REVOLUTION IN PROJECT MANAGEMENT: FOCUSING ON SUSTAINABILITY AND AI

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In recent years, sustainability has become a pivotal focus in several areas, including project management, driven by the need to address environmental, social, and governance (ESG) considerations. This journal explores the integration possibilities and practices of sustainability in project management, emphasizing the role of Industry 5.0 and artificial intelligence (AI) in enhancing ESG outcomes through a systematic literature review of currently accessible academic literature. This literature review, following PRISMA guidelines, addresses 4 research questions. Findings reveal a scarcity of relevant literature, indicating lack of popularity among researchers. Industry 5.0, characterized by the collaboration between humans and advanced technologies, offers a transformative approach to project management by fostering innovation and sustainability. AI, with its capabilities in data analysis, predictive modelling, and decision support, plays a crucial role in supporting ESG initiatives. By leveraging AI, project managers can ensure that projects align with sustainability goals, optimize resource utilization, and enhance transparency and accountability. The authors dive into the synergies between Industry 5.0's pillars and AI, highlighting their potential to drive sustainable project management practices and contribute to long-term value creation for organizations.

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1   Introduction

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 (Martens & Carvalho, 2024). Researchers widely concur that suitable PMMs boost project success. The integration of sustainability in project management is essential for addressing ESG considerations. Industry 5.0 and AI offer transformative potential by fostering innovation, optimizing resources, and enhancing transparency (Chawla et al., 2018). By leveraging these technologies, project managers can drive sustainable practices, contributing to long-term value creation and aligning with organizational sustainability goals. Industry 5.0 represents a significant evolution in industrial practices, emphasizing human-centricity, sustainability, and resilience.

There is only fragmented knowledge regarding implemented practice of Industry 5.0 techniques in organizations. The goal of this paper is to address the fragmented knowledge regarding the implementation of Industry 5.0 techniques in project management. Specifically, it aims to identify and fill the existing gap in academic literature related to these techniques, as examined in Web of Science and Scopus. The research follows PRISMA guidelines (Page et al., 2021) to ensure a systematic, transparent, and rigorous process, focusing on four clear research questions. The study's objective is to provide comprehensive knowledge on the subject. This literature review serves as a foundational reference for future research on the application of Industry 5.0 in project management across various industries. Focusing on keywords during search,

- – Industry 5.0 and/in project management
- – Sustainability and/in project management
- – ESG and/in project management
- – AI and/in project management

the result for number of literatures (including articles, review articles, books, book chapters, conference papers, conference reviews) found in Web of Science is 166, in Scopus 177, all together 255 without duplicates. Out of these around 25% of articles are relevant to this topic after a systematic literature review, which means the topic is not yet popular among business and economists' researchers, moreover there are

several of web articles generally speaking about Industry 5.0 or sustainability and AI, those are not based on scientific research and analyses. As a result, 4 research questions are discussed, including the benefits, challenges, opportunities of Industry 5.0 on the project management field of expertise.

The selection and analysis of articles was guided by 4 research questions determined, found in Table 1. During the search and analysis of academic literature, the individual articles were manually reviewed and searched for relevant content related to the research questions.

Table 1: Research questions

#RQ1	How pillars of Industry 5.0 can be integrated in project management?
#RQ2	How does the integration of sustainability practices impact the success of project management?
#RQ3	How does the adoption of AI impact project management?
#RQ4	What challenges will bring Industry 5.0 and AI in the project management area?

Source: Own Editing (2025)

2 Theoretical Background / Literature review

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 this 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."

„The application of technology in Industry 5.0 based on a constant flow of information provides an increase in opportunities for process efficiency" (Patalas-Maliszewska & Losyk, 2024, p.2), therefore, it seems reasonable to review the related literature to examine the impacts during managing projects. Shortlisted relevant articles (Hein-Pensel et al., 2023; Zuzek et al., 2021; Taboada et al., 2023; Gibbin et al., 2023; Gärtner et al., 2023) mention several approaches and objectives of Industry 5.0, highlighting its focus on holistic, sustainable, and human-centered value creation, bringing in fore social and ecological objectives (Marcelino-Sádaba et al.;

2015; Silvius & Schipper, 2016; Silvius, 2017; Ali et al., 2016). We've collected the main characteristics of Industry 5.0's sustainability pillar and AI related to project management.

The literature on the intersection of Industry 5.0, sustainability, and artificial intelligence (AI) in project management reveals several key themes and trends. Industry 5.0 emphasizes human-centric, sustainable, and resilient production systems, leveraging advanced technologies like AI to enhance efficiency and project outcomes (Dubois & Silvius, 2020; Martens & Carvalho, 2016; Martens & Carvalho, 2017). A significant body of research highlights the transformative potential of AI in project management, particularly in improving project performance, resource allocation, risk management, and decision-making processes (Gilbert Silvius, 2017). AI techniques, such as machine learning and predictive analytics, are noted for their ability to provide accurate forecasting, optimize resource use, and enhance project planning and execution (Gibbin et al., 2023; Taboada et al., 2023; Krause et al., 2024; Aladag, 2023).

Sustainability in project management is another critical focus, with numerous studies emphasizing the integration of environmental, social, and economic dimensions into project processes (Kirchhof & Brandtweiner, 2011; Tam, 2013). The literature suggests that sustainable project management practices can lead to improved project success, stakeholder satisfaction, and long-term benefits for organizations and society (Martens & Carvalho, 2024; Keshavarzian & Silvius, 2022; Khalifeh et al., 2020). However, there is a recognized gap between the perceived importance of sustainability and its actual implementation in project management practices (Soares et al., 2023; Soares et al., 2024; Toledo et al., 2023; Vivek et al., 2023). The convergence of AI and sustainability in the context of Industry 5.0 presents opportunities for developing innovative frameworks and methodologies that incorporate both technological advancements and sustainable practices (Zhang et al., 2023; Marques et al., 2023; Ferrarez et al., 2023). This integration aims to create more resilient, efficient and responsible project management approaches that align with broader sustainability goals and the evolving demands of Industry 5.0. (Maphosa & Maphosa, 2022; Hashfi & Raharjo, 2023; Felicetti et al., 2024).

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n summary, the common themes in the articles include the transformative role of AI in enhancing project management processes, the critical importance of integrating sustainability into project management, and the potential of Industry 5.0 to drive innovative and sustainable project management practices.

3   Methodology

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 2025 02.28. were examined. Only studies in English were included. Abstracts have been exported, Full texts of relevant articles were read from start to finish. Firstly, the search with the search string yielded 166 articles in Web of Science and 177 in Scopus (Figure 1). Boolean operators used: **'and', 'in'.** After extracting these into excel, applying a filter that removes duplicates received 255 results. Articles were screened by filtering „Industry 5.0", „project management", „Sustainability", „ESG", „AI" related to project management receiving 66. These have been reviewed for relevancy by analyzing the title and the abstract, 189 have been excluded. 9 were categorized as not found and 16 no full text received from author. Finally, 41 articles were listed as suitable, clearly containing project management and Industry 5.0 noted keywords, abstracts and body text. Next step was to analyze the full text of the suitable articles.

In terms of limitations and risks, bias might be adopted from analyzed studies, being aware that this literature review relies on available content and context Many articles tend to highlight positive outcomes of Industry 5.0 provided opportunities, however there are no case studies or qualitative analysis related to proven project success due to a specific Industry 5.0 element or approach, because there is not widely applied in project management yet. While the integration of AI and sustainability in project management offers significant potential, the studies highlight several limitations and risks, including context-specific findings, researcher bias, data quality issues, ethical considerations, resistance to change, and the inability of AI to fully account for human factors. Addressing these challenges is crucial for the successful implementation of innovative and sustainable project management practices.
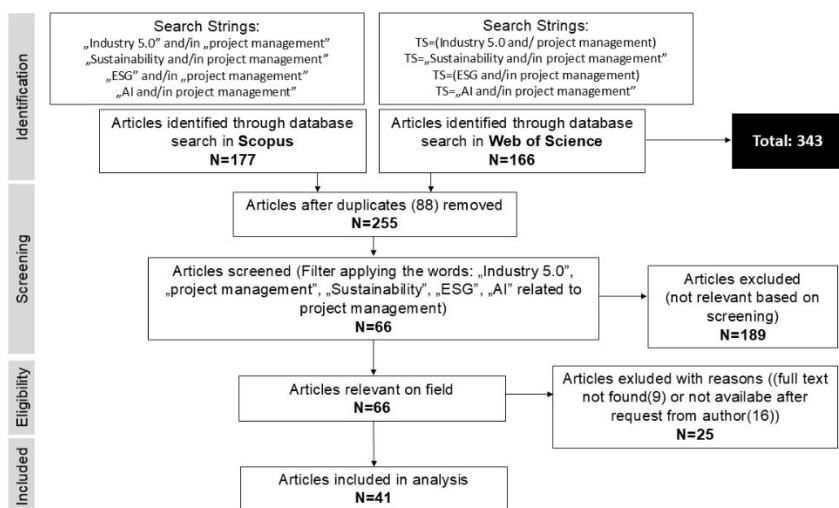
Figure 1: Systematic literature review process, result of findings in Scopus and Web of Science after data clean-up.
Source: Own Editing (2025)

Table 2: List of inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Industry 5.0, Sustainability, ESG and AI related to project management is analyzed	The article text is not in English.
Industry 5.0's main pillar, sustainability is a significant party of the study	There is no full text of the article available. Full text has been requested from authors, but not received within 30 days.
Challenges of AI are examined related to project management	The article does not address any research question closely related Industry 5.0, Sustainability, ESG and AI related to project management is analyzed

Source: Own Editing (2025)

4   Results

In the Industry 5.0 era, companies are leveraging the potential of cutting-edge technologies such as artificial intelligence for more efficient and greener human-centric production (Taboada et al., 2023). Similarly, integrating artificial intelligence into project management methodologies promises enhanced project performance, reaching higher sustainable success. Industry 4.0 emphasizes resilience and its positive ecological and economic impacts, but it often overlooks social dimensions,

such as human-centric approaches. However, Industry 5.0 shifts this perspective, focusing more on the human element in production (Hein-Pensel et al., 2023), also sustainability concepts showcase significant value in construction projects (Stanitsas et al., 2021). Zizic et al. highlight the importance of employee focus and well-being in this new approach, stressing competencies, motivation, and overall human welfare as crucial factors for sustainable digital transformation (Zizic et al., 2022). Similarly, Xu et al. argue that Industry 5.0 complements Industry 4.0 by driving a transition towards a sustainable, human-centric, and resilient industry through research and innovation (Xu et al., 2021).

In a 2021 policy brief, the European Commission describes Industry 5.0 as "more futureproof, resilient, sustainable, and people-centric" concept. (Breque et al., 2021). While there is no universally accepted definition, Industry 5.0 typically refers to a vision of manufacturing and production that integrates advanced technologies such as artificial intelligence, robotics, Internet of Things (IoT), and big data analytics with a strong emphasis on human collaboration and interaction. Based on analysis of the examined literature, Industry 5.0 can be defined as a new concept that focuses on collaboration between humans and machines (Gibbin et al., 2023; Taboada et al., 2023; Krause et al., 2024; Aladag, 2023). The main goal is to create sustainable products and services, while empowering people to fully utilize their skills more efficient and more meaningful (Toljaga-Nikolić et al., 2020; Kostalova & McGrath, 2021), receiving the answer for #**RQ1**.

In a constantly changing project environment that requires high level of adaptability and changing paradigms in management to a more human-centric leadership, Industry 5.0 raised attention on a new project management approach for the future, where every aspect of the PMM is more flexible and people-oriented, due to the popularity of agile project management practices, that are spreading in new industries, not just in software development (Zuzek et al., 2021). The evolution of Industry 5.0 will facilitate more areas of research for project management researchers who are working in human-centric applications, sustainable development, and building resilience in organizations. Majority studies mention the sustainability as core element of Industry 5.0 (Chawla et al., 2018; Ozumba et al., 2018; Rego et al., 2024), receiving answer for #**RQ2**. The integration of sustainability practices positively impacts the success of project management by enhancing project outcomes, improving stakeholder satisfaction, and ensuring long-term benefits.

Sustainable practices help in better resource management, risk mitigation, and alignment with broader organizational goals, leading to more resilient and efficient project execution.

Findings related to **#RQ3** indicate that there is an emerging tendency using artificial intelligence (AI) for project management purposes (Krause et al., 2024; Zuzek et al., 2021; Gibbin et al., 2023), because AI can automate repetitive tasks, provide insights from data analysis, optimize resource allocation, predict project outcomes, generate summaries, tables, facilitate communication and collaboration among team members (Mohite el al., 2024; Dimcheva, 2024; Tarawneh et al., 2024; Sarafanov et al., 2024). By leveraging AI, project managers can streamline workflows, mitigate risks, and achieve better project outcomes. The adoption of AI in project management enhances efficiency by automating repetitive tasks, improving resource allocation, providing accurate forecasting, and aiding in decision-making. It helps in identifying risks, optimizing processes, and ultimately leads to better project outcomes and success.

For project management professionals it will be a challenge to find the balance between structure and flexibility, innovation and discipline, and adaptation to changing circumstances, in terms of ethical using of AI in their projects (Økland, 2015; Friedrich, 2023). Findings to **#RQ4** indicate that companies also face several challenges due to rapid technological developments and innovation projects (Gärtner et al., 2023; Dimcheva, 2024; Sarafanov et al., 2024), they must balance between technological complexity and industrial applicability (Madureira, 2022). Industry 5.0 and AI in project management will bring challenges such as data quality issues, resistance to change, ethical considerations, and the need for skilled personnel to interpret AI-generated insights (Mohite el al., 2024). Additionally, there may be difficulties in fully accounting for human factors and dynamic project environments.

5   Discussion

In the Industry 5.0 era, companies are leveraging advanced technologies like artificial intelligence for efficient, greener, and human-centric production. This integration into project management methodologies enhances project performance and sustainability. Unlike Industry 4.0, which focuses on resilience and ecological impacts, Industry 5.0 emphasizes human-centric approaches and employee well-

being. It aims to create sustainable products and services by fostering collaboration between humans and machines. The European Commission describes Industry 5.0 as a concept that is future-proof, resilient, sustainable, and people-centric. This new approach in project management promotes flexibility, human-centric leadership, and the adoption of agile practices across various industries. The integration of AI in project management automates tasks, optimizes resources, and improves decision-making, leading to better project outcomes. However, challenges such as data quality, resistance to change, ethical considerations, and the need for skilled personnel remain.

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 appliance of Industry 5.0's pillars and exact AI tools in project management related practical scenarios.

6 Conclusions

In order to increase adaptability and acceptance of technological revolutions and innovative solutions on in project management, it is essential to foster a culture of innovation and collaboration on organizational level. Nowadays, there is a growing interest in exploring the potential of AI to revolutionize PM. Very few researches were conducted to analyze the potential and limitations of AI in this field. New technologies are not limited to manufacturing processes; they also hold promise for improving business procedures like project management (PM). Cutting-edge project management trends emphasize the integration of artificial intelligence (AI). AI is transforming both the nature of projects and how they are managed. While reports suggest that AI enhances PM productivity and quality, there is a lack of literature analyzing AI techniques across PM performance domains. This raises questions about how AI can enhance PM processes and performance, and how future literature will address this topic.

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