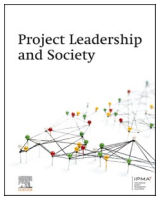
Project Leadership and Society 6 (2025) 100184

Contents lists available at ScienceDirect

Project Leadership and Society

journal homepage: www.sciencedirect.com/journal/project-leadership-and-society



Editorial

# The role of digitalization in project management

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## 1. Digitalization and projects

Digitalization has progressed rapidly, pervading almost all functions in organizations. Whereas digitization denotes the move from analog to digital information advanced by the arrival of new technologies for smart working (Bednar and Welch, 2020; Painter et al., 2016), all aspects of the work environment feel the impact of digitalization, including project environments. Digitalization is a system-wide change process (Gartner, 2013; Ross, 2017), one with fundamental implications as a first step towards digital transformation of how businesses and economies operate (Marnewick and Marnewick, 2022). Digitalization is reshaping the fundamentals of project management, stimulating innovation of new tools, co-working paradigms and learning that collaborates with machine intelligence in addressing the growing complexity of projects and their environment. From initiation to operation, digital technologies afford opportunities to enhance collaboration, decision-making, and sustainability, presenting opportunities for revisiting foundational project scholarship and practice. In this editorial a collection of twelve scholarly contributions are highlighted that showcase diverse perspectives, theoretical advances and societal impact of digitalization across projects.

## 2. Why this special collection?

The goal of this special collection was to offer new insights on how digitalization affects and is affected by contemporary phenomena and studies in Project Management. This editorial presents the twelve contributions that were selected as part of the special collection and organizes them to show the broad spectrum of the role of digitalization in project management. After reflecting on the theoretical and methodological diversity of the contributions, we present them mapped across different project stages for quick comparison and identification of their contributions. Initially, in our call we had outlined two main perspectives: (1) leading projects for digital transformation of companies and societies, affecting collaboration and innovation (Papadonikolaki et al., 2019; Whyte et al., 2016) improving project outcomes, and (2) opportunities that digitalization brings for leading and governing projects (and programs and portfolios) beyond the iron triangle (Manny et al., 2022) through innovative project organizing and information management (Winch and Cha, 2020), reducing the complexity, time and effort involved in projects.

The integration of digitalization across projects is the focus of this special collection, emphasizing theoretical and practical contributions. A broad perspective was adopted in our invitation to contribute to the special collection and sought to solicit a plurality of approaches. Indeed, those papers selected cover various phases of the project lifecycle, initiation, design, execution, as well as the whole lifecycle, highlighting the societal, technological and organizational impacts of these transformations. The overarching goal is to take stock of the fast-evolving role of digitalization in project management while identifying areas for further research and application. The research ranges methodologically to include systematic literature reviews, qualitative methods, including case studies, questionnaire surveys and interviews, quantitative methods, experiments and design science. Additionally, we set out to create a special collection that would be technologically agnostic; indeed, the collected papers covered a range of technologies including Building Information Modelling (BIM), data analytics, Artificial Intelligence (AI) and machine learning, generative AI, computer vision and blockchain. The papers originated from authors working across Europe, Australia and China. In addressing the role of digitalization in projects, the focus of special collection covers different lifecycle phases. as seen in the summary Table 1 below.

## 3. Summary of special collection papers

### 3.1. Initiation stage

Rinchen et al. (2024) focus on the challenges and strategies for implementing Building Information Modelling (BIM) in developing nations. They highlight the transformative role of digitalization in overcoming resource and infrastructural constraints in countries such as Africa, South America and South-East Asia in which there is little

This article is part of a special issue entitled: The Role of Digitalization in Project Management published in Project Leadership and Society.

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https://doi.org/10.1016/j.plas.2025.100184

Available online 24 June 2025

research on BIM adoption. Rinchen et al. (2024) used the Preferred Reporting Items for Systematic reviews and Meta-Analyses or PRISMA method to examine BIM adoption systematically over a decade (2013–2023), identifying key barriers, such as limited technological readiness, economic challenges, and regulatory gaps. After identifying some existing strategies for digitalization in various countries' projects, their major theoretical contribution lies in developing a tailored technology adoption model (TAM), which integrates contextual factors such as socio-economic conditions and strategic frameworks unique to those developing countries. Their model enriches the discourse on digital transformation by offering nuanced insights into how BIM can enhance collaboration, efficiency, and sustainability in construction projects. Practically, the paper provides strategic recommendations in a context-sensitive and scalable roadmap for developing nations situated at varying levels of development and economic parameters, emphasizing government involvement, capacity building, and alignment with international standards. Rinchen et al. (2024)'s work balances theoretical advancements and societal impacts of digitalization in projects, exemplifying how digitalization can address complex contextual challenges and enable transformative change in global project practices.

Mariani et al. (2023) explore how machine learning addresses challenges in stakeholder management. They offer a novel approach by applying unsupervised clustering techniques to classify stakeholders based on multidimensional data, emphasizing its potential for improving project outcomes. By the Partitioning Around Medoids algorithm to categorize stakeholders of an information technology project, Mariani et al. (2023) used 18 demographic and psychographic attributes. With their method they overcome the limitations of traditional classification models, such as the static nature and subjective biases of tools like the power-interest matrix. Theoretically their work demonstrated how unsupervised clustering enables granular, data-driven stakeholder grouping, which traditional models often overlook, strengthening the field of stakeholder management though an innovative approach less prone to biased insights. Practically, the study highlights how clustering algorithms can reveal hidden patterns among stakeholders, enabling tailored engagement strategies. A technologically laden solution is innovatively combined with broad societal impact during the initiation stage of projects.

Toukola et al. (2023) explore how digital tools can transform project marketing processes. They emphasize the critical role of digitalization in the early phases of project development. Their study offers a comprehensive categorization of 117 digital tools across 11 categories, addressing gaps in the literature by identifying how these tools can support project marketing activities. Toukola et al. (2023) contribution is to connect digitalization to project marketing, offering insights into tools that facilitate market screening, bid preparation, and stakeholder engagement. They elaborate the potential of digital tools to streamline operations, enhance information management, and improve client relationships. Toukola et al. (2023) offer practical guidance for project suppliers, highlighting how the strategic use of tools such as customer relation management systems, social media platforms, and web analytics can streamline project inception stages and create meaningful project stakeholder relations. By bridging theoretical understanding of project marketing with practical solutions through digitalization, this 'next practices' paper underscores the transformative impact of digitalization on projects.

### 3.2. Design stage

Morin and Romero-Torres (2024) explore how BIM reshapes decision-making during project design. They address critical aspects of stakeholder collaboration and data-driven decisions. Morin and Romero-Torres (2024) apply the Input-Process-Output framework to evaluate how BIM facilitates informed decision-making. Theoretically, their work elaborates the impact of digitalization on collaboration in projects. By framing the decision-making process as a dynamic interaction of data, information, processual mechanisms, and validated outcomes they demonstrate how BIM transforms traditional decision-making paradigms in construction projects. Practically, Morin and Romero-Torres (2024) identify challenges such as information comprehension asymmetry and the evolving roles of decision-makers. Their work underscores the societal impact of digitalization and the need for enhanced training and governance structures to leverage BIM's potential fully.

**Table 1**
Summary of contributions of the special collection highlighting their theoretical and methodological underpinnings.

| Project stage | Focus of digitalization in projects | Theory | Methods | Reference | Call perspective |
|---|---|---|---|---|---|
| Initiation | Strategies for implementing Building Information Modelling (BIM) in developing nations projects | Technology adoption | Systematic literature review | Rinchen et al. (2024) | Opportunities for digitalization in developing countries |
| | Digital tools transforming project marketing processes | Project marketing | State-of-practice review & Single case study | Toukola et al. (2023) | Transformation of project marketing |
| | Machine learning to classify project stakeholders | Stakeholder | Single case study | Mariani et al. (2023) | Opportunities for stakeholder classification |
| Design | Blockchain-based solutions transforming simple traditional project practices | N/A | Action Design Research (ADR) | Spychiger et al. (2023) | Exploration of impact of decentralization on projects |
| | BIM reshaping decision-making during project design | Decision-making | Embedded case study (2 cases) | Morin and Romero-Torres (2024) | Understanding the impact of BIM on decision-making |
| | Digitalization and bridging project members' mental models | Shared mental models | Multi-case study (4 cases) | Siebelink et al. (2025) | Exploring the relation between team alignment and digitalization maturity |
| Execution | Using generative AI for project planning (Next Practices) | Human-machine interaction | Experiment | Barcaui and Monat (2023) | Exploring potential of AI in projects |
| | AI in construction management for progress monitoring | N/A | Design science research (DSR) | Ekanayake et al. (2024) | Computer vision for construction progress monitoring |
| | Data-driven governance in mitigating the complexities of construction claims | Governance | Systematic literature review & Interviews | Awed and Fini (2024) | Opportunities for claims' automation |
| | Integration of blockchain and commons governance for project delivery | Ostrom Principles – Common pool resources | State-of-practice review | Hunhevicz et al. (2024) | Opportunities for decentralized project governance |
| Lifecycle | Digital tools in project management (PM) education | N/A | Systematic literature review | Tumpa et al. (2024) | Opportunities for PM education |
| | Evolving role of digital competence in projects | Talent management | Questionnaire survey & Interviews | Liu et al. (2024) | Impact of new data-savvy talent on PM |

Spychiger et al. (2023) explore how blockchain-supported decentralized autonomous organizations (DAOs) can transform traditional project management practices. They emphasize the potential of blockchain in enhancing governance, trust and informed decision-making. Spychiger et al. (2023) develop and implement a Decentralized Autonomous Project Organization to test blockchain-based project management principles through an Action Design Research experimental approach. The theoretical contribution of the work lies in illustrating how DAOs can automate structural aspects of project management, such as task assignments, deadlines, and incentive mechanisms, while also highlighting the growing importance of social dimensions of teamwork, trust, and transparency, connecting both hard and soft aspects of project organizing. In practice, the Decentralized Autonomous Project Organization demonstrates the feasibility of decentralized management for simple projects, showcasing its ability to promote self-organization and reduce overheads by automating processes, incentivizing collaboration, and increasing efficiency and fairness in project governance. The societal implications emphasize how blockchain can support innovative, participatory approaches in project environments.

### 3.3. Execution stage

In their 'Next Practices' type paper, Barcaui and Monat (2023) explore the comparative strengths and limitations of generative AI and human project managers in project planning with an experiment comparing project plans for a mobile application generated by GPT-4 (Generative Pre-trained Transformer 4) and an experienced project manager. In this 'next practices' paper, the theoretical contribution lies in examining AI's capacity to automate and optimize specific project management tasks—such as risk identification and stakeholder engagement—while emphasizing the continued necessity of human expertise for nuanced decision-making and context-specific adaptations. In practice, Barcaui and Monat (2023) highlight AI's efficiency in creating rudimentary project plans, particularly in risk assessment and data analysis, but also underscore its limitations in addressing complex interdependencies and subjective elements, such as stakeholder relationships. The human project manager's contributions excelled in areas requiring creativity, contextual awareness, and adaptability. By demonstrating the complementary strengths of AI and human expertise, they provide actionable insights into integrating AI into project management practices, fostering collaboration between people and technology for more effective and robust project planning, which are of high societal importance.

Ekanayake et al. (2024) demonstrate the transformative potential of AI in construction project management, showcasing advancements in automation and digitalization. Ekanayake et al. (2024) develop an optimized deep learning model, Mask Region-based Convolutional Neural Network, for monitoring indoor construction progress through object detection, thereby addressing challenges such as variable lighting, clutter, and occlusions in indoor environments. Their approach extends the application of deep learning and computer vision in automating labour-intensive tasks and calculating work-in-progress. Through a Design Science Research (DSR) methodology, reaching Level 1, per Gregor and Zwikael (2024) categorization, Ekanayake et al. (2024) bridge theoretical principles with practical action, making the paper highly relevant for both academia and industry. Practically, their innovative approach enhances decision-making by providing real-time, accurate data on construction progress, reducing errors and inefficiencies inherent in traditional methods. Their work underscores the role of emerging technologies in modernizing project environments through automation and digitalization for improved project outcomes.

Awed and Fini (2024) advance our understanding of data-driven governance in construction projects by highlighting the transformative potential of data analytics in mitigating complexities of construction claims. Theoretically, Awed and Fini (2024) apply Foucault (2007) concept of governmentality to practices of claim management. By categorizing claim preparation into people-led, organizational-led, and data-led initiatives, Awed and Fini (2024) demonstrate how smart data analytics can bridge gaps in traditional approaches. They propose a novel governance framework for managing claims effectively through the integration of political governance, such as control mechanisms and disciplinary powers. Theoretically they advance our knowledge on digitalization's role in governance and decision-making. Practically, they identify persistent challenges in claim management, such as inadequate data utilization and the lack of structured processes and showcase how data analytics, such as natural language processing and predictive algorithms, can streamline tasks like document retrieval and claim quantification, enhancing efficiency and reducing disputes. At a higher, societal level, this work underscores the role of digitalization in improving stakeholder collaboration and decision-making, enhancing governance and accountability in project management.

Hunhevicz et al. (2024) explore the integration of blockchain technology and commons governance for project delivery. They do so by synthesizing a novel theoretical framework on decentralized project delivery. After conceptualizing "crypto commons," they apply blockchain governance mechanisms akin to common-pool resources, such as smart contracts and tokenization to manage collaborative projects. Hunhevicz et al. (2024) depart from hierarchical, centralized governance to emphasize decentralized systems of self-organization and collective decision-making, comprising a unique theoretical contribution. They identify 22 blockchain applications for decentralized governance in construction projects, demonstrating how such mechanisms can address challenges of resource allocation, accountability, and scalability. The practical applicability of this governance approach can extend from project delivery across project phases, offering a scalable governance model for various industries. Hunhevicz et al. (2024) reflect on the systemic implications and implementation barriers highlighting broader societal benefits, such as equitable resource management, collaboration, and sustainable project practices.

### 3.4. Lifecycle thinking

Tumpa et al. (2024) addressed the special collection topic by exploring how digital tools transform project management (PM) education. They highlight the use of computer-based games to bridge the gap between PM theory and practice—a much-needed approach. Through a systematic review, they consolidate fragmented research on the pedagogical value of games in PM education. By simulating real-world project environments, these tools enable experiential learning, fostering essential skills such as decision-making, collaboration, and problem-solving. Tumpa et al. (2024)'s approach supports the broader goal of digitalization to enhance learning outcomes and equip students who aspire to work on projects skills for managing complex project environments. They contribute theoretically by identifying dominant themes and gaps in the literature, advancing our understanding of the use of digital tools in PM pedagogy. Tumpa et al. (2024) offer practical recommendations for educators and game designers, emphasizing user-friendly interfaces, realism, and adaptability to enhance the effectiveness of learning. By showcasing how digitalization addresses challenges in traditional PM education, they demonstrate the transformative potential of computer-based games in preparing future project professionals to carry out projects in a socially-sustainable manner.

Liu et al. (2024) examine the evolving role of digital competence in project management by focusing on the necessity of cultivating data-savvy talent to address the increasing demands in data-rich project environments. Through mixed methods including a survey and interviews, they investigate how talent management strategies, such as attracting, developing, and retaining new digital talent, shape digital competence in projects. Their theoretical contribution lies in identifying mechanisms that underpin the formation of digital competence, especially how organizational support and individual skills interact to foster

project success. By bridging concepts from human resource management, talent management and digital transformation, the broad implications of integrating new data-savvy talent into project teams are highlighted. Liu et al. (2024) underscore the practical importance of tailored organizational frameworks for digital skill development and offer actionable insights into designing effective training and retention strategies. Moreover, they discuss the critical role of balancing and integrating generational expertise from junior and senior project professionals, emphasizing the societal and organizational impacts in preparing a digitally competent project workforce.

## 4. Concluding remarks and future research avenues

The contributions of the special collection highlight the transformative potential of digitalization for project management. From the two indicative main perspectives of the special collection: (1) leading projects for digital transformation of companies and societies, and (2) opportunities that digitalization brings for leading and governing projects beyond the iron triangle, the contributions focused predominantly on the second perspective (see Table 1). This is understandable, considering the massive impact of digitalization on all aspects of projects as well as the rapidly evolving nature of digital technologies, continuously generating novel and intriguing research phenomena. More research on the impact of digital transformation projects on various societal levels, such as companies and communities, is clearly required.

Out of the twelve contributions of the special collection, two drew solely on literature reviews. The remaining ten studies drew upon rich empirical foundations through case studies, experiments, and design research methods, showing a promising way forward for digitalization studies through impactful case methods (Martinsuo and Huemann, 2021) and co-creating project management knowledge with key research stakeholders (Gregor and Zwikael, 2024).

Digitalization's' diverse impacts on project management map onto different phases across the project lifecycle. These twelve papers collectively enhance our theoretical understanding of how digitalization is reshaping traditional practices. By building on the theoretical advancements presented in the collection, future studies can further substantiate the role of digitalization in navigating the complexities of contemporary project management. Societal impacts, such as fostering sustainability, improving human-machine collaboration, and advancing organizational adaptability, are central to these discussions to which future research can contribute by focusing on:

1. Lifecycle thinking: Exploring how digitalization can seamlessly connect lifecycle phases for holistic project management.
2. Human-centric digitalization: Investigating the interplay of digitalization with psychological safety and human-centric approaches in Industry 5.0.
3. Socially sustainable strategies: Examining digitalization in diverse socio-economic contexts to identify scalable, societal and inclusive solutions.

Through these new research avenues, project scholarship can offer a service to society by driving the digital transformation of communities, businesses, public organizations and national economies.

## 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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