exploit predictive and iterative best practices
N/A TPM APM	50	McMahon	2006	Management	Are management basics affected when using agile methods?

(continued on next page)

Appendix 1 (*continued*)

Categ.	Reference list serial Nr.	Authors	Publ. Year	Research area and Study type	Article Title
APM	51	Mohanarajah & Jabar	2015	Project success	An improved adaptive and dynamic hybrid agile methodology to enhance software project success deliveries
N/A	52	Mokhtari et al.	2010	Hybrid project management methods	Project time-cost trade-off scheduling: a hybrid optimization approach
TPM, APM	55	Pervoukhin et al.	2020	IT project management/ Software engineering	Theoretical comparative analysis of cascading, iterative, and hybrid approaches to IT project life cycle management
N/A	57	Raffo	2005	Hybrid project management methods	Software project management using PROMPT: A hybrid metrics, modeling and utility framework
TPM, APM, HPM	58	Reiff & Schlegel	2022	Project management techniques	Hybrid project management – a systematic literature review
N/A	60	Seniy	2023	Project management techniques	Method for Selecting a Software Development Methodology Taking into Account Project Characteristics
HPM, APM	63	Sithambaram et al.	2021	Agile project management	Issues and challenges impacting the successful management of agile-hybrid projects: A grounded theory approach
APM, HPM	64	Suarez-Gomez & Hoyos-Vallejo	2023	Agile project management	Scalable Agile Frameworks in Large Enterprise Project Portfolio Management
N/A	70	Ying & Lin	2009	Hybrid project management methods	Hybrid-directional planning: improving improvement heuristics for scheduling resource-constrained projects
TPM, APM, HPM	71	Zasa et al.	2021	Project management practices	Managing the Hybrid Organization: How Can Agile and Traditional Project Management Coexist?
APM, HPM	72	Zuzek et al.	2020	Agile project management	Agile-Concurrent hybrid: A framework for concurrent product development using Scrum

Source: Own Editing (2024)

Data availability

No data was used for the research described in the article.

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