

Enhancing Product Management Performance through Digitalization: Advantages, Challenges, Design Fields

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Abstract

In dynamic environments, product management plays a key role in aligning innovation, customer needs, and strategic decision-making. Digitalization offers significant opportunities to enhance this role by enabling data-driven insights for improved customer and product understanding—yet its successful implementation requires a fundamental transformation. Based on a systematic literature review, this study synthesizes key advantages, challenges, and design fields that shape this transformation. The results highlight performance benefits across business, product, process, and decision-making dimensions, while also uncovering barriers rooted in strategy, organization, people, and technology. To address these barriers, critical enablers and conditions for success are identified. Four overarching design fields provide orientation for structuring digitalization efforts and guiding organizational change in industrial practice. The paper provides both a conceptual foundation and a practical guide for companies seeking to digitalize their product management effectively.

Keywords: Product Management, Data Analytics, Literature Review, Transformation, AI.

1. Introduction

Product management (PM) is a core business function responsible for products over their entire lifecycle, from initial idea generation and market launch to the ongoing development of existing offerings (Ebert, 2007; Niehaus et al., 2005). Acting as the interface between the market, development, and strategy, PM plays a pivotal role in aligning the portfolio with value-based principles, thereby significantly contributing to a company's innovation capacity and competitiveness (Gorchels, 2003;

Haines, 2014). In an increasingly dynamic environment characterized by volatile markets, evolving customer demands, and mounting pressure to innovate, the importance of this role is growing (Hallstedt et al., 2020). Digitalization offers substantial potential to strengthen PM in this context. Digitalization refers to the increasing use of digital information and communication technologies that are permeating the economy and society, connecting physical systems and individuals in the virtual world (Acatech, 2013). Digital technologies are systems that collect, process, store, present, and transmit data and information (Stähler, 2002). Throughout the product lifecycle, vast amounts of data are generated on product usage, customer behavior, or operational performance (Fichtler et al., 2024b). Leveraging this data through advanced analytics enables more informed, responsive, and customer-oriented decision-making (Wuest et al., 2014; Z. Xu et al., 2016). Empirical studies confirm that digital technologies can improve key PM tasks across strategic, operational, and overarching dimensions (Fichtler et al., 2024a). Yet, this potential is far from being fully realized in practice. Many companies lack digital maturity, clear structures, or the confidence to implement data-driven approaches effectively (Bahrenburg et al., 2019; Grigoryan et al., 2023). This lack of implementation highlights the need to better understand what benefits digitalization can bring, which obstacles impede its implementation, and how companies can actively shape the transformation. Existing research has addressed individual aspects of data-driven approaches in the context of PM, but a systematic, integrated perspective remains scarce. Against this backdrop, the present study conducts a comprehensive systematic literature review to answer the following research questions:

1) *What advantages does digitalization offer for product management?*

2) What challenges hinder the implementation of digital approaches in PM?

3) What design fields and success factors shape the digital transformation of PM?

By addressing these questions, the study aims to provide both conceptual clarity and practical orientation. It contributes to the growing body of research on digital transformation by focusing specifically on the PM function—an area of high relevance and complexity that has so far received limited integrated attention.

The paper is structured as follows: Following the presentation of the research methodology, the results regarding the advantages, challenges, success factors, and focus areas of digitalization in PM are introduced. These findings are subsequently discussed in detail. The paper closes with a brief conclusion.

2. Research Methodology

To address the research questions, we performed a systematic literature review (SLR) following the methodology outlined by (Webster & Watson, 2002). The review process consisted of four consecutive steps: (I) selecting a suitable database, (II) formulating a precise search string, (III) executing the search, and (IV) analyzing the identified literature. As part of the selection of a database, the databases (Scopus, IEEE, AiSel, EBSCOhost, and ACM) were selected for further analysis. Through iterative improvement, the following search string was formed and applied in the selected databases: ("product manage*" OR "product planning" OR "product strateg*") AND ("digital*" OR "data*" OR "analytics*" OR "AI") AND ("decision*" OR "support" OR "feedback*" OR "information" OR "knowledge" OR "insights" OR "learning" OR "innovation" OR "improvement" OR "recommendation*" OR "evaluation" OR "optimization"). To ensure a rigorous and unbiased selection of relevant literature, four independent researchers participated in the screening process. Figure 1 provides an overview of the paper selection process. The search yielded 1,451 articles, which were screened based on title and abstract. A total of 310 papers with an assumed focus on the research questions remained. After reading these papers and conducting a backward and forward search, 145 papers were identified as containing answers to our research questions; the remaining papers were excluded. Information from the selected publications was systematically extracted and synthesized. The researchers thoroughly reviewed the full texts to identify passages that explicitly addressed elements relevant to the research question. These passages were systematically recorded using dedicated literature

analysis software to ensure traceability and consistency in the evaluation process. The extracted material was then examined through a qualitative content analysis, following the approach developed by (Mayring, 2022). Building on the extracted information relevant to the research questions, the dataset was initially organized into overarching thematic blocks. These preliminary clusters served as a foundation for an iterative structuring process, during which each cluster was critically examined, refined, or split where necessary, and new clusters were formed based on emerging patterns. Through this stepwise refinement, key thematic areas were systematically identified and refined. As a result of this iterative clustering process, the central advantages, challenges, success factors, and focus areas of digitalization in PM were derived.

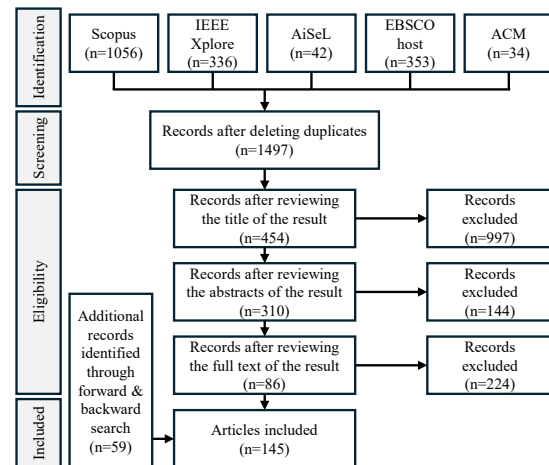


Figure 1. PRISMA flow diagram of the SLR (adapted from (Moher et al., 2009)).

3. Results

This chapter presents the key findings of the literature review conducted. The results are structured along three central outcomes: advantages, challenges, and design fields that organizations should address to leverage digitalization in PM. Due to space limitations, not all sources analyzed are listed. We have specifically selected those sources that cover all key aspects addressed in the manuscript, so that each argument is supported by appropriate literature.

3.1. Advantages

Digitalization enhances PM performance in four ways: improving market responsiveness, increasing process efficiency, enabling a deeper understanding of customers and products, and facilitating faster, more informed decisions. These advantages make

digitalization a strategic lever for more effective PM. They are presented in Table 1 and described below.

Enhanced Market Responsiveness:

Digitalization enhances the ability of product managers to respond flexibly and proactively to changing market conditions. Digital technologies enable the identification of current developments in customer behavior, competitive dynamics, and regulatory frameworks at an early stage, allowing for strategic consideration of these factors (Fichtler et al., 2023; Groggert et al., 2017; Harkonen et al., 2020). These capabilities enable more targeted adaptation of product portfolios, quicker addressing of market segments, and systematic expansion of differentiating services (Fichtler, et al., 2024a). Real-time information and analytical tools support identifying new business opportunities and implementing innovative value propositions, such as data-based services, personalized offers, and platform models (Nikolova & Antonova, 2019; Olsson & Bosch, 2025). Access to sound market information enables the continuous review and realignment of strategic objectives (Z. Xu et al., 2016).

2025). Additionally, digital infrastructures promote intensive interdisciplinary collaboration, such as between product development, sales, and production, by simplifying access to data and making decision-making processes transparent (Jun et al., 2007; F. Xu et al., 2019). The continuous availability of relevant information improves operational goal orientation and increases the speed of response to unexpected deviations (Groggert et al., 2017; Olsson & Bosch, 2014).

Customer and Product Understanding:

Digitalization opens up new possibilities for systematically collecting, evaluating, and integrating customer and product data (Meyer et al., 2021). Through the analysis of usage patterns, feedback, sensor data, and interactions, product managers can develop a comprehensive, contextualized understanding of their customers' behavior, preferences, and latent needs (Li et al., 2015; Olsson & Bosch, 2025). These insights allow for the derivation of requirements that far surpass traditional methods, such as surveys or workshops. Digital feedback loops also allow conclusions to be drawn about actual product use, such as functionality, load, and application situations (Hou & Jiao, 2020; Siddiqui et al., 2004). These in-depth insights form the basis for holistic requirements analysis and the development of customer-centric product solutions (Holler et al., 2017; Meyer et al., 2021). Consistently using this data enables companies to design more differentiated offerings, plan variants in a targeted manner, and strengthen long-term customer loyalty (Dremel et al., 2017; Holler et al., 2017).

Decision Quality and Speed: Another key advantage of digitalization in PM is improving decision-making processes qualitatively and quantitatively. Digital technologies provide access to comprehensive, context-relevant data in real time, which allows strategic and operational decisions to be made based on broader and more objective information (Fichtler et al., 2024a; Wu et al., 2020). Hypotheses, customer feedback, and assumptions can be systematically validated; measures can be prioritized; and decision alternatives can be transparently evaluated (Holler et al., 2017; Meyer et al., 2022b; Olsson & Bosch, 2025). At the same time, the influence of subjective distortions, experience-based misjudgments, and political conflicts of interest is minimized (Fichtler et al., 2023; Olsson & Bosch, 2025). The acceleration of analysis and evaluation processes significantly reduces decision latency, which is particularly advantageous in volatile markets (Menon et al., 2005).

Table 1. Advantages of Digitalization in PM

Advantage	Key Aspects
Enhanced Market Responsiveness	<i>Strategic Adaptation to Market Dynamics; Acceleration of Competitive Positioning; Expansion of Data-Driven Value Propositions</i>
Efficiency and Process Agility	<i>Faster Product Delivery and Response Times; Operational Efficiency and Resource Optimization; Cross-Functional Collaboration and Transparency</i>
Customer and Product Understanding	<i>Comprehensive Insights into Customer Behavior; Holistic Understanding of Product Use; Customer-Centric Design of Product Offerings</i>
Decision Quality and Speed	<i>Evidence-Based Strategic and Operational Decisions; Validation and Prioritization of Actions; Faster and More Objective Decision-Making</i>

Efficiency and Process Agility: One key advantage of digital technologies in PM is that they accelerate and optimize operational processes. Automating recurring tasks and making intelligent use of digital tools shortens development times and allows for more efficient use of resources (Fichtler et al., 2024a; Siddiqui et al., 2004). Analytics-based decisions and integrated tools allow for the dynamic adaptation of processes and better coordination of activities along the value chain (Olsson & Bosch,

3.2. Challenges

Digitizing PM has its advantages, but companies must also overcome challenges, which are listed in Table 2 and explained below.

Table 2. Challenges of Digitalization in PM

Challenge	Key Aspects
Lack of Strategic Embedding	<i>Strategic Guidance; Management Legitimation; Value Proposition; Day-to-day Business</i>
Organizational Fragmentation	<i>Siloed Departments; Roles and Responsibilities; Cost-benefit-ratio; Integration Efforts</i>
Cultural and Skill Barriers	<i>Know-how; Cultural Resistance; Reservations</i>
Technological Limitations	<i>Guidelines; Data Availability; Interoperability; Data Management; Influence</i>

Lack of Strategic Embedding: A key obstacle to digital transformation in PM is the absence of strategic integration of digital initiatives. Many companies lack an overarching vision that links digital potential with corporate goals and provides clear guidelines for PM (Nalchigar & Yu, 2018; Olsson & Bosch, 2025). Consequently, digital projects are given low priority by top management and lack legitimacy, budgets, and support within the organization (Siddiqui et al., 2004). Additionally, companies often lack the methodological expertise necessary to evaluate the concrete benefits of digital measures, leading to unrealistic expectations and operational uncertainty (Hallstedt et al., 2020; Wilberg et al., 2017b; Witkowski & Wodecki, 2024b). Product managers are heavily involved in operational tasks, which means that strategic issues, such as digitalization, are often neglected (Fichtler et al., 2024a). Especially smaller companies struggle to keep pace with overarching developments (Meyer et al., 2022b).

Organizational Fragmentation: Many PM digitalization initiatives fail due to unclear structures, insufficiently defined roles, and a lack of coordination between involved departments (Dremel et al., 2017; Zahay et al., 2004). Information flows inconsistently or gets stuck in silos because responsibilities are not assigned, and conflicting goals are not managed (Yong & Wang, 2013; Zahay et al., 2004). The result is conflicting priorities, inefficient processes, and a high risk of friction losses (Dremel et al., 2017; Igba et al., 2015). Additionally, a lack of suitable evaluation methods for comparing costs and benefits further inhibits investment willingness (Machchhar et al.,

2022; Siddiqui et al., 2004). Existing processes are often not designed for digital work steps (Yong & Wang, 2013). This hinders the integration of new technologies and incurs additional transformation costs (Goh & McMahon, 2009; Zahay et al., 2004).

Cultural and Skill Barriers: The digitalization of PM is not only an organizational challenge, but also a cultural and human one. A lack of digital expertise, uncertainty when dealing with new technologies, and a lack of experience with data-based methods can hinder implementation significantly (Harkonen et al., 2024; Meyer et al., 2022b). Employees often perceive change as an additional burden and fail to recognize its benefits, especially when new tools challenge their established workflows (Dremel et al., 2017). Additionally, deep-seated reservations about data-based decisions often exist, stemming from a lack of transparency, fear of losing control, or the desire to retain interpretive authority (Fichtler et al., 2024a; Olsson & Bosch, 2025).

Technological Limitations: Significant barriers also exist at the technological level. Often, there is a lack of clear responsibilities, established standards, and structured governance approaches for handling data, particularly regarding quality, security, and access rights (Dremel et al., 2017; Harkonen et al., 2024). Despite the abundance of data, transparency regarding the availability, timeliness, and usability of relevant information is often lacking (Fichtler et al., 2024a; Meyer et al., 2021). The fragmented system landscape and lack of interoperability between IT systems considerably hinder data integration (Harkonen et al., 2024; Meyer et al., 2022b). PM usually has limited influence over IT architecture and depends on central systems in other departments (Hannila et al., 2020). Additionally, many processes require manual data preparation, reducing efficiency and hindering scalability (Igba et al., 2015; Witkowski & Wodecki, 2024b).

3.3. Design Fields for Digitalization in PM

The challenges outlined above show that digital transformation in PM can only succeed if it is effectively implemented on several levels simultaneously. The analysis of the literature reveals four design fields that serve as a structured response to the identified challenges. These fields combine factors critical to success along strategic, organizational, cultural, and technological dimensions. The design fields help to structure the transformation in terms of content, derive concrete measures, and implement changes in a targeted manner. Figure 2 provides a structured overview of the design fields and their contents. A detailed description follows below.

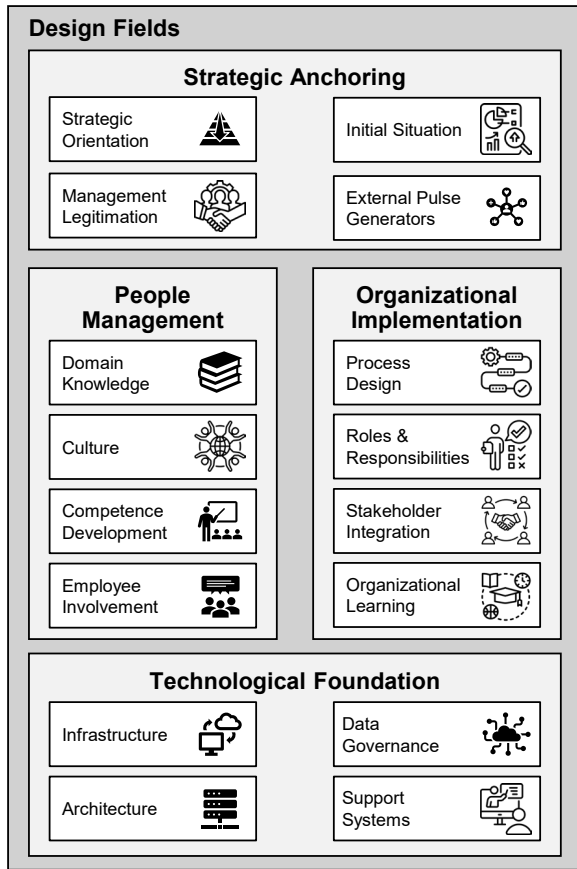


Figure 2. Design Fields for Digitalization in PM.

(1) Strategic Anchoring: A key obstacle is the lack of strategic integration of digital initiatives. The "Strategic Anchoring" design field addresses this challenge by showing how digital activities can be strategically aligned and legitimized within the company, as well as strengthened by external influences.

Strategic Orientation: A clear strategic vision is the foundation of successful PM digitization. This vision connects digital potential with overarching corporate goals (Dremel et al., 2017; Nalchigar & Yu, 2018). It serves as a framework for digital initiatives, creating the necessary priority and legitimacy within the organization. The planning process must be based on concrete, value-adding use cases rather than technology (Lin, 2018). Aligning all data-related measures consistently with the overall strategy ensures that resources, technologies, and competencies are used effectively (Wilberg et al., 2017b). This strategic integration fosters transparency, facilitates informed prioritization, and enhances organizational commitment to digital transformation (Yong & Wang, 2013).

Management Legitimation: For digital initiatives in PM to have a lasting impact, active support from top

management is essential (Yong & Wang, 2013). This support does not arise automatically but must be cultivated intentionally. For example, success stories can be prepared and tailored to the target audience. Strategic argumentation aids and educational measures on the potential of data-based approaches can also be used (Chen et al., 2025; Herterich et al., 2016). A key strategy is implementing clearly defined pilot projects that offer tangible benefits. These projects allow for early successes ("quick wins"), build confidence in implementation feasibility, and increase organizational acceptance for later scaling (Dremel et al., 2017; Siddiqui et al., 2004). The gradual expansion of these projects to other areas of application should follow a strategically planned development path to secure the realized added value systematically (Dremel et al., 2017).

Initial Situation: A realistic picture of the initial situation is essential for any digital project in PM (Meyer et al., 2022c). First, the structural role of PM within the company must be analyzed, as well as the existing interfaces and how the processes are set up (Olsson & Bosch, 2025). This analysis helps identify areas where action is needed and derive targeted development measures (Dremel et al., 2017). Progress on the digital transformation should continuously be measured and controlled using suitable target systems and objective key performance indicators (KPIs) (Hallstedt et al., 2020).

External Pulse Generators: The strategic integration of digital initiatives into PM is reinforced by the targeted participation of external partners (Dremel et al., 2017). By collaborating with technology providers, research institutions, and data platforms, companies can access new technologies and data sources. This accelerates expertise development and supports the early identification of regulatory or technological developments (Chen et al., 2025; Olsson & Bosch, 2025; Witkowski & Wodecki, 2024a). Systematic openness to environmental stimuli through structured partnerships, scouting activities, or co-creation projects promotes innovation and increases the strategic relevance of PM, positioning it as a key player in digital transformation (Meyer et al., 2022b; Witkowski & Wodecki, 2024a).

(2) Organizational Implementation: A lack of coordination and organizational inconsistencies make it difficult to implement digital initiatives in PM. The "Organizational Implementation" design field illustrates how digital changes can be structurally integrated.

Process Design: Strategic initiatives can only be effective if they are translated into robust processes. Therefore, a consistent, structured, and digitally connectable process landscape is a key prerequisite for

data-driven decisions in PM (Goh & McMahon, 2009; Harkonen et al., 2024). Processes must be designed so that they can be automated, evaluated analytically, and adapted flexibly. This requires an integrative view of the entire value chain, from market observation and product planning to usage and feedback, as well as digital mapping of these processes (Dremel et al., 2017; Wilberg et al., 2017a). Digital tools can only create real added value when embedded in structured, measurable, and adaptive processes (Kiron et al., 2014; Wu et al., 2019).

Roles & Responsibilities: Digital transformation in PM requires clearly defined roles and responsibilities to facilitate effective collaboration (Dremel et al., 2017). Clear role definitions across departments help reduce uncertainty and improve task distribution (Zahay et al., 2004). Tools such as RACI matrices can help distribute tasks and clarify responsibilities (Meyer et al., 2022d). Additionally, creating federated competencies supported by a core team of experts can guide digital initiatives and ensure their successful deployment (Dremel et al., 2017). To drive progress, steering committees play a critical role in monitoring and adjusting digital transformation efforts (Gemino & Reich, 2023).

Stakeholder Integration: Effectively digitizing PM requires the early and targeted involvement of all relevant stakeholders (Wilberg et al., 2017b). This fosters shared visions, mitigates interface issues, and enhances the feasibility of digital projects across departments (Zahay et al., 2004). Interdisciplinary teams with expertise in PM, IT, and data analysis are indispensable for this process. These teams combine domain-specific knowledge, technical capabilities, and analytical thinking to lay the foundation for well-informed, data-driven decisions (Dremel et al., 2017; Meyer et al., 2022b).

Organizational Learning: Effective knowledge sharing within PM fosters better decision-making and enhances performance (Zahay et al., 2004). The integration of domain-specific expertise with IT competencies is essential for organizational learning, facilitating smoother digital transformation (Dremel et al., 2017). Interdisciplinary teams enable the exchange of knowledge across functions, breaking down silos and promoting collaborative learning (Herterich et al., 2016). Institutionalized feedback mechanisms, such as structured lessons learned and KPI-based reviews, support the continuous learning and improvement of PM processes (Yong & Wang, 2013; Zheng et al., 2020). Furthermore, precise and repeated measurements are necessary to assess the long-term effects of data-driven changes and optimize innovation outcomes (Witkowski & Wodecki, 2024b; Wu et al., 2019).

(3) People Management: Digitalization often fails due to cultural reservations and a lack of expertise in handling data and technology. The "People Management" design field demonstrates how targeted training, participation, and cultural change can foster acceptance and capacity for action in PM.

Domain Knowledge: Digital tools and data analysis deliver value in product management when combined with deep domain expertise, including knowledge of markets, customer needs, and technical contexts (Herterich et al., 2016; Li et al., 2015). Systematic knowledge management ensures that this expertise is available not only to individuals but also throughout the organization (Dremel et al., 2017). Interdisciplinary teams, integrating both technical and domain-specific knowledge, are crucial for leveraging digital solutions effectively (Herterich et al., 2016).

Culture: A data-driven culture is essential for leveraging digital tools in PM, as it fosters an understanding of data's value and encourages innovation (Dremel et al., 2017; Hultink et al., 2011). Organizations must cultivate a pioneering, digital mindset, integrating business and technology skills to align with the evolving demands of digital transformation (Gemino & Reich, 2023). Interdisciplinary, heterogeneous teams across departments and hierarchical levels strengthen collaboration, ensuring effective use of data analytics in PM (Meyer et al., 2022a). A shared data culture promotes innovation-oriented thinking and creates the basis for lasting commitment to digital transformation (Kiron et al., 2014; Zahay et al., 2004).

Competence Development: Continuous training enhances employees' ability to adapt to new systems and management philosophies, improving system suitability (Yong & Wang, 2013). Skill development should be carried out systematically through training programs, external expertise involvement, or structured personnel development measures (Dremel et al., 2017; Yong & Wang, 2013). Stepwise capability building across teams and aligned with organizational goals ensures both short-term benefits and long-term success (Fichtler et al., 2024a; Herterich et al., 2016).

Employee Involvement: Involving employees in the development process, particularly key users, is crucial for successful product management digitalization (Siddiqui et al., 2004). Early participation in pilot projects or agile teams strengthens system acceptance and fosters ownership (Dremel et al., 2017; Yong & Wang, 2013). Incentive systems, such as performance-based rewards and knowledge-sharing recognition, encourage active participation and information sharing (Ozer, 2000; Zahay et al., 2004). Additionally, involving employees in decision-making and overcoming resistance

through clear communication and success stories enhances engagement and aligns teams with organizational goals (Dremel et al., 2017; Goh & McMahon, 2009).

(4) Technological Foundation: Technological limitations and limited data availability are significant obstacles to digital transformation in PM. The "Technological Foundation" design field illustrates how suitable systems, data structures, and governance can lay the groundwork for digitally transformed PM.

Infrastructure: A robust infrastructure is crucial for enabling digital transformation in PM. It provides the operational foundation for collecting, transmitting, storing, and processing data (Dremel et al., 2017; Mubarak et al., 2024). This includes cloud-based data platforms, scalable storage solutions, and reliable system interfaces that allow for the real-time availability of large and distributed data volumes (Hannila et al., 2020; Witkowski & Wodecki, 2024b). Ensuring high availability across locations, seamless access to heterogeneous data sources, and the reliable operation of data-related technologies is crucial for effective data-driven control of PM processes (Harkonen et al., 2020; Herterich et al., 2016).

Architecture: The architecture must support reconfigurability to integrate new data sources and adapt to changing business needs (Kiritsis, 2011). To process and transform raw data into actionable insights, the architecture must enable seamless integration and support data governance at the corporate level (Hannila et al., 2020). Strong architectural competence is crucial to ensure that technological decisions align with short-term goals and long-term investments (Gemino & Reich, 2023). Furthermore, this architecture must facilitate smooth collaboration across global teams (Ozer, 2000).

Data Governance: Establishing a strong data governance framework is critical for ensuring that data serves as a reliable foundation for decision-making in PM (Hannila et al., 2020). Corporate-level governance sets the rules for data responsibility, quality assurance, access control, and protection, building trust in data-driven processes (Hannila et al., 2020; Mubarak et al., 2024). Governance not only serves as a control tool but also enables structured data flows (Harkonen et al., 2024). It ensures compliance with external requirements like documentation and traceability, while ensuring the reliability of analytical systems (Goh & McMahon, 2009; Yong & Wang, 2013).

Support Systems: Technology can only be effective if it is accessible to people (Siddiqui et al., 2004). Intuitive, role-based support systems, such as dashboards, automated evaluations, and interactive visualizations, lower the barriers to entry for specialist users and encourage the use of data-based control

instruments (Durmuşoğlu & Barczak, 2011; Pora et al., 2018). User-centered design provides data-based support for operational and strategic decisions at all levels (Meyer et al., 2021). The goal is to create a work environment in which information is available, understandable, and actionable (Dremel et al., 2017).

4. Discussion

This study provides a structured understanding of how digitalization can enhance PM performance, while uncovering the multidimensional nature of the required transformation. In terms of theoretical classification, the article can be placed within the framework proposed by Wessel et al. (2025). This article focuses on DT in relation to PM and its specific characteristics. By synthesizing insights across advantages, challenges, and four design fields, the results show that success depends not on isolated initiatives but on a coordinated transformation across strategic, organizational, technological, and cultural levels. The study combines several levels of analysis (macro, meso, micro) in the design fields. The paper examines advantages, challenges, and design areas during the transformation. It thus offers a conceptual framework that is relevant for ongoing and planned DT initiatives in PM.

4.1. Key insights

The results of this review confirm that digitalization can substantially improve PM performance by enhancing decision quality, customer and product understanding, market responsiveness, and process agility. These advantages support and consolidate prior research, which highlights the growing relevance of data-driven approaches in dynamic and innovative environments (Fichtler et al., 2024a; Harkonen et al., 2024; Witkowski & Wodecki, 2024b). Yet the realization of these benefits is not straightforward. The analysis also shows that many companies face persistent barriers, ranging from missing strategic guidance and fragmented responsibilities to cultural resistance and inadequate data infrastructures. Notably, and in line with earlier studies, the majority of these challenges are not technical but stem from organizational or structural shortcomings (Bahrenburg et al., 2019; Product Management Festival, 2019).

To address this complexity, the study identifies four interconnected design fields that provide a structured response to the observed barriers. Strategic Anchoring supports alignment between digital initiatives and overarching goals, while Organizational Implementation focuses on process

integration and role clarity. People Management emphasizes cultural readiness, upskilling, and employee involvement, and the Technological Foundation lays the groundwork for interoperable, scalable, and user-centered data infrastructures. Together, these fields illustrate that successful digitalization in PM requires a coordinated, multi-dimensional transformation, tailored to organizational context and maturity, rather than driven by isolated tools or technologies. At the same time, the transferability of the proposed framework is subject to contextual limitations. The effectiveness of the design fields likely depends on factors such as company size, industry affiliation, regulatory environment, and the existing maturity level of PM. For example, while large enterprises may be able to implement formalized governance and analytics capabilities, smaller firms often require pragmatic, low-complexity solutions. Similarly, sectors with strong compliance requirements may face additional constraints in applying iterative or data-driven approaches. These differences underline the need for careful contextualization when using the framework in practice and highlight that digital transformation remains a contingent, not uniform, process.

4.2. Theoretical and practical implications

From a theoretical standpoint, the study consolidates previously scattered insights on digitalization in PM, presenting them as an integrated framework. The study advances discourse by linking strategic ambitions to operational mechanisms and emphasizing the sociotechnical nature of transformation. The design fields allow researchers to distinguish analytically between core transformation layers and examine their interaction in various organizational settings. For practitioners, the results provide comprehensive yet accessible guidance for planning and implementing digitalization initiatives. By focusing on technology, tools, legitimacy, roles, skills, and culture, the framework supports a more holistic understanding of digital transformation in PM. It encourages companies to move beyond isolated pilot projects and establish long-term, learning-oriented structures that ensure scalability and resilience. The results also underscore the importance of involving employees early on, achieving visible successes, and cultivating a shared data culture as key drivers of acceptance and sustainability.

4.3. Limitations and future research

Despite its systematic approach, the study has several limitations. The insights are derived from

academic literature, which may not fully capture current industrial practices or emerging trends in rapidly evolving fields such as AI-assisted PM. While the qualitative coding and clustering process was rigorously executed, it still involves subjective interpretation and may have excluded relevant nuances. Future research should empirically test the framework's validity and refine it through industrial case studies. Comparative analyses across different industries or organizational sizes could help us understand how design fields manifest in practice. Additional studies should examine cultural change and competence development dynamics over time and the effectiveness of digital support tools in real-world decision-making. These efforts will sharpen the framework, enhance its transferability, and provide more targeted guidance for scholars and practitioners.

5. Conclusion

This study offers a structured overview of how digitalization can improve PM performance. It identifies four key advantages: improved decision quality, enhanced customer understanding, greater market responsiveness, and increased process efficiency. The study also highlights persistent challenges related to strategy, organization, culture, and technology. Four design fields with 16 concrete elements were derived to address these challenges: Strategic Anchoring, Organizational Implementation, People Management, and Technological Foundation. Together, these fields offer an integrated framework for guiding digital transformation in PM. The results underscore that successful implementation requires coordinated changes across multiple dimensions, not isolated tools. This framework supports academic theorizing and practical transformation planning.

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