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REVIEW PAPERS

Digital Transformation and Flexible Performance Management: A Systematic Literature Review of the Evolution of Performance Measurement Systems

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Abstract *In the era of digital transformation, businesses must innovate and adapt to sustain a competitive edge. This dynamic environment compels a reevaluation of traditional management practices, highlighting the need for highly flexible systems. Flexibility, defined as the ability to adapt organizational resources, processes, and strategies in response to environmental changes such as rapid technological advancements, is crucial. Our systematic review of 47 studies investigates how digital transformation influences performance measurement systems across various industries and global contexts. We found that digital transformation fosters the dynamism and adaptability of these systems. This study integrates strategic, organizational, and information systems flexibility concepts that are essential for effective adaptation and resilience. Our findings underscore the shifts towards decision-making agility, inclusivity, and sustainability, stressing the significant role of human resources in adapting to digital imperatives. We advocate for a comprehensive approach that fosters digital literacy, upholds ethical standards, promotes continuous skill development, and enhances strategic adaptability. Practical implications suggest integrating digital technologies into performance strategies, utilizing real-time metrics for agile decision-making and emphasizing ethical and sustainable practices to improve transparency and stakeholder trust. These strategies are crucial for optimizing performance in the digital age.*

Keywords Adaptive management · Decision-making · Digital transformation · Flexibility · Organizational flexibility · Performance measurement system · Systematic review

Introduction

Digital transformation (DT) is rapidly reshaping industries, requiring businesses to innovate and adapt quickly to remain competitive and meet evolving stakeholder demands (Alnoor et al., 2024; D'Adamo et al., 2023a, 2023b). This environment challenges traditional performance measurement systems (PMSs), which often fail to fully leverage the benefits of emerging technologies, such as artificial intelligence (AI), big data, and the Internet of Things (IoT) (Aldoseri et al., 2024; Sardi et al., 2023). In response, flexible management has become essential, enabling organizations to adapt their operational, strategic, and measurement practices in real time to foster a culture of continuous improvement (Chowdhury et al., 2024; Enrique et al., 2022; Gao & Chen, 2021).

Flexibility is crucial for aligning with strategic objectives, responding to changes, and enhancing sustainability. For example, supply chain and tourism companies exemplify the rapid adaptation to new business models and unforeseen challenges (Agrawal et al., 2024; Pandey et al., 2024; Singh et al., 2023). Indeed, the evolving role of flexibility increasingly contributes to organizational and environmental adaptability (Singh et al., 2021).

The DT-driven evolution of business models, methods, and customer experiences necessitates a comprehensive understanding of how these changes impact PMSs (Sakhteh et al., 2023). Technical, cultural, organizational, and

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relational shifts underscore DTs' role in enhancing performance and creating customer value (Mergel et al., 2019).

However, the broader implications for organizational flexibility and strategic alignment remain underexplored (Korsen & Ingvaldsen, 2022), as existing systematic reviews focus narrowly on specific technological impacts without considering pervasive organizational effects. For instance, Yadav and colleagues' study (2022) within the agricultural food supply chain highlighted the need for PMSs that incorporate sustainability, spurred by rapid digitalization. Hidalgo Martins et al. (2022) noted challenges in performance measurement for SMEs in the manufacturing industry. Additionally, Miklosik and Evans (2020) addressed the issue of information overload in marketing organizations, a complication arising from disorganized data from digital sources. These studies detailed the technological integration within PMSs, yet seldom addressed the holistic transformation of organizational strategies.

Our study addresses this gap by examining how DT necessitates realignment within organizations, fostering a more interconnected and responsive business environment. We explore how DT enhances the flexibility and effectiveness of PMSs across diverse organizational contexts (Gong & Ribiere, 2021). Therefore, we propose the following research questions:

RQ1: How does DT influence PMSs in terms of organizational flexibility? This question seeks a deeper understanding of the relationship between DT and PMSs beyond technical aspects (Nadkarni & Prügl, 2021).
RQ2: How do digital technologies affect decision-making within PMSs? This inquiry is critical to obtain insights into maintaining innovation and agility in a fast-paced digital economy (Kamble & Gunasekaran, 2020).
RQ3: How do traditional measurement methods adapt in the digital era? Exploring this topic is imperative, as the pace of digital advancements threatens the relevance of conventional PMS tools, necessitating their evolution to accurately capture firm-created value (Bansal et al., 2023).

We conducted the first systematic review with a thematic analysis of the role of PMSs in digitally transformed environments, integrating 47 peer-reviewed articles. This analysis reveals the fundamental functions of PMSs, such as monitoring, attention focusing, strategic decision-making, and legitimacy (Henri, 2006), and provides a unified view that advances the understanding of modern organizations' responsiveness to ongoing digitalizing environments.

Following this introduction, Section "Methodology" details our review methodology, describing the selection criteria and analysis techniques used to comprehensively examine the literature. Section "Results" presents our thematic findings, and Section "Discussion" explores the impact of DT on flexibility in decision-making within PMSs, linking to our research questions. Section "Contributions and Implications" concludes the paper by providing theoretical and practical implications and outlining future research directions, emphasizing the need for PMS alignment with digital advancements to boost organizational effectiveness.

Methodology

We conducted a systematic review adhering to the PRISMA guidelines of Liberati et al. (2009). This approach enhances research quality and reliability by offering a comprehensive, unbiased synthesis of both published and unpublished literature. By systematically identifying, evaluating, and integrating studies based on predefined criteria, our review ensures thorough coverage of the topic, promoting the reproducibility of findings and deepening understanding in this research area (Popay et al., 2006; Tranfield et al., 2003). Such rigour is crucial for identifying knowledge gaps and directing future research (Webster & Watson, 2002). It supports evidence-based practice by providing clear, synthesized outcomes that aid decision-making for practitioners and policy-makers (Schardt et al., 2007).

Conceptual Framework

Figure 1 illustrates our adopted conceptual framework, as defined by Henri (2006), which categorizes the flexible roles and capabilities of PMSs into four types: monitoring, attention focusing, strategic decision-making, and legitimization. Each category enhances organizational agility to adapt to DT.

Henri's framework is noted for its thorough examination of performance measurement complexities and has been successfully applied in fundamental studies (DeNisi & Smith, 2014; Franco-Santos et al., 2012; Ukko et al., 2019). Its focus on flexibility aligns with our examination of how DT reshapes PMSs to support more adaptive and dynamic organizational environments.

By applying Henri's structured approach, we categorize the literature into four thematic areas:

1. Monitoring involves setting goals and using them as flexible diagnostic tools that adjust to new data and changing conditions. It is crucial for tracking progress and ensuring that firm performance aligns with stakeholder expectations.

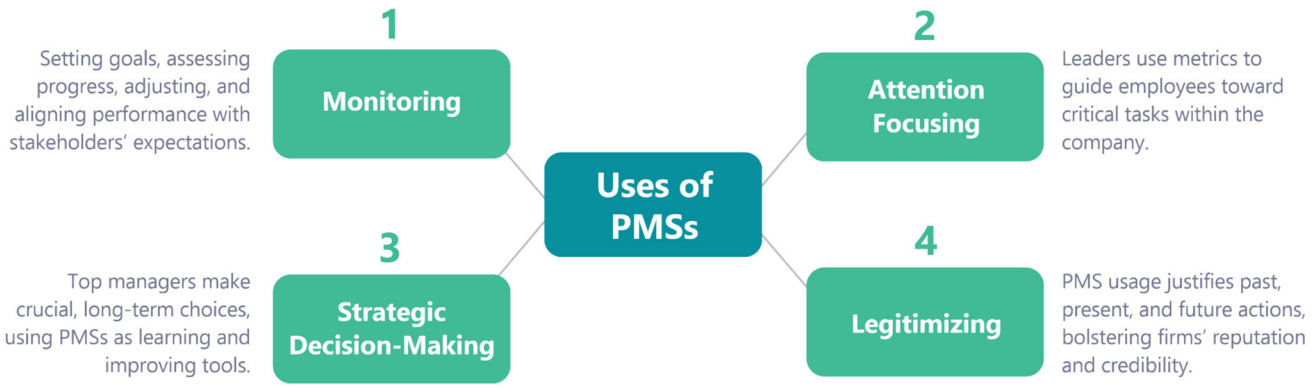

Fig. 1 Conceptual framework: Uses of PMSs. Source: Adapted in part from Henri (2006)

2. Attention focusing enables leaders to dynamically highlight and communicate organizational priorities and critical success factors, fostering adaptability to strategic objectives.
3. Strategic decision-making assists in formulating long-term, adaptive decisions by providing insights into the evolving dynamics within organizational processes and facilitating strategic planning and execution.
4. Legitimization ensures that PMSs rationalize past decisions under changing conditions and bolster future planning efforts. Having flexible and accountable demonstrations enhances organizational credibility and secures societal support.

Henri's framework integrates seamlessly with our research questions, coherently presenting findings and illustrating the dynamic interplay between PMSs and DT. It effectively addresses the identified gaps in the literature by offering nuanced insights into how organizations can leverage PMSs in digitally evolving business landscapes. Thus, this study provides a new perspective on the relationship between digital technologies and performance management tools crucial for strategic decision-making in modern organizational contexts.

Search Strategy

On August 7, 2023, we searched the Web of Science, Scopus, and ProQuest databases, focusing on DT and performance measurement. This search adhered to methodologies from previously validated systematic reviews, limiting inclusion to peer-reviewed studies published in international journals and excluding conference papers and book chapters.

For DT, we utilized search terms from recent literature (Gurzhii et al., 2022; Hanelt et al., 2021; Verhoef et al., 2021; Zhu et al., 2021): "digital transformation", "digital strategy", "digital disruption", "digital business strategy", "digitalize", "digitize", "IT transformation", "IS transformation", "business transformation", and "emerging technologies."

In terms of performance measurement, we derived keyword variants from earlier systematic reviews (Bititci et al., 2012; Franco-Santos et al., 2012; Rojas-Lema et al., 2021), including "performance measurement system*", "performance measure*", "management control*", "performance measurement", "performance management", "performance indicators", "strategic control", "performance evaluation", and "performance assessment." To address the multidisciplinary nature of our study, we expanded our search to include terms such as "organi* performance", "firm performance", and "SME performance."

We employed the wildcard "*" to capture plural forms and variants in our search terms. Table 1 outlines the search strings used for each database and the results obtained.

Our expansive keyword approach aimed to overcome the limitations of keyword-centric searches, acknowledging the lack of universally accepted definitions for DT and performance measurement (Vial, 2021).

We performed our searches across titles, abstracts, and keywords. The initial search yielded 3109 articles, from which we removed 930 duplicates using Zotero 6.0.27. The remaining 2179 articles were screened for eligibility and focused on adaptability, agility, and resilience, which are themes relevant to the impacts of DT on PMSs.

Inclusion/Exclusion Criteria

The next stage involved screening papers using the Population, Intervention, Comparison, Outcome, Time (PICOT) framework, as suggested by Echevarria and Walker (2014). Table 2 details the inclusion and exclusion criteria, providing clear guidelines for our systematic review process.

We adopted a focused selection strategy to ensure that our research on DT's impact on PMSs was relevant and

Table 1 Database source and query executed

Database	Search query	No. of documents
Web of Science	TS=("digital transformation" OR "digital strategy" OR "digital disruption" OR "digital business strategy" OR "digitalize" OR "digitize" OR "IT transformation" OR "IS transformation" OR "business transformation" OR "emerging technologies")	1245
	AND TS=("performance measurement system*" OR "performance measure*" OR "management control*" OR "performance measurement" OR "performance management" OR "performance indicators" OR "strategic control" OR "performance evaluation" OR "performance assessment" OR "organi* performance" OR "firm performance" OR "SME performance")	
Scopus	TITLE-ABS-KEY("digital transformation" OR "digital strategy" OR "digital disruption" OR "digital business strategy" OR "digitalize" OR "digitize" OR "IT transformation" OR "IS transformation" OR "business transformation" OR "emerging technologies")	1290
	AND TITLE-ABS-KEY("performance measurement system*" OR "performance measure*" OR "management control*" OR "performance measurement" OR "performance management" OR "performance indicators" OR "strategic control" OR "performance evaluation" OR "performance assessment" OR "organi* performance" OR "firm performance" OR "SME performance")	
ProQuest	(TI("digital transformation" OR "digital strategy" OR "digital disruption" OR "digital business strategy" OR "digitalize" OR "digitize" OR "IT transformation" OR "IS transformation" OR "business transformation" OR "emerging technologies") OR AB("digital transformation" OR "digital strategy" OR "digital disruption" OR "digital business strategy" OR "digitalize" OR "digitize" OR "IT transformation" OR "IS transformation" OR "business transformation" OR "emerging technologies") OR IF("digital transformation" OR "digital strategy" OR "digital disruption" OR "digital business strategy" OR "digitalize" OR "digitize" OR "IT transformation" OR "IS transformation" OR "business transformation" OR "emerging technologies"))	574
	AND (TI("performance measurement system*" OR "performance measure*" OR "management control*" OR "performance measurement" OR "performance management" OR "performance indicators" OR "strategic control" OR "performance evaluation" OR "performance assessment" OR "organi* performance" OR "firm performance" OR "SME performance") OR AB("performance measurement system*" OR "performance measure*" OR "management control*" OR "performance measurement" OR "performance management" OR "performance indicators" OR "strategic control" OR "performance evaluation" OR "performance assessment" OR "organi* performance" OR "firm performance" OR "SME performance") OR IF("performance measurement system*" OR "performance measure*" OR "management control*" OR "performance measurement" OR "performance management" OR "performance indicators" OR "strategic control" OR "performance evaluation" OR "performance assessment" OR "organi* performance" OR "firm performance" OR "SME performance"))	

Table 2 Inclusion/Exclusion criteria

Parameter	Inclusion	Exclusion
Population	Private sector	Public and non-profit organizations
Intervention	Digital transformation process	Little or no focus on digital transformation
Comparison	Control groups (if available)	–
Outcome	Studies reporting digital transformation effects on PMSs	Studies assessing: The success rate of the digital transformation process and/or The general performance of organizations
Time	Studies undertaken in 2000–2023	Studies published before 2000

specific. Following Franco-Santos et al. (2007), we concentrated on studies with a precise unit of analysis, aiming for clear and in-depth research outcomes. Therefore, we included only peer-reviewed articles in English that were strictly related to PMSs rather than to performance measurement in general. This approach allowed us to delve deeply into how DT influences PMSs specifically. We also excluded studies assessing the performance and metrics for the different phases of DT, as these areas have been extensively reviewed elsewhere (Ochoa-Urrego & Peña-Reyes, 2021; Teichert, 2019).

The exclusion of studies from the public and nonprofit sectors was intentional due to their unique measurement standards and challenges. The public sector is subject to diverse, legally mandated measurement standards that vary significantly across different national contexts (Speklé & Verbeeten, 2014), introducing variables that could confound the analysis of DT's impact on PMSs. Similarly, the nonprofit sector's nascent stage in adopting PMSs (Treinta et al., 2020) suggests that its inclusion might not offer the mature perspective necessary for our investigation.

We set our timeframe for the included studies from January 2000 to the present, following Verhoef et al. (2021). This period is significant because the internet bubble burst when tech giants such as Google, Amazon, and eBay not only survived but also began significantly shaping our understanding of DT. We did not restrict our search to journal rankings or research fields to maintain broad coverage across disciplines.

After screening the titles and abstracts, 2,132 papers were excluded, leaving 804 for full-text review. Ultimately, 47 papers met our criteria and were included in our systematic review. Figure 2 depicts the PRISMA flowchart of our screening process.

Our stringent selection criteria might limit the scope of the study. However, this specificity is crucial for ensuring the integrity and applicability of our findings, particularly regarding DT's impact on PMSs within business organizations. Our focused approach strengthens the foundation for future research and enhances the precision and relevance of our contributions to discussions on DTs and PMSs.

Data Extraction

We extracted essential information from each paper, including title, authors, abstract, and publication year. To mitigate potential biases, we also gathered detailed data, such as country of origin, research questions, study design, sample size, demographic information, and main findings.

We employed thematic analysis to systematically categorize and interpret the data. This method is particularly effective for exploring varied research questions, from subjective experiences to objective performance assessments (Clarke & Braun, 2013). Analysing the data this way provided deeper insights into the underlying themes and patterns that emerged.

Our focus was on PMS roles (monitoring, attention focusing, strategic decision-making, and legitimization), guided by Henri's (2006) conceptual framework, which links specific PMS functions to their capabilities, as observed in the literature (Pinheiro de Lima et al., 2008).

Adhering to the PRISMA checklist and applying stringent selection criteria ensured that our review was comprehensive and sharply focused. This meticulous approach enhances the credibility of our findings and supports their applicability across diverse contexts. Section "Results" will delve into how these findings illustrate PMSs' adaptive responses to DT. We explore significant themes, such as the strategic implications of these adaptations across various industries, demonstrating the practical impact of digitalization on performance management practices.

Results

Overview of Results

Our final sample included 47 studies, as detailed in Table 3. The methodologies used varied and included quantitative (26 studies), qualitative (3), mixed-method (3), conceptual (6), and case studies (9). Geographically, the studies were conducted across Europe (14), Asia (12), the Americas (4), multiple countries (4), and Africa (1). Six articles did not specify a location, and the six conceptual papers inherently lacked geographical data.

Figure 3 illustrates the temporal distribution of the studies. There has been a noticeable increase in publications, with over 85% of publications released since 2019, indicating a growing academic interest in this area.

The majority of the articles focused on strategic decision-making. Only four studies explored attention focusing, a critical element in digitally transforming environments. Figure 4 illustrates the distribution based on Henri's (2006) categories.

In the following sections, we will further analyse each category to understand the impact of DT on PMSs, decision-making processes, and the adaptation of traditional tools within digital contexts.

Monitoring (n = 15)

Fifteen studies focused on observing and assessing organizational activities using PMSs. These studies emphasized the importance of tracking performance metrics to align operations with strategic objectives and promptly detect deviations, underscoring the critical role of monitoring in flexible management.

We identified five clusters within this theme:

1. Digital tools and techniques
2. Methodological approaches
3. Context of digitalization
4. Challenges and opportunities
5. Illustrative case studies

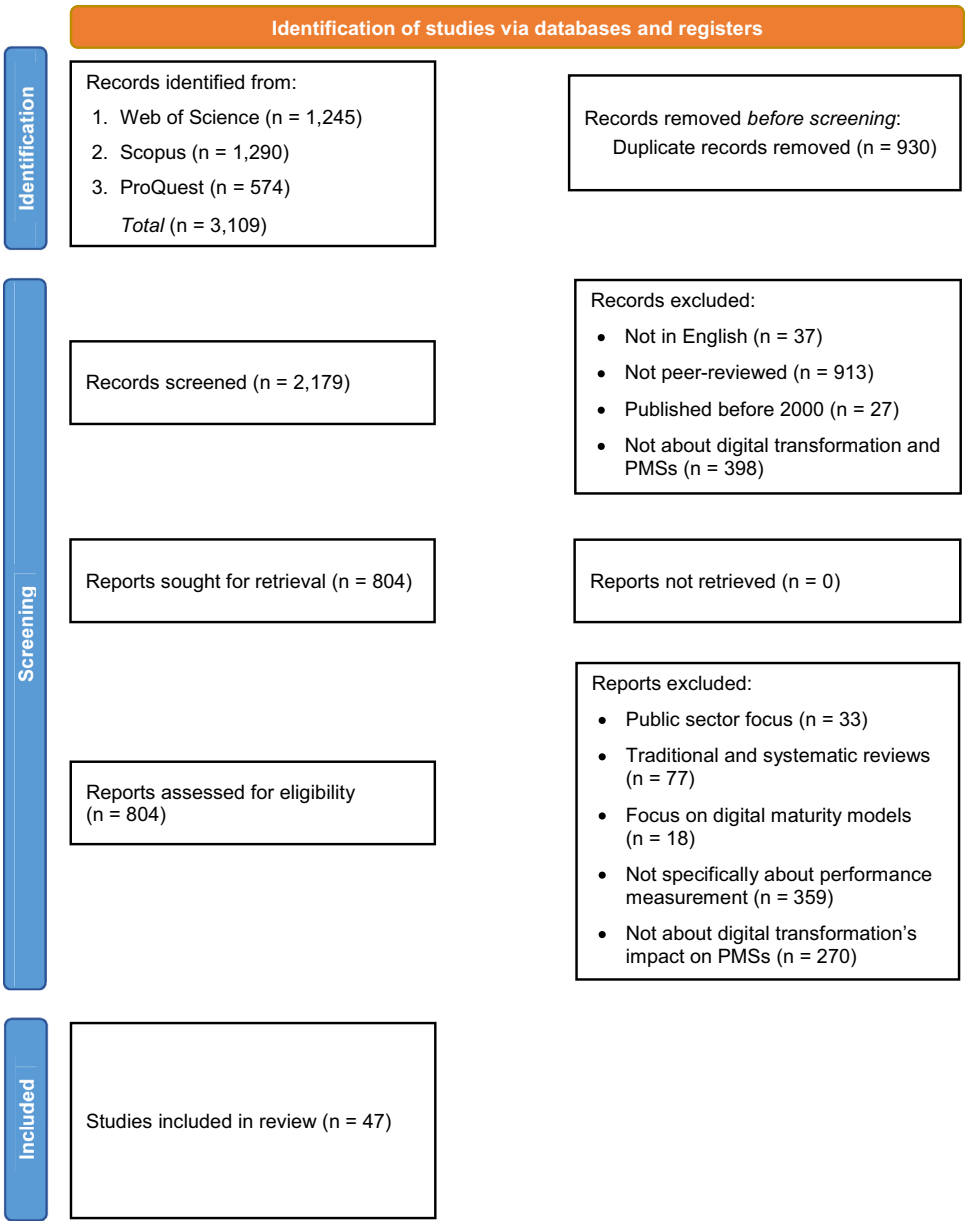

Fig. 2 PRISMA flowchart for screening and inclusion

Digital Tools and Techniques (n = 4)

Four studies highlighted how innovative digital tools designed for monitoring are revolutionizing industry practices. For instance, Ahmad and Qiu (2009) utilized a comprehensive dataset covering 1500 firms from 1993 to 2005 to develop an integrated model for manufacturing SMEs. This model underscores the critical role of human resources in technology adoption, especially amid widespread talent scarcity. This insight emphasizes the necessity of human capital in maximizing the benefits of digital tools. Similarly, studies by Bonci et al. (2019), Litavniece et al. (2023), and Fischer et al. (2021) demonstrated how integrating computer algorithms with physical processes enhances efficiency and sustainability across various sectors. These studies indicate that effective use of digital tools depends on integrating skilled human resources.

Methodological Approaches (n = 3)

Three studies explored structured methodologies for digital monitoring, offering a broader perspective on the applications of such tools. Aibinu and Papadonikolaki (2020) expanded the utility of building information modelling by introducing an "effort distribution analysis" methodology. This approach aims to enhance organizational learning and innovation, illustrating the potential of structured methods to foster significant advancements in company practices. In

Table 3 Characteristics of included studies

References	Journal	Geographic focus	Study design	Theme/PMS use	Main findings
Ahmad and Qiu (2009)	*Journal of Intelligent Manufacturing*	Multi-country	Mixed	Monitoring	Human resources' role in tech adoption in small and medium firms is vital
Aibinu and Papadonikolaki (2020)	*Construction Management and Economics*	Not reported	Mixed	Monitoring	New techs can foster corporate continuous learning and innovation
AL-Khatib (2022)	*EuroMed Journal of Business*	Jordan	Quantitative	Monitoring	Intellectual capital and big data analytics boost banks' innovation
AlMujaini et al. (2021)	*International Journal of Data and Network Science*	United Arab Emirates	Quantitative	Monitoring	A blend of innovation, tech, and learning is the key to success
Baral et al. (2023)	*International Journal of Logistics Management*	India	Quantitative	Monitoring	Amidst disruptions, SMEs must develop resilient strategic blueprints
Bititci (2007)	*Business Strategy Series*	–	Conceptual	Strategic decision-making	Stressed on integrating leadership, strategy, and processes for firm evolution
Bonci et al. (2019)	*Automation in Construction*	–	Conceptual	Monitoring	Technology enhances real-time monitoring, diagnostics, and building efficiency
Chhabra et al. (2022)	*International Journal of Productivity and Performance Management*	India	Case study	Monitoring	Digital tools in green logistics enhance environmental efficiency
Čizmić and Ahmić (2021)	*Management: Journal of Contemporary Management Issues*	Bosnia and Herzegovina	Quantitative	Attention focusing	Strong human resources practices boost profit and growth
Colombo and Beuren (2023)	*Journal of Business and Industrial Marketing*	Brazil	Quantitative	Strategic decision-making	Innovation culture and PMS enhance accounting automation
Curzi et al. (2019)	*Frontiers in Psychology*	Italy	Quantitative	Attention focusing	Specific appraisals can boost innovation, but excessive formality might hinder creativity
El Kihel et al. (2023)	*International Journal of Computer Integrated Manufacturing*	Morocco	Case study	Strategic decision-making	Big data analytics and AI optimize supply chain processes
Fischer et al. (2021)	*Information Systems*	Multi-country	Quantitative	Monitoring	Infrequent processes with fewer interactions have improvement potential
Globerson (2024)	*International Journal of Organizational Analysis*	–	Conceptual	Monitoring	Digitalization demands process automation for better customer engagement
Holopainen et al. (2023)	*Measuring Business Excellence*	Finland	Quantitative	Strategic decision-making	Tech understanding does not directly boost PMS usage
Homburg and Wielgos (2022)	*Journal of the Academy of Marketing Science*	Not explicitly stated	Mixed	Attention focusing	Digital marketing requires a customer-centric approach and aligned processes
Hristov and Appolloni (2022)	*Business Strategy and the Environment*	Italy	Case study	Legitimizing	Stakeholders' insights are crucial for decision-making
Hung et al. (2023)	*Heliyon*	Vietnam	Quantitative	Strategic decision-making	DT and leadership can boost success for emerging market firms using cloud accounting
Joensuu-Salo and Matalamäki (2023)	*Journal of Enterprising Culture*	Finland	Quantitative	Strategic decision-making	Mastery of digital tech enhances performance and growth
Joshi et al. (2022)	*Decision Support Systems*	Multi-country	Quantitative	Strategic decision-making	IT governance process capability improves IT and firm performance

Table 3 continued

References	Journal	Geographic focus	Study design	Theme/PMS use	Main findings
Kim (2021)	*Sustainability*	South Korea	Quantitative	Legitimizing	SMEs' growth factors vary by industry, and tech skills are key in the IT/ Software sector
Lavorato and Piedepalumbo (2023)	*Sustainability*	Italy	Case study	Legitimizing	Smart technologies improve sustainability and supply chain operations
Litavniece et al. (2023)	*Worldwide Hospitality and Tourism Themes*	Not reported	Qualitative	Monitoring	Digital tools significantly enhance hotel management tactics
Martín-Peña et al. (2020)	*Journal of Business and Industrial Marketing*	Spain	Quantitative	Strategic decision-making	Integrating servitization with digitalization benefits firms
Meagher (2002)	*Information Management Journal*	–	Conceptual	Strategic decision-making	Emphasized holistic approach to information management for firm success
Moretti and Re Cecconi (2019)	*Buildings*	Italy	Case study	Strategic decision-making	Model for predicting failures and improving efficiency in maintenance
Moumtzidis et al. (2022)	*Information*	Greece	Quantitative	Strategic decision-making	The pivotal role of big data analytics and the Internet of Things in the telecom industry
Nandi et al. (2023)	*International Journal of Logistics Research and Applications*	–	Conceptual	Legitimizing	Integrated digital techs enhance sustainability performance
Ng (2009)	*International Journal of Intelligent Enterprise*	Canada and USA	Case study	Strategic decision-making	R&D is crucial for intangible assets and market value
Ng et al. (2017)	*International Journal of Entrepreneurship and Innovation Management*	Hong Kong	Quantitative	Monitoring	Performance analysis needs adaptability with diverse indicators
Nudurupati et al. (2021)	*International Journal of Production Economics*	Not reported	Case study	Strategic decision-making	Shift to wider value-creation networks in performance measures
Olan et al. (2022)	*Journal of Business Research*	Not reported	Quantitative	Strategic decision-making	AI and knowledge-sharing tools improve organizational performance
Opazo-Basáez et al. (2023)	*International Journal of Physical Distribution and Logistics Management*	Spain	Quantitative	Strategic decision-making	Smart manufacturing implementation impacts vary based on firms' types and nature
Papiorek and Hiebl (2023)	*Journal of Accounting and Organizational Change*	Germany	Quantitative	Monitoring	Investing in high-quality info systems is vital for management control
Park et al. (2022)	*Energy Research and Social Science*	–	Conceptual	Monitoring	Collaboration is essential for tech-driven, sustainable energy efficiency
Quille et al. (2023)	*Sustainability*	Brazil	Case study	Monitoring	Robotic process automation simplifies data collection and monitoring
Reinking et al. (2020)	*International Journal of Accounting Information Systems*	Not reported	Qualitative	Attention focusing	Managers opt for simple tactics with PMSs to ensure alignment with broader goals
Samarghandi et al. (2023)	*Journal of Risk and Financial Management*	Iran	Quantitative	Strategic decision-making	AI's integration in accounting info systems has led to predicting human actions
Scalco and Simske (2023)	*Systems Engineering*	USA	Quantitative	Monitoring	Human factors are primary cybersecurity vulnerabilities
Shin et al. (2023)	*Sustainability*	South Korea	Quantitative	Legitimizing	Digital leadership and tech culture boost corporate performance

Table 3 continued

References	Journal	Geographic focus	Study design	Theme/PMS use	Main findings
Szymczak et al. (2018)	*Journal of Business Economics and Management*	Poland	Quantitative	Strategic decision-making	Firms rely on old tech and hesitate to adopt new solutions
Teng et al. (2022)	*Sustainability*	China	Quantitative	Strategic decision-making	Digital tools and skilled workforce play a critical role for SMEs
Trequattrini et al. (2022)	*Meditari Accountancy Research*	Italy	Case study	Strategic decision-making	Technology enhances PMS transparency and accuracy
Vărzaru (2022)	*Electronics*	Multi-country	Quantitative	Legitimizing	DT tools bolster transparency in sustainability reporting
Vrontis et al. (2022)	*Sustainability*	India	Quantitative	Legitimizing	Digital tools spur SME growth and societal benefits
Wang and Chien (2016)	*International Journal of Production Research*	Taiwan	Quantitative	Strategic decision-making	Combining financial and non-financial indicators enhances the performance view
Wengler et al. (2021)	*Journal of Business and Industrial Marketing*	Germany	Qualitative	Strategic decision-making	Many executives follow outdated PMS indicators despite new tools

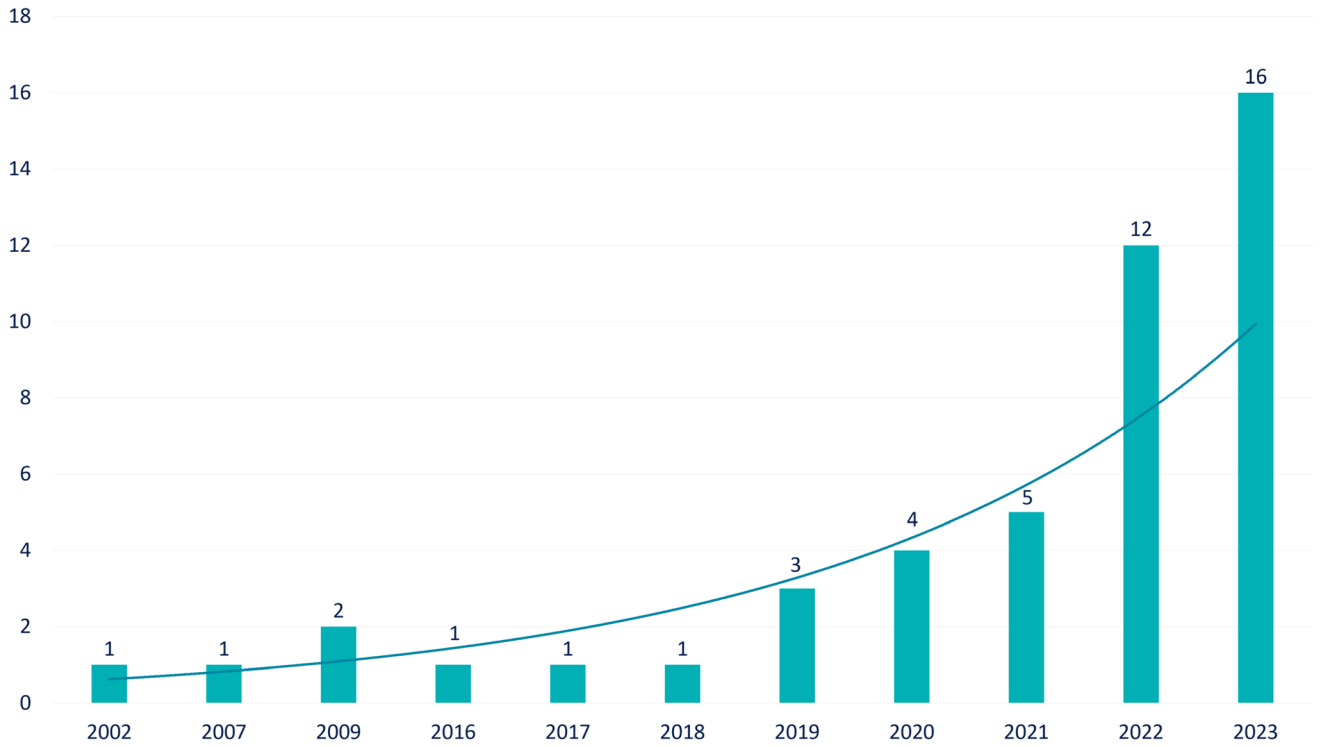

Fig. 3 The number of studies published per year. *Notes* In 2023, we found 16 studies published in Web of Science, Scopus, and ProQuest as of 07/08/2023

Hong Kong, Ng et al. (2017) highlighted how adaptable performance analysis methodologies incorporating financial and nonfinancial indicators are crucial for innovative firms. Papiorek and Hiebl (2023) further supported

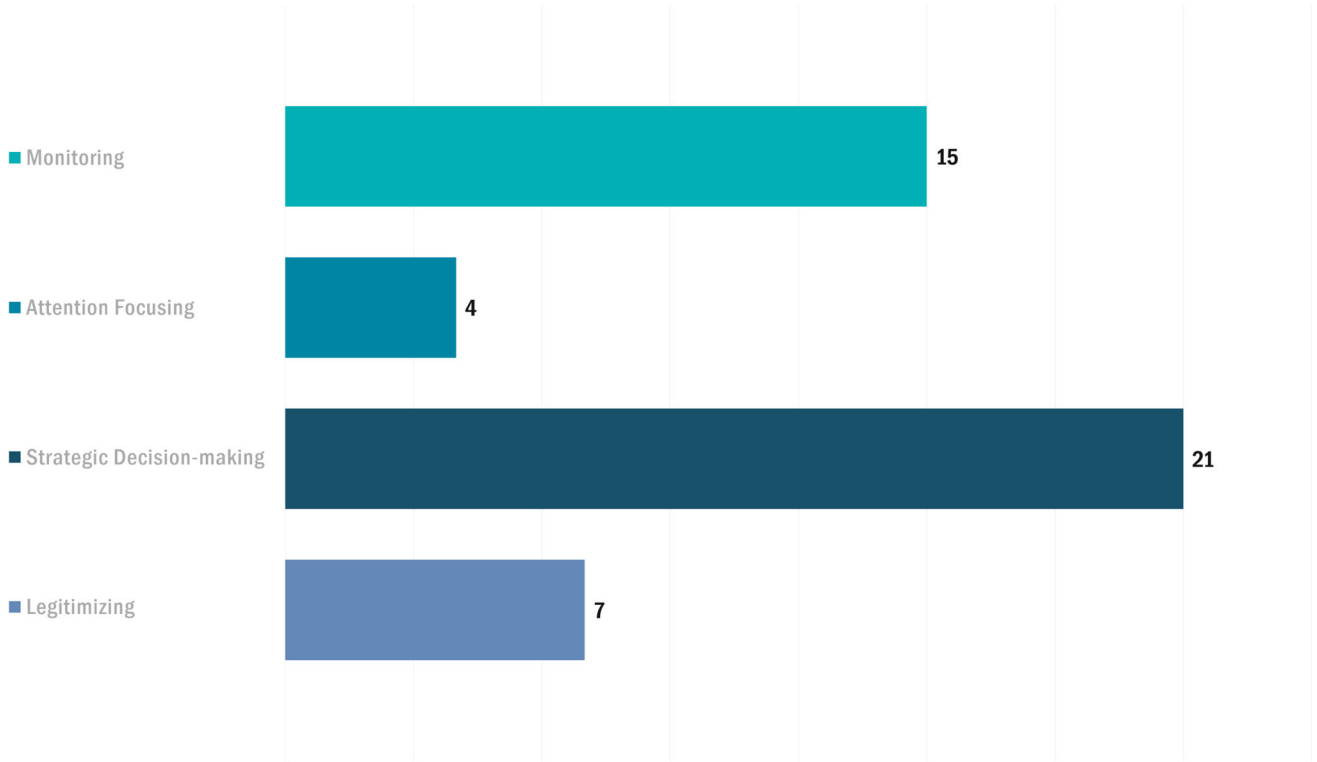

Fig. 4 Roles of PMSs in included articles

this view by demonstrating the importance of high-quality information for effective management control systems, requiring robust IT capabilities and external expertise. These insights underscore that flexible performance analysis requires high-quality information systems. Companies must integrate these elements skilfully to optimize results, highlighting the value of technological innovation and methodological adaptability.

Context of Digitalization (n = 4)

This cluster examines the interface between digital transformation and performance tracking. Studies such as those by Scalco and Simske (2023) and AlMujaini et al. (2021) revealed that successful DT involves more than merely implementing new technologies. It requires a strategic alignment integrating technology with insightful human management and organizational vision. Similarly, AL-Khatib (2022) demonstrated that intellectual capital coupled with big data analytics (BDA) significantly enhances innovation performance in 333 Jordanian banks. In addition, Park et al. (2022) advocated for global collaboration to leverage disruptive technologies for improved sustainability and energy efficiency in their conceptual study on appliance and equipment systems. These findings challenge traditional views of technology adoption, advocating for a more nuanced approach that leverages human insights alongside digital advancements.

Challenges and Opportunities (n = 2)

The digital era introduces challenges and opportunities for monitoring, as seen in studies by Baral et al. (2023) and Globerson (2024). Baral et al. (2023) highlighted how the COVID-19 pandemic underscored the vulnerability of global supply chains, prompting SMEs to develop resilient strategic plans. This adaptation involves not only automation but also a comprehensive rethinking of performance monitoring systems to ensure resilience and real-time adaptability (Globerson, 2024). These studies illustrate that the digital era reshaped performance monitoring paradigms. Digital disruptions and global uncertainties highlight the vulnerabilities of traditional PMSs. The emerging digital landscape demands not only automation but also strategic rethinking of performance monitoring, ensuring resilience and real-time flexibility.

Illustrative Case Studies (n = 2)

Case studies by Chhabra et al. (2022) and Quille et al. (2023) provided practical insights into how digital tools can transform traditional monitoring practices. These studies showcased the application of the IoT, BDA, global

positioning system, and robotic process automation in enhancing monitoring efficiency, sustainability, and customer satisfaction. They exemplified how leveraging cutting-edge technologies can revolutionize traditional practices, offering a blueprint for future innovations in performance monitoring. Together, these case studies underscore the evolving nature of monitoring in digitalization. By leveraging such emerging technologies, businesses can dramatically boost operational flexibility, sustainability, and customer satisfaction.

Attention Focusing (n = 4)

Four studies explored the mechanisms organizations and individuals use to prioritize specific areas, issues, or metrics crucial for swiftly addressing vital aspects. These studies range in scope from broad organizational strategies to targeted tactical actions. Strategic considerations set the overarching corporate direction, while tactical measures focus on immediate, actionable steps.

Therefore, we classified the articles as follows:

1. Digital strategy shifts
2. Tactical performance signals

Digital Strategy Shifts (n = 2)

Exploring the transition from traditional to digital marketing, Homburg and Wielgos (2022) analysed responses from 382 German-speaking senior managers and financial data from 273 global companies. Their findings emphasize the necessity of a customer-centric approach and internal processes aligned with this perspective, essential for maintaining relevance in the face of rapid technological changes. Similarly, Reinking et al. (2020) interviewed 27 managers across various industries to examine how visual performance measurement tools influence managerial focus on specific metrics. Their research introduced the concept of "strategy surrogation", where managers may prefer simpler tactics over complex strategies to align decisions with broader goals. This approach was critical for effectively diffusing corporate strategy, with PMSs providing real-time feedback that positively influences managerial behaviour. Both studies highlight that DT requires a strategic reorientation. Organizations should enhance their PMSs to focus on key areas such as employee digital marketing skills and strategic internal knowledge dissemination.

Tactical Performance Signals (n = 2)

The role of performance appraisal systems in signalling organizational priorities was the focus of a study by Curzi and colleagues (2019), which surveyed 865 employees from multinational firms in Italy. Their findings suggest that appraisals aimed at specific performance outcomes or new competencies can foster innovative work behaviour. However, they noted that overly formalized systems, such as standardized yearly evaluations, may inhibit innovation. In a related study, Čizmić and Ahmić (2021) explored the impact of robust human resource practices on organizational success by studying 97 managers in Bosnia and Herzegovina. Their research showed that talent identification and skills development are crucial for boosting profitability and sales growth, emphasizing the significance of tactical measures in steering organizational direction. These studies reveal that while balanced PMSs can drive innovation and effectively signal organizational priorities, excessive formalization in appraisal systems might stifle creativity, underscoring the need for a delicate balance between individual autonomy and strategic alignment.

Strategic Decision-Making (n = 21)

Twenty-one studies investigate how PMSs and performance metrics guide strategic decisions and align with organizational directions, priorities, and visions. We categorized the papers into three distinct clusters:

1. DT in business strategies
2. Technological tools in decision-making
3. Strategic AI and digital shifts

DT in Business Strategies (n = 9)

Nine studies examined how DT influences strategic business decisions. The significance of digital tools and a skilled workforce was highlighted by Teng and colleagues (2022) in their study of 335 Chinese SMEs. Research on Finnish SMEs offered contradictory insights. Holopainen et al. (2023) observed that technological understanding alone does not increase PMS usage. However, Joensuu-Salo and Matalamäki (2023) found that mastery of digital technologies significantly boosts performance and growth. This dichotomy underscores the diverse effects of technology on strategy depending on contextual factors. Further supporting the critical role of technology, studies by Moumtzidis et al. (2022), Hung et al. (2023), and Opazo-Basáez et al. (2023) documented the positive impacts of BDA, IoT, and cloud platforms on strategic decision-making, enhancing production efficiency and customer satisfaction.

From an innovation perspective, Trequattrini et al. (2022) conducted a case study of Soundreef S.p.A., an Italian copyright management company, showing how technologies bolster PMS transparency and accuracy.

Adding services to products (servitization) and digitalization interact to create value in 828 Spanish firms (Martín-Peña et al., 2020). However, despite recent advances, many executives still rely on outdated indicators (Wengler et al., 2021).

In sum, while digital technologies are reshaping business strategies, a dichotomy exists in the perceived utility of PMS usage. Firms must align technologies with updated and relevant performance metrics to gain a competitive advantage.

Technological Decision-Making Tools (n = 8)

This cluster focuses on strategically integrating AI and other technological tools across various industries. From an operations management lens, Ng (2009) analysed the strategic advantage of R&D activities in 12 US technology companies, showing how investment in intangible assets boosts market value. Transitioning to optimization tools, Moretti and Re Cecconi (2019) introduced a decision support system (DSS) applied to an Italian office building to predict maintenance needs and optimize operations. Building on performance measurement frameworks, Wang and Chien (2016) employed the balanced scorecard approach in 23 Taiwanese LED companies, proposing the integration of financial and nonfinancial indicators to gain a holistic view of performance.

In supply chain management, Szymczak et al. (2018) reported the cautious adoption of new technologies such as cloud computing and data mining among 200 Polish companies, while El Kihel et al. (2023) highlighted the transformative potential of BDA and AI in Stellantis car manufacturing operations in Morocco. Nudurupati et al. (2021) noted an evolution in performance measures over 17 months, incorporating broader value-creation networks.

Finally, Bititci (2007) and Meagher (2002) proposed conceptual frameworks emphasizing the seamless integration of leadership, strategy, processes, and performance metrics for business evolution, advocating a shift to evidence-based decision-making over mere intuition.

These studies underscore that PMSs streamline resource allocation and refine decision-making across industries. Embracing a comprehensive approach can enable organizations to make more informed decisions.

Strategic AI and Digital Shifts (n = 4)

Four studies specifically emphasized the transformative impact of AI on business operations. Joshi and colleagues (2022) surveyed 881 global firms and introduced the concept of the IT governance process capability. It refers to a company's ability to choose the right tech resources, make decisions, plan, update systems, deliver services, and monitor them effectively. The authors found that such capability significantly enhances technological and financial performance. Building on this technological momentum, Olan et al. (2022) demonstrated the synergistic benefits of AI integration with knowledge-sharing tools, noting improvements in organizational efficiency.

Diving deeper into AI's potential, Samarghandi et al. (2023) applied deep learning techniques in an Iranian audit organization to predict human actions in an accounting information system (AIS), identifying key predictors of effective AIS usage. Finally, Colombo and Beuren (2023) surveyed 298 employees in a Brazilian shared services centre and found that an innovation culture and an interactive PMS significantly boost accounting process automation.

These studies emphasise that AI, data mining, and cloud systems are transforming strategic decision-making. Effective implementation requires strong governance, expert human oversight, and a proactive approach to technological innovation.

Legitimizing (*n* = 7)

This section reviews seven studies that analyse how organizations leverage PMSs to enhance credibility and justify decisions within societal norms and expectations. We divided these articles into two primary clusters:

1. Stakeholder engagement and legitimacy
2. Ethics and sustainability management

Stakeholder Engagement and Legitimacy (n = 2)

Two articles explored the impact of DT on organizational performance and legitimization. As part of their study on incorporating stakeholder feedback in organizational decision-making, Hristov and Appolloni (2022) conducted semistructured interviews with 183 managers, surveyed 637 stakeholders from 61 Italian organizations, and analysed internal reports. Their findings underscore the importance of incorporating stakeholders' insights into the decision-making process, identifying four key integration dimensions: sustainable development, organizational drivers, digital transformation, and cultural context. According to Vărzaru's (2022) study, using BDA and cloud computing significantly improves sustainability reporting across 21 European Union countries. This enhances transparency in communicating sustainable development strategies to stakeholders. These studies illustrate that strategic stakeholder engagement through advanced technologies can boost organizational legitimacy and performance.

Ethics and Sustainability Management (n = 5)

Five studies underscored how digital capabilities influence corporate sustainability practices and performance metrics. Shin et al. (2023) demonstrated that leadership proficient in digital technologies can significantly enhance corporate performance in South Korea, with a supportive technology adoption culture and digital skills among employees amplifying this effect. In the same country, the study by Kim (2021) indicated industry-specific variations in factors driving sustainable growth among SMEs in the IT/software sectors, emphasizing the impact of business technology skills. A study of 319 Indian SMEs by Vrontis and colleagues (2022) highlighted how digital tools such as social media apps, AI, BDA, the IoT, and blockchain contribute to economic growth and societal benefits.

To further emphasize the role of technology in sustainability, Lavorato and Piedepalumbo (2023) presented a case study of an innovative Italian high-tech startup, illustrating how smart technologies such as the IoT and cloud solutions enhance sustainability measures and align with sustainable development goals. Nandi and associates (2023) proposed a CE performance measurement model that integrates digital technologies with alternative pricing valuation methods, enabling firms to effectively assess sustainability performance and CE benefits.

The reviewed studies affirm that tailored digital tools are crucial for enhancing corporate sustainability and ethical management. They drive SME growth and align business practices with broader societal values, underscoring the critical role of digital expertise in achieving sustainable development goals. The integration of digital solutions into PMSs not only boosts performance but also significantly contributes to societal progress and sustainable development.

Discussion

This study explored the intricate relationship between DTs and PMSs across various industries and global regions. We aimed to address critical gaps in the literature, specifically the underexplored dynamics of how DT enhances PMS dynamism and adaptability, the influence of digital technologies on decision-making processes within these systems, and the evolution of traditional PMS tools in response to digital advancements.

Impact of Digital Transformation on PMSs

In addressing the first research question, we found that DT profoundly impacts PMSs by enhancing their operational dynamics through increased adaptability, agility, and resilience. These flexible management practices, enabled by digital tools such as AI and big data, deepen the integration of technology with human resources, which is essential for effective operation. This integration entails adopting new technologies and transforming decision-making cultures within organizations to be more dynamic and responsive.

Digital technologies facilitate new operational capabilities and transform organizational decision-making cultures to be more dynamic and responsive. The necessity for skilled human intervention underscores that while technology extends capabilities, human oversight ensures strategic alignment. Methods such as building information modelling (BIM) illustrate this synergy by merging advanced tools with human expertise to boost performance (Aibinu & Papadonikolaki, 2020; Ng et al., 2017; Papiorek & Hiebl, 2023). Moreover, the volatile digital era demands a synthesized approach integrating technology, human factors, and organizational strategy (AL-Khatib, 2022; Park et al., 2022).

Contrasting studies have shed light on the varying impacts of DT on PMS usage. While Teng et al. (2022) and Joensuu-Salo and Matalamäki (2023) emphasized the significance of managerial digital literacy, Holopainen et al. (2023) found no direct correlation between technological awareness and PMS application, suggesting that the benefits of digital tools may not be universally perceived. This can occur in sectors characterized by low competition (Soto Setzke et al., 2023). This diversity of findings enriches our understanding of digital tool integration across different competitive landscapes.

Our findings confirm that digitally enabled PMSs significantly enhance institutional flexibility across various sectors. For instance, using AI and BDA in the commercial agriculture industry facilitates real-time performance adjustments, supporting decisions responsive to changing market and environmental conditions (Abeysiriwardana et al., 2022). This capability is equally valuable in health care and manufacturing, where real-time data support enhances patient care and optimizes operational flexibility and responsiveness (Brandín & Abrishami, 2024; Dogra et al., 2023).

As we consider the enhanced operational dynamics facilitated by DT, it is also crucial to explore how these technologies specifically augment decision-making flexibility within organizations, a point we examine in the following section.

Flexibility Factors in PMSs and Organizational Decision-Making

Regarding the second research question, our investigation reveals that digital technologies fundamentally enhance the

flexibility of decision-making processes within PMSs, democratizing and enriching this crucial organizational function. By implementing digital tools that enable dynamic and real-time metrics, PMSs have evolved from static, rigid systems into adaptable, responsive frameworks that facilitate participatory and inclusive decision-making processes (Lavorato & Piedepalumbo, 2023). This shift not only entails incorporating new tools but also transforming the decision-making culture within organizations (Shukla & Shankar, 2024).

Digital tools such as AI-driven analytics platforms enable systems to quickly integrate new information and adapt outputs to meet changing conditions, showcasing adaptability in sectors such as construction and manufacturing (Moretti & Re Cecconi, 2019; Szymczak et al., 2018). Furthermore, decision support systems leveraging the IoT and big data provide instant insights into operational efficiency, facilitating rapid responses to logistical or supply chain challenges (Joshi et al., 2022; Olan et al., 2022).

Resilience, another critical aspect of PMSs, involves maintaining functionality and quickly recovering from setbacks. Technologies such as cloud-based PMSs ensure data integrity and availability across multiple geographies, safeguarding against localized failures (Hung et al., 2023; Opazo-Basáez et al., 2023). This is crucial in industries such as health care, where downtime can have severe repercussions (Sharma et al., 2023).

Our findings align with seminal studies that underscore managerial cognition's role in dynamically and creatively interpreting performance metrics (Ittner & Larcker, 2003; Malmi, 2001). These digital tools enable a shift towards more inclusive and innovative decision-making processes, as demonstrated by the strategic value of R&D activities guided by KPIs continually refined by AI and BDA (Moretti & Re Cecconi, 2019; Ng, 2009). Integrating these technologies enhances decision-making and underscores the importance of governance and human expertise in effectively leveraging these technologies (Chen et al., 2012; Kar et al., 2023).

After exploring how digital tools enhance both the adaptability and resilience of PMSs, we now focus on how traditional PMSs have undergone significant transformations due to digital technologies.

Evolution of Traditional PMSs in Digitally Transformed Settings

Responding to the third research question, we observe a significant evolution in the capabilities of traditional PMSs driven by the integration of advanced technologies such as AI, BDA, and the IoT. The shift from periodic, retrospective analysis to continuous, real-time monitoring has enhanced the accuracy of performance metrics and the speed of organizational response.

Real-time dashboards, AI-enhanced forecasting tools, and blockchain technology have each played a role in advancing PMS capabilities, aligning them more closely with modern organizational needs and stakeholder expectations (El Kihel et al., 2023; Fischer et al., 2021; Hristov & Appolloni, 2022; Nandi et al., 2023). These advancements underscore the transformative impact of DT on traditional systems, enhancing its utility and strategic value.

DT's potential to foster sustainable communities is significant. By leveraging emerging technologies, organizations can enhance operational efficiency and effectively manage their environmental impacts (Feroz et al., 2021). This approach ensures compliance with environmental regulations and supports broader sustainability goals that benefit entire communities (Ciasullo et al., 2024). For instance, digitally enabled PMSs track resource consumption and energy efficiency, providing insights that can help reduce ecological footprints (Latifah & Soewarno, 2023). Integrating these systems into public sector initiatives amplifies their impact, contributing to more resilient community infrastructures (Ayoko, 2021).

This strategic alignment between digital advancements and community development emphasizes transforming technological capabilities into tangible societal benefits (Joy et al., 2023). Studies such as D'Adamo et al., (2023a, 2023b) show how photovoltaic systems optimize energy consumption within community frameworks, enhancing local sustainability efforts. Additionally, higher education institutions play a crucial role in promoting sustainability through community engagement projects (Biancardi et al., 2023).

Henri's (2006) framework remains relevant. However, our findings extend these principles by emphasizing the role of real-time analytics and digital tools in optimizing monitoring effectiveness. Our review also highlights the continuing relevance of human resources, particularly in SMEs where talent scarcity poses significant challenges (Ahmad & Qiu., 2009). The complexities introduced by digital tools necessitate an approach valorizing human capabilities. DT's influence transcends mere tool adaptation, reshaping organizational attention management. We finally identified an evolved legitimizing role. Modern PMSs now serve as strategic assets, driving ethical sustainability (Kim, 2021; Shin et al., 2023), thus enhancing their legitimizing function in the DT context. By synthesizing these findings in alignment with our research questions, we see a clear trajectory of how digital technologies have intricately and profoundly reshaped PMSs, influencing their design, functionalities, and objectives.

Contributions and Implications

Theoretical Contributions

Our study enhances the understanding of PMSs by illustrating their evolution from traditional "rationalization machines" (Henri, 2006, p. 81) to strategic assets within organizations (Nandi et al., 2023; Vrontis et al., 2022). This transition reflects a significant shift in PMS conceptualization, aligning with the principles of flexible systems management by integrating adaptability, strategic flexibility, and resilience into their core functions (Nayal et al., 2024).

We identified a symbiotic interplay between DTs and PMSs. Figure 5 illustrates this dynamic enrichment process, emphasizing how DT enhances PMS comprehensiveness and dynamism. This interaction underlines the importance of flexible management in increasing organizational resilience and adaptability during digital transitions, prompting a reevaluation of the discourse on the coevolution of DT and PMSs in modern organizations.

Furthermore, our research broadens the application of flexible systems management by incorporating ethical and sustainable decision-making metrics into our PMS analysis. This contributes to the ongoing discourse on performance metrics (Kim, 2021; Shin et al., 2023; Vrontis et al., 2022) and challenges the prevailing narratives that overly emphasize technology at the expense of human involvement.

We emphasize the importance of integrating human expertise and technology to achieve the benefits of flexible systems management, highlighting that harmonization is essential for effective management flexibility. The interplay between technological capabilities and human resources marks a crucial expansion of flexible systems management. Insights from human resource management and information systems are vital to fully leverage the potential of PMSs in the digital age, suggesting a model where technology and human resource strategies are cohesively aligned.

Practical Implications and Policy Directions

Our findings offer actionable insights for managers, policymakers, and organizations navigating the digital landscape. We propose several practical recommendations based on our thematic analysis to integrate DT into PMS strategies effectively:

Integrating DT into PMS Strategies: Organizations should view digital technologies as integral rather than supplementary components of performance measurement frameworks. By embedding these technologies directly into PMS strategies, organizations can adopt a more dynamic approach to performance measurement. Continuous training initiatives ensure that personnel develop the necessary

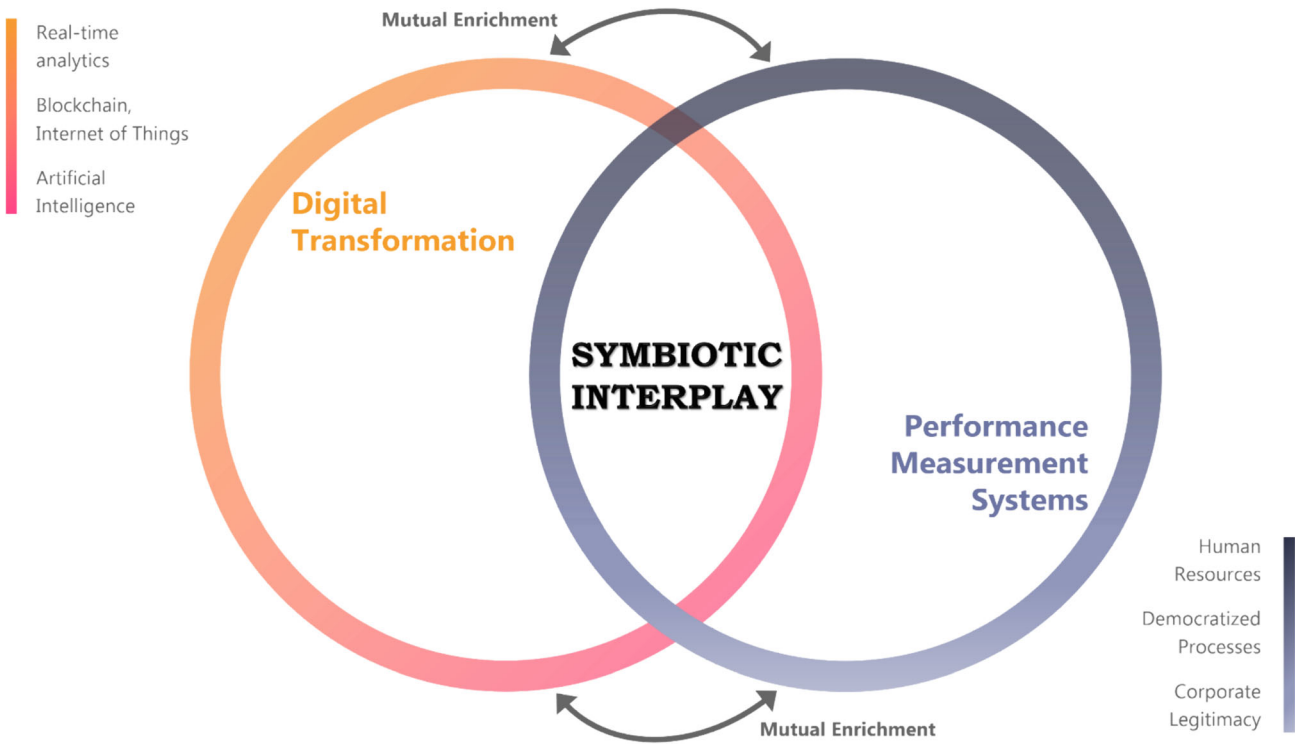

Fig. 5 The 'symbiotic interplay' between DT and PMSs

digital literacy to utilize complex performance metrics effectively, thus empowering employees to leverage digital tools (Joensuu-Salo & Matalamäki, 2023; Teng et al., 2022).

Embracing Real-Time Metrics: With the increasing importance of timely data in decision-making, organizations must transition from traditional periodic reviews to dynamic, data-driven approaches. Investing in real-time analytics technologies and cultivating a culture that values data interpretation skills are essential. This shift enhances organizational agility and responsiveness by enabling quicker reactions to market changes and internal challenges (Fischer et al., 2021; Szymczak et al., 2018).

Prioritizing Ethical and Sustainable Measures: As sustainability becomes a critical performance indicator, organizations should employ digital tools to enhance the transparency of their sustainability efforts. Such transparency aids compliance with environmental standards and bolsters stakeholder trust and organizational credibility. Digital platforms that facilitate detailed tracking and reporting of sustainability metrics enable organizations to effectively communicate their efforts and impacts (Kim, 2021; Vrontis et al., 2022).

Continuous Training and Development: Adopting new technologies necessitates an ongoing commitment to training and development. Establishing continuous learning environments ensures that organizations remain current with technological advancements and that their workforce is proficient in the latest digital tools (Aibinu & Papadonikolaki, 2020). This commitment is vital for maintaining effective PMSs and for enabling employees to adapt to new tools and strategies as they emerge. A holistic approach that merges DTs' technological capabilities with human resource expertise is essential for organizations aiming to enhance their performance in today's digital era. The strategic governance of technological changes will position organizations to make informed, proactive decisions in a turbulent marketplace rather than engage in passive compliance (Cosa et al., 2024).

Policy Innovations for AI-driven PMSs: Integrating AI-driven PMSs with policy innovations is crucial for maintaining high integrity and aligning with evolving regulations. Implementing these systems requires policies that support continuous adaptation and learning, facilitate the seamless integration of new technologies into existing frameworks, and encourage the development of skills necessary to manage and optimize these systems. Such policies support a sustainable transition to more intelligent and responsive organizational practices.

Limitations

Our systematic review has inherent limitations. First, our focus was strictly on articles that addressed PMS as the unit of analysis, excluding studies that discussed performance measurement more broadly. This selection criterion limited our final sample to 47 papers. Although this number may appear small, this focused approach was intended to maintain sharp relevance to our research objectives. This methodological rigour allows for an in-depth exploration of PMS-specific insights, providing a targeted understanding of how DT reshapes PMSs despite potentially missing broader insights from the general performance measurement literature.

Second, the diverse nature of the articles posed classification challenges. We adhered to Henri's (2006) framework for categorization and followed Massaro et al.'s (2016) recommendation to prioritize each paper's most prominent research focus. This approach helped maintain clarity and coherence, even as we adopted a narrative style to highlight the complex web of research angles, enriching our discussion across multiple dimensions (Popay et al., 2006).

A third limitation involves our terminology. Despite subtle distinctions, we used "digital transformation" and "digital technologies" interchangeably. DT refers to integrating digital technologies across all business areas, while digital technologies are specific tools, systems, devices, and resources (Berman, 2012). We made this choice for coherence and clarity, yet it is important to recognize these terms' nuances when interpreting our findings.

Additionally, we excluded studies that focused on metrics for different DT phases and did not include articles from the public or nonprofit sectors due to their unique measurement dynamics. Our temporal scope, focusing on post-2000 publications, aimed to capture insights from an era shaped by the survival of tech giants post-Internet bubble burst, possibly omitting foundational insights from earlier periods. Finally, our decision to include all studies, regardless of journal rankings or research fields, aimed to broaden the perspectives considered, counterbalancing our other exclusion criteria.

Future Research

Our study highlights significant opportunities for further investigation into the evolving landscape of digitalization and PMSs. Detailed research is needed on the specific advantages, challenges, and strategies for integrating individual digital tools in various industrial contexts. Such research could explore the most effective tools in the digital era and whether organizations are adopting innovative frameworks.

The rapid evolution of DT underscores the necessity for a comprehensive research agenda focused on emerging trends in performance measurement. This agenda would pinpoint critical areas for exploration, offering practitioners insights into the field's trajectory and helping them adapt strategically.

Surprisingly, the attention-focusing role of PMSs is underrepresented in the literature despite the growing emphasis on employee well-being (Pradhan & Hati, 2022; Rasool et al., 2021). Future studies could investigate how a well-defined PMS can guide employees on what to prioritize, thereby reducing cognitive overload, uncertainty, and stress. Exploring the interplay between corporate wellness initiatives and performance measurement could yield valuable insights for enhancing organizational health in the digital era.

Another area for future exploration is human resistance and the acceptance of digital tools. Discrepancies in findings on managers' technological understandings and their impact on PMS usage suggest that factors such as organizational culture, existing infrastructure, or the specific design and utility of PMS tools themselves might play more significant roles than previously thought (Holopainen et al., 2023; Joensuu-Salo & Matalamäki, 2023; Teng et al., 2022). A more nuanced exploration, potentially integrating qualitative methodologies, is necessary to fully understand these underlying dynamics.

Finally, several studies have addressed SMEs' unique challenges and opportunities related to DT and performance measurement (Ahmad & Qiu, 2009; AlMujaini et al., 2021; Baral et al., 2023; Kim, 2021; Vrontis et al., 2022). Future research could focus specifically on the types of digital tools SMEs prioritize, the challenges they encounter in integrating these tools, and how their strategies differ from or converge with those of larger organizations. Such studies could help tailor performance management strategies to the needs of SMEs, fostering more effective and sustainable practices.

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Declarations

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Ethical Approval This manuscript is a systematic literature review not involving primary data collection, including questionnaires or surveys. Therefore, ethical approval is not applicable to this study. No personal data or identifiable information from participants was used, ensuring that ethical considerations regarding informed consent and data anonymization are irrelevant to this research.

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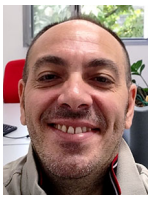
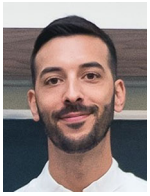
Key Questions for Further Reflection

1. In what ways can PMSs contribute to enhancing organizational resilience and sustainability in the digital age?
2. What role do human resources play in optimizing digital tools within PMSs to enhance organizational performance?
3. How can organizations balance the need for technological innovation with ethical standards and sustainability practices in their PMS frameworks?



Marcello Cosa is an accomplished academic and researcher with a strong focus on Business Ethics, Performance Measurement, Digital Strategy, and Tourism Management. With a Ph.D. in Business Economics from the University of Bari, Marcello has developed a robust academic foundation and a deep understanding of the integration of CSR within business strategies. Marcello currently serves as a Postdoc Research Fellow at the Università Cattolica del Sacro Cuore, Piacenza (Italy), focusing on CSR in the Faculty of Economics and Law. He is a member of the Research Centre for Responsibility, Ethics and Sustainability in Management (RES.m HUB). His role includes coordinating sustainability seminars and organizing workshops addressing sustainability's value in modern enterprises. He has also contributed to numerous conferences and workshops, sharing his insights on CSR, sustainability, and digital transformation. His editorial roles in journals such as Corporate Social Responsibility and Environmental Management and active participation in various academic networks underline his dedication to the field. With a focus on actionable insights and real-world applications, Marcello's work bridges the gap between academic research and practical implementation, making his contributions invaluable to both scholars and practitioners in the realm of CSR and organizational well-being.



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