SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2026
ORGANIZATION AND MANAGEMENT SERIES NO. 253

DIGITAL MATURITY AS DETERMINANT OF ORGANIZATIONAL AGILITY IN THE INDUSTRY 4.0 CONTEXT

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Purpose: This study aims to identify and systematize the relationships between digital maturity domains and organizational agility dimensions in the context of Industry 4.0. The study further examines these relationships through a socio-technical perspective to better understand the organizational conditions supporting digitally enabled agility.
Design/methodology/approach: A systematic literature review (SLR) was conducted following the PRISMA protocol to ensure methodological transparency and replicability. The review included 68 studies retrieved from Scopus and ProQuest databases published between 2020 and 2026. The analysis employed a qualitative coding approach based on digital maturity domains, organizational agility dimensions, and socio-technical enablers.
Findings: The findings indicate that digital maturity should be understood primarily as an organizational capability rather than solely a technological condition. Strategic and cultural maturity emerged as the dominant domains supporting organizational agility, while acting agility appeared as the most represented agility dimension, suggesting an execution-oriented understanding of agility in Industry 4.0 environments. Furthermore, the findings reveal a stronger influence of social system enablers (structure and people) compared to technical system factors, emphasizing the importance of socio-technical alignment in translating digital capabilities into adaptive organizational behaviour.
Research limitations: Research limitations/implications: The study is limited to English-language studies indexed in Scopus and ProQuest between 2020 and 2026 and reflects a strong concentration of research conducted in Asian contexts. Future research should explore micro-level organizational mechanisms, sensing agility, market maturity, and empirically validate the proposed conceptual framework.
Practical implications: The findings suggest that organizations should approach digital transformation beyond technology adoption by prioritizing strategic alignment, leadership commitment, employee capabilities, and organizational culture. Managers should focus on aligning technological investments with supportive organizational structures and workforce readiness to strengthen organizational agility.
Originality/value: This study contributes to the literature by systematically integrating fragmented research on digital maturity and organizational agility in Industry 4.0. It introduces a socio-technical perspective and proposes a conceptual framework explaining how digital maturity contributes to organizational agility through socio-technical alignment.

Keywords: Digital maturity, Organizational Agility, Industry 4.0, Digital Transformation, Socio-technical systems.
Category of the paper: Literature Review.

Introduction

With the emergence of Fourth Industrial Revolution, commonly known as a Industry 4.0 the operational and competitive landscape of the contemporary organization has shifted and changed completely. In contrast to the previous industrial changes Industry 4.0 stands out by combining digital technologies and intelligent systems that are capable of autonomous decision making and communication (Castillo-Vergara, et al., 2025; Ghobakhloo, et al., 2026). With the integration of cyber-physical systems, the Internet of Things (IoT), cloud computing, artificial intelligence, robotics, blockchain, and big data analytics organizations are able to establish interconnected ecosystems characterized by real-time information exchange and advanced process automation. At the same time organizations are expected to operate in the environment that is highly dynamic and digitally interconnected since traditional organizational boundaries and methods are becoming more blurred and outdated (Silva, et al., 2025; Senadjki, et al., 2024). Industry 4.0 goes beyond just simple technological advancements instead it reshapes organizational structures where digital technologies no longer functions solely as a operational support tools but increasingly constitute strategic assets that improve productivity and foster customer-centric business models. The increasing pace of technological change introduces substantial complexity and competitive pressure, forcing organizations to reconsider how they develop capabilities necessary for long-term sustainability and resilience. With such situation organizations are compelled to respond more rapidly to market disruptions, personalize products and services through data-driven insights (Franke, et al., 2026; Castillo-Vergara, et al., 2025; Oncioiu, et al., 2025). As a response to the high and fast technological development, digital transformation has emerged as a strategic imperative for organizations seeking to remain competitive in digitally intensive environments. This process involves organizations integrating digital technologies into business operations, organizational structures, and strategic decision-making to create value and improve performance (Pan, et al., 2022; Cuong, et al., 2025). Digital transformation is not only introducing new digital tools but fundamentally changes organizational culture, employee competencies, business models, and managerial approaches. With greater environmental pressure organizations encounter challenges related to organizational resistance, fragmented digital initiatives, insufficient strategic alignment, and limitations in digital competencies. Consequently, firms and researchers recognize that successful digital transformation requires more than isolated technological investments and instead depends on a broader organizational readiness for digital change (Chang, et al., 2025; Abidi, et al., 2025; Yang, et al., 2025).

In order to evaluate organization's readiness and capability to navigate digital transformation effectively the concept of digital maturity (DM) has gained increasing scholarly and managerial attention. Commonly this concept refers to the extent to which organizations are able to systematically adopt, integrate, and leverage digital technologies to achieve strategic and operational objectives (Zheng, 2025; Kaszás, et al., 2023). Digitally mature organizations are characterized not only by advanced technological adoption but also by their ability to continuously adapt, innovate, and derive business value from digital initiatives. The concept became highly important thanks to its influence on organizational performance and transformation success. Research on DM suggests that organizations with higher levels of this concept are more likely to achieve operational efficiency, innovation capacity, enhanced customer engagement, and competitive advantage. With fast evolving technologies, DM helps businesses to respond better and quicker to environmental changes with data-driven decision-making, cross-functional collaboration, and organizational flexibility (Tortora, et al., 2024; Çallı, et al., 2022; Mick, et al., 2024). As Industry 4.0 keeps changing the landscape of traditional organisations DM is rising to the point of being a prerequisite for successful capitalization of digital opportunities while minimizing risks associated with technological disruption. However, despite the popularity and benefits, many firms fails to achieve high levels of DM and remains a big challenge for many of them. It is important to understand that the concept of DM is inherently multidimensional and hard to grasp fully due to the complexity of collaboration between important technological, strategic, cultural, and organizational factors (Sánchez-Rodríguez, et al., 2025; Kwiotkowska, 2025). Many organisations struggle to comprehend those elements at the same time because of their fragmented digital strategies, insufficient managerial commitment, resistance to organizational change, inadequate employee digital skills, and limited integration between technological capabilities and business objectives. Additionally, implementation of transformational initiatives if different from one department to another since DM prerequisites differ across departments. This suggest that the concept should be viewed as an evolving organizational capability that need continuous adaptation and strategic alignment rather than a static end-state (Haryanti, et al., 2023; Zhao, et al., 2023; Orero-Blat, et al., 2024).

While DM reflects an organization's capability to adopt and leverage digital technologies effectively just being prepared alone is not enough to ensure sustained competitiveness in highly dynamic environment. The concept of organizational agility (OA) has emerged as a critical capability enabling organizations to adapt, innovate, and sustain performance in turbulent business environments. It allows organisations respond to the increasing complexity, uncertainty, and volatility associated with Industry 4.0 that require the development of digital capabilities rapid responsiveness to changing internal and external conditions. Overall, OA refers to organisation's ability to sense environmental changes, make timely and informed decisions, and rapidly implement appropriate responses to emerging opportunities and threats (Cuong, et al., 2025; Akkoca, 2025). Agile organizations are capable of identifying shifts in

customer expectations, technological advancements, and competitive dynamics while simultaneously adapting strategies, structures, and operational processes accordingly. As a result, OA is increasingly recognized as an essential capability that supports organizational responsiveness, innovation, and long-term competitiveness in digitally transformed environments. In the context of digital transformation and DM, OA gains crucial importance. Although organizations may possess advanced technological infrastructures and digitally enabled processes, the absence of agility may limit their ability to effectively exploit these capabilities. This means that even thou DM provides organisations with technological reediness and strategic alignment, OA is the element that determines whether such resources can be transformed into adaptive actions and sustained business value (Asghar, et al., 2026; AlNuaimi, et al., 2022; Nyamboga, 2025). The development of both DM and OA is influenced by a broader set of organizational mechanisms rooted in socio-technical theory. Those enablers emphasize the interdependence between technological and social elements within organizations and may include leadership support, organizational culture, employee competencies, technological infrastructure, collaborative processes, and governance mechanisms that collectively facilitate organizational adaptability and digital capability development. Those element may play a critical role in strengthening the relationship between DM and OA by fostering alignment between technological capabilities and organizational behaviour (Dubey, et al., 2024; Cardoso, et al., 2025; Mele, et al., 2024).

Although prior studies acknowledge the importance of DM and OA in the context of Industry 4.0, the interrelationships between DM domains and OA dimensions remain underexplored. Existing findings are dispersed across diverse conceptual and empirical perspectives, limiting theoretical integration and a comprehensive understanding of how DM contributes to OA. Therefore, this study aims to identify and systematize the relationships between DM domains and OA dimensions in Industry 4.0 through a systematic literature review following the PRISMA protocol.

1. Methodology

This study adopts a systematic literature review (SLR) to identify and synthesize the relationships between DM and OA in the context of Industry 4.0. To ensure a rigorous, transparent, and replicable research process, the review was conducted following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. This approach provides a structured procedure for literature identification, screening, eligibility assessment, and final study selection, thereby enhancing the credibility and methodological transparency of the review (Figure 1).

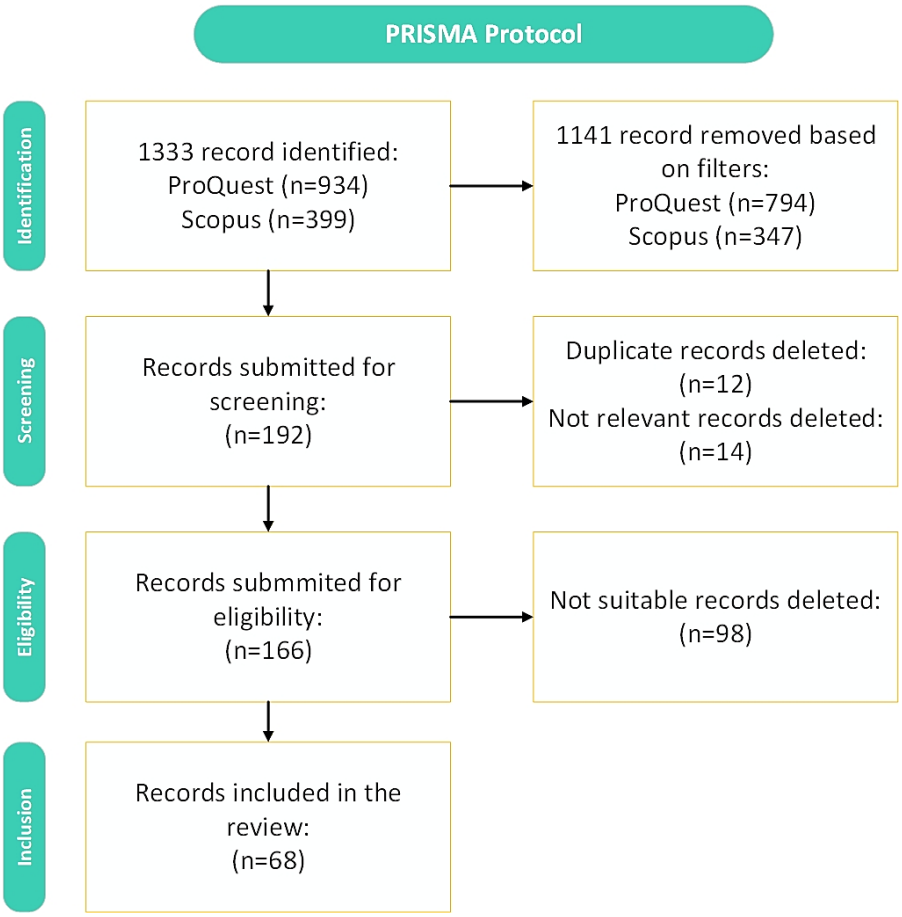

Figure 1. PRISMA Protocol Showcasing the Analysis of the Articles.

Source: Own elaboration.

Figure 1 illustrates the complete study selection process conducted in accordance with the PRISMA protocol. The final dataset reflects a carefully filtered body of literature that satisfies the predefined eligibility criteria. Consequently, the review is based exclusively on studies directly relevant to the research scope.

1.1. Identification

At this stage, the literature search was conducted across two major academic databases, ProQuest and Scopus, selected due to their broad coverage of high-quality, peer-reviewed research in management, organizational studies, and digital transformation. The search strategy involved the use of a keyword string designed to capture studies addressing the relationship between DM and OA within the context of Industry 4.0. The final search query was formulated as: (“Digital Maturity”) AND (“Organizational Agility”), yielding an initial total of 399 records from Scopus and 934 from ProQuest. To ensure alignment with the scope of the study, several database-specific filters were applied. First, the publication period was restricted to studies published between 1st January 2020 and 14th of May 2026, reflecting the growing scholarly attention devoted to digital maturity and organizational agility in recent years. Additional filters included document type, restricting the sample to articles, review papers, and conference

papers, while only studies written in English and available in full-text or open-access format were considered. Furthermore, subject-related restrictions were introduced to enhance the contextual relevance of the retrieved literature. In Scopus, results were limited to the Business, Management and Accounting subject area and refined using keywords such as Digital Transformation, Industry 4.0, Digital Maturity, and Organizational Agility, ensuring consistency with the research focus. Similarly, in ProQuest, topic-based filters were applied, restricting the search to studies related to Industry 4.0 and Digital Transformation, as more specific filters concerning DM and OA were not available at this stage. After applying all filters and restrictions, the number of retrieved studies was reduced to 52 records from Scopus and 140 from ProQuest, resulting in a final pool of 192 studies eligible for the subsequent screening stage. The literature search was conducted using Scopus and ProQuest databases due to their complementary coverage and strong representation of interdisciplinary research related to management, organizational studies, digital transformation, and Industry 4.0. While Scopus provides extensive indexing of high-impact peer-reviewed journals and international scientific output, ProQuest offers broader access to multidisciplinary full-text publications, conference proceedings, dissertations, and applied management research that are often underrepresented in Web of Science. The choice of ProQuest was particularly justified by the interdisciplinary and practice-oriented nature of the analysed topic, combining digital transformation, OA, socio-technical systems, and Industry 4.0. Previous studies indicate that research concerning DM and OA is dispersed across multiple domains, including management, information systems, organizational behaviour, innovation studies, and technology management. Therefore, relying exclusively on Web of Science could potentially limit the retrieval of relevant studies published in emerging or practice-oriented sources. Moreover, ProQuest enables broader access to recent publications and management-oriented research outputs, which was particularly important given the rapidly evolving nature of digital transformation and Industry 4.0 research. Consequently, the combination of Scopus and ProQuest allowed for a more comprehensive and contextually diverse identification of relevant literature while maintaining the quality and scientific rigor of the review process

1.2. Screening

The next stage involved exporting all retrieved records into a single Microsoft Excel file to facilitate the screening process and eliminate duplicate entries. During this procedure, 12 duplicate records were identified and removed. The remaining studies subsequently underwent title and abstract screening to assess their relevance to the scope and objectives of the review. At this stage, studies were excluded if they clearly fell outside the focus of the research. Specifically, articles were removed when they focused exclusively on either DM or OA without considering their interrelationship, did not address the context of Industry 4.0, digital transformation, or digitally intensive organizational environments, focused on purely technical or engineering-related aspects without organizational or managerial implications,

or lacked sufficient conceptual relevance based on the title and abstract assessment. The purpose of these criteria was to ensure that only studies relevant to both constructs and their organizational implications in the context of Industry 4.0 were retained for further analysis. Following the application of these exclusion criteria, 14 studies were removed, leaving 166 records eligible for the subsequent eligibility assessment stage.

1.3. Eligibility

Following the title and abstract screening, the remaining 166 studies underwent a full-text eligibility assessment to determine their suitability for inclusion in the final review. At this stage, articles were examined in greater depth to evaluate their conceptual relevance, research focus, and alignment with the objectives of the study. Studies were excluded if, after full-text examination, they did not provide a meaningful discussion of the relationship between DM and OA, addressed the concepts only superficially or indirectly, lacked sufficient relevance to the organizational context of Industry 4.0 or digital transformation, or focused primarily on technical implementations without meaningful managerial or organizational implications. Additionally, studies were excluded when the full text revealed inconsistencies with the research scope that were not apparent during the title and abstract screening stage. As a result of the eligibility assessment, 98 studies were excluded, leaving a final sample of 68 articles for inclusion in the systematic literature review and subsequent qualitative analysis.

1.4. Inclusion

Following the eligibility assessment, a final sample of 68 studies meeting all predefined inclusion criteria was retained for the systematic literature review. The selected articles represent diverse organizational contexts, methodological approaches, and research perspectives related to DM and OA in the context of Industry 4.0. This final body of literature served as the basis for the subsequent qualitative analysis and coding process aimed at identifying relationships between DM domains and OA dimensions.

1.5. Dimensions categorization

To ensure consistency in the analysis of the reviewed literature, the dimensions of DM and OA were categorized using conceptually grounded classification schemes derived from prior research. Since both constructs are characterized by fragmented and multidimensional interpretations in the literature, a unified categorization framework was required to enable systematic comparison across studies.

The categorization of DM domains was conceptually informed by the work of van Tonder et al. (2024), who synthesized the core dimensions frequently appearing across DM models. These dimensions collectively reflect an organization's preparedness to leverage digital technologies for transformation and competitive adaptation. However, rather than directly adopting the original framework, this study consolidates and reorganizes these dimensions into broader analytical domains to better align with the objectives of the review and facilitate cross-study comparison. Accordingly, five overarching domains of DM were identified: strategic maturity, incorporating elements related to organizational strategy and leadership; cultural maturity, encompassing organizational culture, people, and structural readiness for digital transformation; process maturity, associated with the digitalization and optimization of organizational processes; technological maturity, referring to technological capabilities and digital infrastructure; and market maturity, including customer orientation, products, and market-related digital responsiveness. The conceptual foundations underlying this categorization are illustrated in Figure 2.

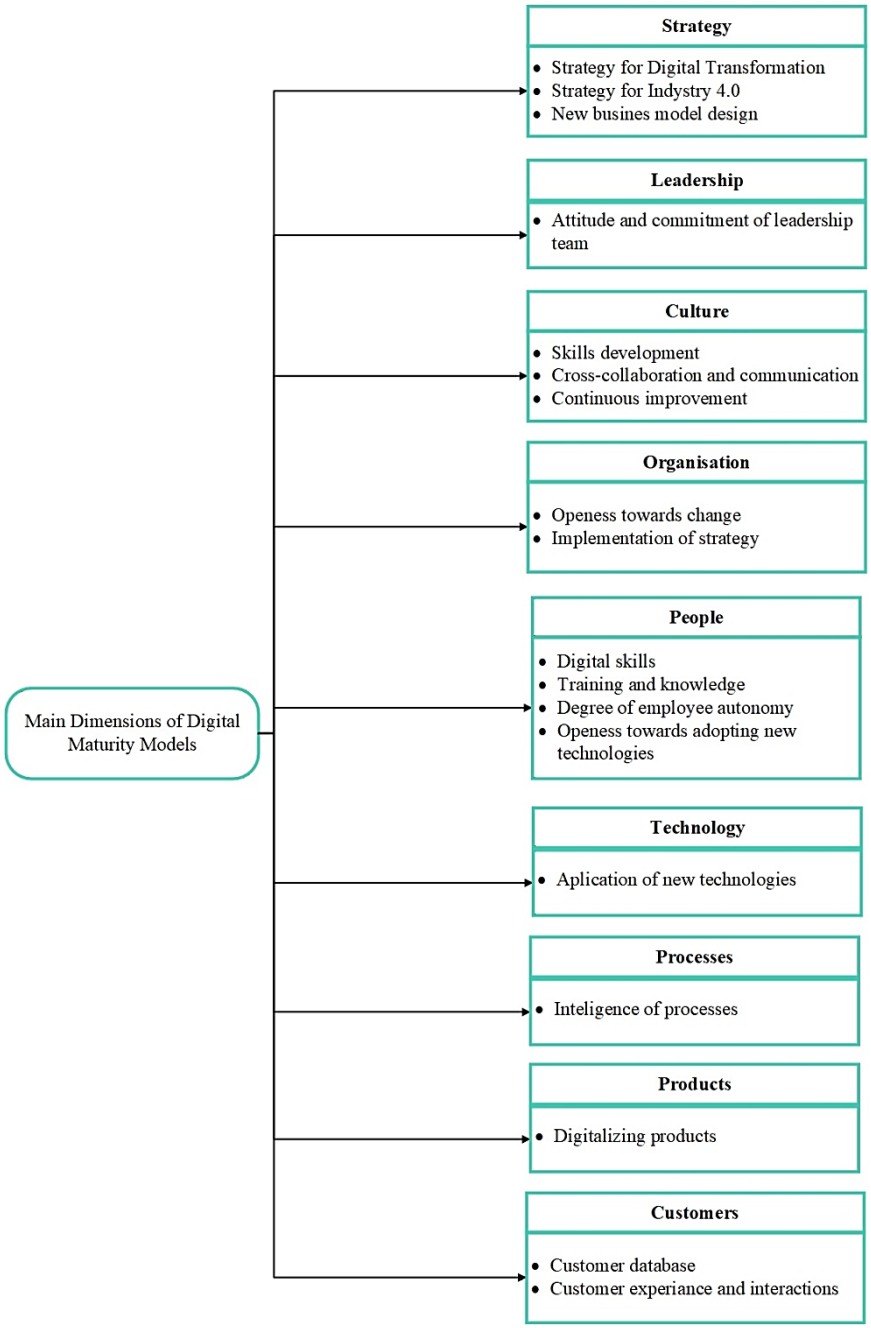

Figure 2. Main Dimensions of Digital Maturity Models.

Source: Van Tonder C. et al. (2024). Key dimensions that measure the digital maturity levels of Small and Medium-Sized Enterprises (SMEs). *Journal of Technology Management & Innovation, 19(1),* pp. 110-130. https://doi.org/10.4067/s0718-27242024000100110.

Similarly, the categorization of OA dimensions was informed by the multidimensional conceptualization proposed by Siddique & Asif khan (2022) where they conceptualized OA as an organizational capability that enables firms to sense environmental changes and respond rapidly and effectively to dynamic market conditions. According to this perspective, OA consists of three interrelated dimensions: sensing agility referring to the capability to identify and anticipate environmental changes, decision-making agility describing the ability to evaluate information and respond through timely decisions, and acting agility reflecting the

organization's capacity to implement adaptive responses effectively. The reviewed literature conceptualizes these dimensions as complementary organizational capabilities enabling environmental adaptation. Following this conceptual foundation, the present study adopts these three agility dimensions as analytical categories for classifying the OA perspective employed in the reviewed literature. Since the reviewed studies operationalize OA differently, these dimensions were used as a harmonized interpretive lens rather than as directly adopted measurement constructs. The conceptual basis for these dimensions is presented in Figure 3.

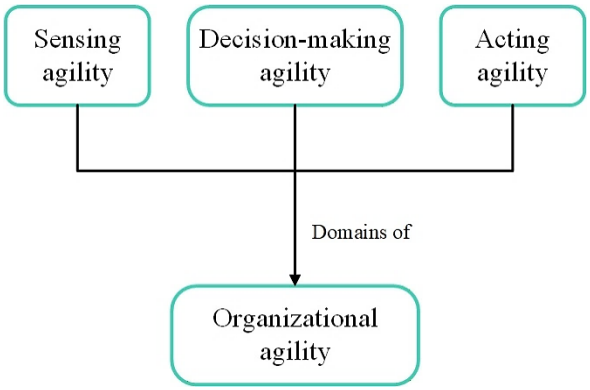

Figure 3. OA Domains.

Source: Siddique, A. & Asif khan, M. (2022). The Association between Organization Agility and Quality of Work Life in Small and Medium Enterprise of Punjab Pakistan. *International Journal of Social Science & Entrepreneurship, 2(1)*, pp. 1-15. https://doi.org/10.58661/ijsse.v2i1.15.

This conceptualization establishes a common reference point for examining the role of organizational agility across the reviewed studies. It also supports a more coherent interpretation of findings derived from diverse research contexts and methodological approaches.

1.6. Analytical Framework

To ensure consistency in the interpretation and synthesis of the reviewed literature, this study employed an analytical framework grounded in two complementary perspectives: the contextual lens of Industry 4.0 and the socio-technical perspective. While the relationship between DM and OA constituted the primary analytical focus, these perspectives provided an interpretive basis for understanding how digital capabilities and responsiveness emerge within digitally intensive environments.

Since the reviewed studies predominantly investigate organizational transformation under conditions of increasing digitalization, automation, and technological disruption, the findings were interpreted within the broader context of Industry 4.0. In this study, it served as a contextual lens and is considered as the broader technological and organizational context within which DM and OA evolve. Prior research conceptualizes Industry 4.0 through a set of enabling technologies that facilitate digitally integrated, data-driven, and adaptive organizational systems. The most frequently identified technologies include cyber-physical systems (CPS), the Internet of Things (IoT), big data analytics, artificial intelligence, cloud

computing, robotics, digital twins, system integration, additive manufacturing, and cybersecurity. These technologies collectively support real-time connectivity, process integration, automation, and organizational responsiveness, thereby creating conditions conducive to higher DM and agility. However, Industry 4.0 was not employed as a formal coding category or analytical dimension. Instead, it provided the contextual background for interpreting organizational responses to environmental turbulence, technological complexity, and digital transformation challenges.

To provide an additional interpretive perspective for analysing the reviewed literature, this study adopts the socio-technical systems perspective proposed by Richard P. Bostrom and J. Stephen Heinen. According to this perspective, organizational effectiveness and successful system implementation emerge from the alignment between social and technical organizational subsystems rather than from technological development alone. The socio-technical perspective distinguishes between two interdependent systems. The social system refers to organizational and human-related components and was categorized into two analytical dimensions: structure and people. While the technical system captures operational and technology-related components and was divided into technology and tasks. Since prior studies rarely classify organizational enablers explicitly according to socio-technical categories, the assignment of identified enablers to the four socio-technical dimensions was conducted interpretively based on the conceptual characteristics and descriptions provided within each study. This perspective enabled a more structured understanding of how organizational conditions support the relationship between DM and OA (Table 1).

Table 1.
Socio-technical enablers

Socio-technical system	Dimension	Example of enablers
Social system	Structure	governance, organizational design, leadership
Social system	People	employee competencies, digital skills, culture
Technical system	Technology	digital infrastructure, analytics, AI, ERP
Technical system	Tasks	process redesign, workflow integration, automation

Source: Own elaboration.

To systematically synthesize findings across the reviewed literature, a qualitative coding approach was employed. Each study included in the final sample was manually analysed and classified according to three analytical categories: DM domains, OA dimensions, and socio-technical enablers. Studies were examined to identify whether particular dimensions were explicitly or implicitly addressed within the research findings, conceptual discussions, or empirical analyses. The coding process was conducted using a binary classification logic, where the presence of a given dimension or enabler within a study was recorded and subsequently aggregated to identify recurring relationships and patterns across the literature. Since many studies addressed multiple dimensions simultaneously, individual articles could be assigned to more than one category within each analytical perspective. An example of the coding matrix applied during the literature analysis is presented in Table 2.

Table 2.
Example of the coding matrix applied in the literature analysis

Study	DM Domain	OA Dimension	Socio-Technical Enabler
AI-Enabled Strategic Transformation and Sustainable Outcomes in Serbian SMEs	Strategic, Technological, Culture	Acting, Decision-making	People, Technology, Structure
Strategizing in a digital world: Overcoming cognitive barriers, reconfiguring routines and introducing new organizational forms	Strategic, Process, Market, Culture	Sensing, Decision-making, Acting	Structure, People, Task
Unpacking Digital Transformation: Identifying key enablers, transition stages and digital archetypes	Strategic, Process, Technological, Culture	Acting, Decision-making	People, Structure, Task, Technology

Source: Own elaboration.

As illustrated in Table 2, individual studies were categorized according to the DM domains addressed, the OA dimensions identified, and the socio-technical enablers evident within the study context. This approach enabled a systematic comparison of heterogeneous studies and facilitated the identification of recurring patterns regarding how different dimensions of DM contribute to OA in Industry 4.0 environments.

2. Results

2.1. Paper characteristics

The final sample of 68 articles was first analysed according to the year of publication to identify temporal patterns in the development of research on DM and OA in the context of Industry 4.0. As presented in Table 3, the distribution of publications indicates a clear increase in scholarly attention over time, particularly from 2023 onwards.

Table 3.
Distribution of articles by year of publication

Year	Number of articles	Percentage
2020	4	~6
2021	1	~1
2022	5	~7
2023	6	~9
2024	13	~19
2025	28	~41
2026	11	~16

Note: The data presented in this table reflect the state of the literature as of 14 May 2026, corresponding to the completion of the database search.

Source: Own elaboration.

The results show that research activity was relatively limited between 2020 and 2022, with only 10 articles published during this period. A gradual increase can be observed in 2023, followed by a substantial rise in 2024 and especially in 2025, which accounts for the largest share of the sample. This trend suggests that the relationship between DM and OA has gained increasing relevance in recent years, likely reflecting the growing importance of digital transformation, technological turbulence, and Industry 4.0-related organizational challenges. Although the number of publications in 2026 is lower, the data collection ended on 14 May 2026 and therefore does not represent the full publication year. However, high number of articles published in 2025 indicates that the topic is still emerging and actively developing. Following the temporal analysis, the reviewed studies were classified according to the geographical region in which the research was conducted (Table 3).

Table 4.
Distribution of articles by research region

Region	Number of articles	Percentage
Europe	12	~18
Asia	28	~41
Australia	1	~1
Africa	1	~1
South America	4	~6
North America	1	~1
Not Specified	21	~31

Note: The data presented in this table reflect the state of the literature as of 14 May 2026, corresponding to the completion of the database search.

Source: Own elaboration.

This classification aimed to identify regional patterns in the investigation of DM and OA and assess the geographical concentration of existing research. The findings indicate that Asia dominates the existing body of literature, accounting for approximately 41% of the reviewed studies. This strong representation may reflect the increasing emphasis placed on digital transformation, smart manufacturing, and Industry 4.0 implementation across rapidly developing and highly industrialized Asian economies. Europe constitutes the second most represented region, contributing approximately 18% of the analysed studies, suggesting a growing scholarly interest in organizational digitalization and agility within European contexts. A considerable proportion of studies (31%) were categorized as Not Specified. This category includes systematic literature reviews, studies conducted from a global or cross-country perspective, and articles that did not explicitly identify a geographical research setting. The prevalence of such studies indicates that the relationship between DM and OA is increasingly examined from a broader conceptual perspective rather than being limited to a single regional context. In contrast, North America, South America, Australia, and Africa remain substantially underrepresented, each accounting for only a marginal proportion of the reviewed literature, suggesting that existing research remains geographically concentrated and may indicate opportunities for future studies. The reviewed studies were also classified according to the research level at which DM and OA were examined (Table 5).

Table 5.
Distribution of articles by research level

Research level	Number of articles	Percentage
Micro (actors & roles)	0	0
Meso (organizational structure & functions)	57	~84
Macro(ecosystems &platform)	11	~16

Note: The data presented in this table reflect the state of the literature as of 14 May 2026, corresponding to the completion of the database search.

Source: Own elaboration.

Following a multilevel organizational perspective, studies were categorized into micro, meso, and macro levels to better understand the dominant analytical focus within the existing literature. The results demonstrate that the overwhelming majority of studies (84%) investigate DM and OA at the meso level, focusing primarily on organizational structures, managerial capabilities, internal processes, and firm-level transformation mechanisms. This finding is consistent with the conceptual foundations of both constructs, as DM and OA are predominantly understood as organizational capabilities requiring strategic, cultural, technological, and process alignment. A smaller proportion of studies (16%) adopted a macro-level perspective, examining broader ecosystems, inter-organizational networks, digital platforms, or industry-wide transformation dynamics. These studies typically emphasize external collaboration, ecosystem responsiveness, and broader digital transformation environments rather than internal organizational capabilities. Interestingly, no studies were identified at the micro level, indicating a lack of research focusing on individual actors, employee roles, or behavioural mechanisms associated with DM and OA. This gap suggests an opportunity for future research to explore. The reviewed studies were further classified according to research method and research tool to identify dominant methodological approaches in the existing literature (Table 6).

Table 6.
Distribution of articles by research method and research tool

Research method	Research tool	Number of articles	Percentage
Quantitative	Survey	33	~49
	PLS-SEM	5	~7
Qualitative	Case Study	3	~4
	Models analysis + Case study	1	~1
	Case study + Interview	2	~3
Mixed	Survey + Case study	3	~4
	Delphi method	1	~1
	Survey + Focus Groups	1	~1
	fsQCA	2	~3
	Survey + Interview	2	~3
	PLS-SEM + Interview	1	~1
Other	Systematic Literature Review	13	~19
	Literature Synthesis	1	~1

Note: The data presented in this table reflect the state of the literature as of 14 May 2026, corresponding to the completion of the database search.

Source: Own elaboration.

The results indicate that quantitative methods dominate the literature, representing approximately 56% of the reviewed studies, with survey-based research being the most frequently applied methodological approach (49%). Additionally, several studies employed PLS-SEM to examine relationships between DM and OA and test structural relationships between organizational variables. Qualitative approaches accounted for a smaller proportion of the sample and were primarily represented by case study research, often combined with interviews or model analysis to provide context-specific insights into digital transformation and organizational adaptation processes. A number of studies adopted mixed methods, combining surveys with interviews, focus groups, or fuzzy-set qualitative comparative analysis (fsQCA) to capture both quantitative relationships and contextual organizational dynamics. Finally, studies categorized as other were predominantly represented by systematic literature reviews, accounting for approximately 19% of the sample. This finding highlights the increasing scholarly effort to synthesize fragmented knowledge concerning DM and OA in digitally intensive environments.

2.2. Main Results

The first stage of the main analysis focused on identifying the frequency with which individual DM domains appeared in the reviewed literature. Since a single article could address more than one DM domain, the results are presented as frequencies of occurrence rather than as the number of unique articles. This approach enables a more accurate representation of the multidimensional character of DM in the analysed studies (Table 7).

Table 7.
Frequency of DM domains identified in the reviewed literature

DM Domain	Frequency	Percentage
Strategic	55	~31
Culture	49	~27
Process	32	~18
Technological	34	~19
Market	9	~5

Note: The data presented in this table reflect the state of the literature as of 14 May 2026, corresponding to the completion of the database search.

Source: Own elaboration.

The results indicate that strategic maturity was the most frequently identified domain, appearing 55 times and accounting for approximately 31% of all coded occurrences. This strong representation suggests that the reviewed literature consistently positions DM as a strategically driven organizational capability rather than solely a technological condition. Studies frequently emphasize the importance of digital vision, leadership commitment, strategic alignment, and governance mechanisms in enabling organizations to navigate Industry 4.0-related transformation (Suwandi, et al., 2026; Luu, et al., 2026; Peter, et al., 2020). In particular, the literature highlights that organizations exhibiting higher levels of DM tend to integrate

digital initiatives into broader business strategies, align transformation efforts with organizational goals, and actively involve top management in digital decision-making. Furthermore, leadership is frequently portrayed as a critical mechanism for coordinating digital transformation efforts and reducing organizational resistance to change. As a result, strategic maturity is commonly framed as the foundational domain through which organizations mobilize digital resources and foster organizational adaptability (Cardoso, et al., 2025; Sagala & Őri, 2024).

The second most frequently represented domain was cultural maturity, with 49 occurrences (approximately 27%). The literature consistently stresses that successful digital transformation extends beyond technological implementation and depends heavily on organizational culture and employee readiness. Studies frequently associate cultural maturity with organizational openness to change, experimentation, collaboration, learning orientation, and employee empowerment (Orero-Blat, et al., 2024; Rubio-Andrés, et al., 2025). Moreover, digitally mature organizations are often characterized by stronger digital competencies, greater workforce adaptability, and leadership practices encouraging innovation and cross-functional cooperation. A recurring pattern visible across the reviewed studies is the emphasis placed on people-related capabilities, suggesting that employee engagement and organizational mindset are essential for translating digital initiatives into agile organizational behaviours. Together, strategic and cultural maturity represent the dominant focus of the literature, indicating that DM is primarily conceptualized as an organizational and managerial capability rather than merely a technological condition (Zhao, et al., 2023; Chen, et al., 2025; Senadjki, et al., 2024).

Technological maturity and process maturity were also strongly represented, accounting for approximately 19% and 18% of coded occurrences, respectively. The literature commonly describes technological maturity in terms of digital infrastructure, information systems, data analytics capabilities, artificial intelligence, cloud technologies, and digital integration mechanisms that support organizational responsiveness. However, rather than being treated as independent drivers of transformation, technological capabilities are often portrayed as enabling mechanisms facilitating faster information flows, decision-making, and operational flexibility (Ragmoun & Aloulou, 2026; Castillo-Vergara, et al., 2025). Similarly, process maturity is frequently linked to workflow integration, process automation, operational redesign, and process standardization, which collectively enhance organizational efficiency and adaptive capacity. The comparatively lower frequency of these domains suggests that the literature increasingly recognizes that technological advancement alone is insufficient unless accompanied by strategic direction and organizational readiness (Malik, et al., 2025; Silva, et al., 2025).

By contrast, market maturity appeared least frequently, with only 9 occurrences (approximately 5%). This limited representation indicates that customer orientation, product digitalization, external responsiveness, and market-facing capabilities remain relatively underexplored within the literature connecting DM and OA. While some studies emphasize the

importance of digitally enabled customer engagement and market responsiveness in turbulent environments, these aspects are substantially less prominent compared to internally oriented dimensions such as strategy, culture, and organizational processes. This pattern may suggest that current research tends to conceptualize DM primarily through an internal organizational lens, leaving external market-related capabilities comparatively overlooked (Almajali, et al., 2025; Aloulou, et al., 2024; Honigsberg, et al., 2026). The reviewed studies were subsequently analysed according to the frequency of OA dimensions addressed in the literature (Table 8).

Table 8.
Frequency of OA dimensions identified in the reviewed literature

OA Dimensions	Frequency	Percentage
Sensing	25	~21
Decision-making	35	~30
Acting	58	~49

Note: The data presented in this table reflect the state of the literature as of 14 May 2026, corresponding to the completion of the database search.

Source: Own elaboration.

The findings reveal that acting agility was by far the most frequently represented dimension, accounting for 58 occurrences (approximately 49%) of all coded agility dimensions. The strong emphasis on acting agility suggests that the reviewed literature primarily focuses on organizations' ability to translate digital capabilities into concrete organizational responses through resource reconfiguration, process redesign, strategic adaptation, and rapid operational implementation. Studies frequently associate acting agility with organizations' capacity to rapidly implement digital initiatives, modify internal workflows, introduce new digitally enabled products and services, and respond flexibly to disruptions emerging from dynamic environments (Yang, et al., 2025; Akkoca, 2025). Within Industry 4.0 contexts, acting agility is commonly portrayed as a capability allowing organizations to operationalize transformation efforts and maintain responsiveness amid technological turbulence and increasing environmental uncertainty. Moreover, many studies emphasize that digitally mature organizations tend to exhibit greater implementation speed and adaptive capacity due to stronger coordination mechanisms and digitally integrated processes. Consequently, the literature frequently conceptualizes agility through an execution-oriented perspective, emphasizing how organizations respond rather than merely how they perceive change (Ueasangkomsate, 2025; Forliano, et al., 2023). The decision-making agility dimension was represented with 35 occurrences (approximately 30%). Studies addressing this dimension frequently emphasize the role of information processing, rapid interpretation of environmental signals, evaluation of opportunities and threats, and timely managerial responses to dynamic business environments. In particular, the literature highlights how digitally mature organizations increasingly rely on data-driven decision-making, real-time information flows, analytics capabilities, and digitally enabled managerial coordination to support organizational responsiveness (AlNuaimi, et al., 2022; Çallı, et al., 2022). Decision-making agility is often

discussed in relation to organizations' ability to shorten decision cycles, reduce uncertainty, and improve strategic responsiveness under rapidly changing market and technological conditions. Several studies further suggest that DM contributes to decision-making agility by improving information accessibility and enhancing managerial capacity to evaluate complex organizational environments more effectively (Orero-Blat, et al., 2025; Cuong, et al., 2025). On the other hand, sensing agility appeared least frequently, accounting for 25 occurrences (approximately 21%). This dimension concerns organizations' ability to monitor environmental developments, identify emerging opportunities, anticipate market shifts, and detect technological disruptions before they materialize into operational challenges. The reviewed literature commonly associates sensing agility with environmental scanning, market intelligence, customer insights, competitor monitoring, and technological foresight capabilities. However, compared to acting and decision-making agility, sensing mechanisms receive substantially less scholarly attention. One possible explanation visible across the literature is that many studies focus more heavily on organizational adaptation after change occurs, rather than on anticipatory capabilities enabling organizations to proactively identify emerging trends and risks. As a result, sensing agility appears comparatively underrepresented despite its theoretical importance for maintaining competitiveness in Industry 4.0 environments (Ge, et al., 2026; Awad1 & Martín-Rojas, 2024; Ghobakhloo, et al., 2026). This distribution may indicate a tendency within existing research to conceptualize agility primarily through organizational action rather than through the full cycle of sensing, decision-making, and acting. To further explore the relationship between DM and OA, a cross-dimensional matrix was developed to identify how individual DM domains are associated with specific OA dimensions across the reviewed literature (Table 9).

Table 9.
Matrix of relationships between DM domains and OA dimensions

DM Domain	Sensing Agility	Decision-making Agility	Acting Agility	Total
Strategic	22	29	50	101
Culture	17	26	45	88
Process	9	20	32	61
Technological	10	18	29	57
Market	5	6	9	20

Note: The data presented in this table reflect the state of the literature as of 14 May 2026, corresponding to the completion of the database search.

Source: Own elaboration.

Since a single study could simultaneously address multiple domains and agility dimensions, the matrix presents the frequency of co-occurrence rather than the number of unique articles. This approach enabled the identification of dominant patterns in how digitally mature organizations develop agility capabilities in the context of Industry 4.0. The results reveal a clear pattern in which acting agility emerges as the dominant OA dimension across all DM domains. The fact that it received the highest frequency of occurrence suggest that digitally

mature organizations primarily leverage their capabilities to enhance executional responsiveness and organizational adaptation. The strongest relationship identified in the reviewed literature concerns strategic maturity and acting agility (50 occurrences), indicating that organizational strategy and leadership are most frequently associated with the implementation of adaptive responses and transformation activities. Rather than merely supporting digital transformation conceptually, strategic maturity appears to function as a mechanism translating digital ambitions into coordinated organizational action. Across the reviewed studies, organizations characterized by clear digital strategies and strong leadership involvement are frequently described as more capable of rapidly reconfiguring resources, aligning transformation initiatives across organizational units, and implementing strategic responses to environmental disruption. Particularly in Industry 4.0 contexts, where technological turbulence and competitive pressures are intensified, strategic maturity appears closely linked with an organization's ability to execute change effectively rather than simply formulate digital objectives (Aljehani, et al., 2026; Chen, et al., 2025; Pan, et al., 2022). At the same time, the relatively strong presence of decision-making agility (29 occurrences) suggests that strategic maturity also facilitates information processing and timely managerial responses to environmental change. The literature frequently portrays digitally mature leadership structures as facilitating quicker strategic adjustments, stronger coordination between departments, and more informed decision processes supported by digital information systems (Fachrunnisa, et al., 2020; Zheng, 2025).

Cultural maturity demonstrated the second strongest relationship with OA, particularly in relation to acting agility (45 occurrences) and decision-making agility (26 occurrences). In contrast to strategic maturity, which emphasizes formal alignment and leadership direction, cultural maturity appears to strengthen agility through behavioural and organizational conditions enabling responsiveness. The reviewed literature repeatedly highlights that organizational cultures characterized by openness to experimentation, learning orientation, employee autonomy, and collaboration tend to facilitate faster organizational adaptation. In many studies, digitally mature cultures are portrayed as reducing resistance to change and improving organizational flexibility by encouraging cross-functional cooperation and knowledge exchange. This suggests that cultural maturity contributes to agility not necessarily through formal mechanisms but through the development of organizational mindsets supporting adaptive behaviour (Duvivier & Gupta, 2023; Alshammari & Alshammari, 2026; Chang, et al., 2025).

Both process maturity and technological maturity exhibit similar relational patterns, with the strongest associations observed for acting agility (32 and 29 occurrences, respectively). However, the literature reveals important distinctions in the mechanisms through which these domains contribute to OA. Process maturity is commonly associated with organizational standardization, workflow integration, operational flexibility, and process redesign, enabling organizations to react more effectively to changing demands and disruptions. Studies frequently

suggest that organizations with digitally integrated and optimized processes are better positioned to implement rapid organizational adjustments and maintain operational continuity under dynamic conditions (Oncioiu, et al., 2025; Alaskar, 2025). In contrast, technological maturity is primarily portrayed as an enabling infrastructure supporting agility-related capabilities. The reviewed studies frequently emphasize technologies such as data analytics, digital platforms, cloud computing, enterprise systems, and artificial intelligence as facilitating faster information exchange, coordination, and managerial responsiveness. However, technological capabilities alone are rarely portrayed as sufficient drivers of agility. Instead, the literature consistently suggests that technology contributes to OA only when embedded within supportive organizational strategies, cultures, and processes. The relatively limited occurrence of sensing agility within technological maturity (10 occurrences) further suggests that digital technologies are more frequently leveraged for organizational coordination and execution rather than proactive sensing of environmental change (Islam, et al., 2023; Sagala & Őri, 2026; Alrub & Sánchez-Cañizares, 2025).

Although market maturity appeared least frequently in the literature, its strongest relationship was also observed with acting agility (9 occurrences). The reviewed studies commonly associate market maturity with customer responsiveness, digitally enabled products and services, and organizations' capability to adjust offerings according to changing market demands. However, unlike internally oriented domains such as strategy or culture, market maturity is more frequently discussed in terms of external adaptation and customer-facing responsiveness. The relatively limited representation of this domain may indicate that the relationship between DM and OA is still predominantly examined through an internal organizational lens, while market-oriented agility mechanisms remain comparatively underexplored (Volberda, et al., 2021; Franke, et al., 2026; Priyono, et al., 2020). The findings indicate that the literature conceptualizes the relationship between DM and OA primarily through organizational execution and implementation capabilities, rather than through sensing and anticipation mechanisms. Across all DM domains, acting agility consistently emerges as the dominant dimension, suggesting that digitally mature organizations are predominantly portrayed as organizations capable of translating digital capabilities into adaptive organizational action. To complement the analysis of DM and OA, the reviewed literature was further examined through the lens of socio-technical enablers (Table 10).

Table 10.
Frequency of socio-technical enablers identified in the reviewed literature

Socio-Technical Enabler	Frequency	Percentage
People	51	~29
Structure	55	~31
Technology	37	~21
Task	32	~18

Note: The data presented in this table reflect the state of the literature as of 14 May 2026, corresponding to the completion of the database search.

Source: Own elaboration.

Following the socio-technical systems perspective introduced in the methodological framework, studies were analysed to identify whether the conditions supporting the relationship between DM and OA were primarily associated with social system factors (people and structure) or technical system factors (technology and tasks). Similar to previous analyses, multiple socio-technical enablers could be assigned to a single study; therefore, the results are presented as frequencies of occurrence rather than as the number of unique articles. The findings indicate that structural enablers were the most frequently identified category, accounting for 55 occurrences (approximately 31%) of all coded socio-technical enablers. The reviewed literature consistently emphasizes the role of organizational governance, leadership arrangements, coordination mechanisms, structural flexibility, and decision-making structures in enabling organizations to effectively translate DM into OA. Studies frequently suggest that digitally mature organizations require organizational structures capable of facilitating cross-functional collaboration, reducing bureaucratic rigidity, and supporting rapid responses to environmental change. In particular, leadership support and governance mechanisms are often portrayed as essential for coordinating digital initiatives and aligning transformation efforts across organizational units. This finding suggests that organizations seeking to enhance agility through DM frequently rely on structural alignment mechanisms that facilitate organizational responsiveness and adaptive implementation rather than technological development alone (Damnjanović, et al., 2025; Tortora, et al., 2024; Leso, et al., 2022).

Similarly, people-related enablers demonstrated strong representation within the reviewed literature, accounting for 51 occurrences (approximately 29%). However, unlike structural enablers, people-related factors are predominantly discussed in terms of organizational capabilities and behavioural readiness supporting digital transformation and agile adaptation. The literature frequently highlights employee digital competencies, leadership involvement, workforce adaptability, organizational culture, learning orientation, and openness to change as critical determinants of organizational responsiveness. Many reviewed studies suggest that DM contributes to agility most effectively when employees possess the necessary digital skills and are willing to engage with transformation initiatives. Furthermore, organizations characterized by collaborative cultures and employee empowerment are frequently portrayed as better positioned to respond rapidly to environmental disruptions and organizational uncertainty (Kaszás, et al., 2023; Kő, et al., 2022; Asghar, et al., 2026).

By contrast, technology-related enablers accounted for 37 occurrences (approximately 21%), reflecting the continued importance of digital infrastructure, analytics capabilities, automation technologies, enterprise systems, cloud solutions, and information technologies in supporting organizational adaptation. The literature commonly describes technological enablers as mechanisms facilitating faster communication, improved information accessibility, operational visibility, and enhanced coordination across organizational processes. However, technological capabilities are rarely portrayed as independent determinants of agility. Instead, reviewed studies repeatedly emphasize that technology alone is insufficient to generate

organizational responsiveness unless accompanied by supportive leadership, employee readiness, and organizational structures. This comparatively lower representation suggests that the literature increasingly conceptualizes technology as an enabling infrastructure supporting agility, rather than as the central driver of adaptive organizational behaviour (Wang, et al., 2025; Abidi, et al., 2025; Sánchez-Rodríguez, et al., 2025).

Finally, task-related enablers appeared least frequently (32 occurrences; approximately 18%). These enablers are primarily associated with workflow redesign, process integration, task flexibility, operational reconfiguration, and process automation, all aimed at supporting digital transformation initiatives. The reviewed studies commonly discuss task-related mechanisms in relation to organizations' ability to redesign operational routines and improve internal efficiency in response to changing environmental demands. Nevertheless, compared to people and structural enablers, task-related factors are less frequently conceptualized as standalone organizational conditions supporting agility. Instead, they are often portrayed as consequences of broader digital transformation efforts, emerging after technological and organizational changes have already been implemented (Konopik, et al., 2022; Mick, et al., 2024; Nyamboga, 2025).

Overall, the findings suggest that the reviewed literature places stronger emphasis on social system enablers (structure and people) than on technical system enablers (technology and tasks) in explaining how DM contributes to OA. This pattern highlights that successful organizational adaptation in Industry 4.0 environments is not driven exclusively by technological advancement but rather depends on the alignment between organizational structures, human capabilities, and supporting technological mechanisms. In this regard, the findings provide empirical support for a socio-technical perspective on digital transformation and agility, emphasizing the interdependence between organizational and technological conditions in fostering adaptive capability (Gillani, et al., 2024; Karadağ, et al., 2026; Zhang, et al., 2025).

3. Discussion

One of the central findings emerging from this review concerns the evolving conceptualization of DM as a multidimensional organizational capability rather than a condition determined solely by technological advancement. Although technological readiness remains an important prerequisite for digital transformation, the reviewed studies consistently indicate that strategic and cultural dimensions of maturity play a more decisive role in shaping organizations' ability to navigate digitally intensive environments (Mulyana, et al., 2024; Mick, et al., 2024). This pattern suggests that DM is increasingly understood not simply as the adoption of advanced digital technologies, but as an organization's capacity to strategically coordinate, integrate, and leverage digital initiatives across multiple organizational levels.

The findings of this systematic literature review further indicate that this interpretation is not driven by isolated studies but represents a consistent pattern across the reviewed literature. The predominance of strategic and cultural maturity domains over technological maturity suggests that researchers increasingly conceptualize digital maturity as an organizational capability embedded in managerial and organizational practices rather than as a measure of technological sophistication alone.

Across the reviewed literature, organizations exhibiting higher levels of DM are consistently characterized by stronger strategic alignment, leadership commitment, governance mechanisms, employee readiness, and organizational adaptability. These findings reinforce the broader argument within digital transformation research that technological investments alone rarely produce sustainable organizational outcomes unless embedded within supportive managerial and organizational conditions (Senadjki, et al., 2024; Gillani, et al., 2024). Rather than functioning as an isolated technological state, DM appears to emerge from the interaction between organizational structures, managerial capabilities, cultural readiness, and technological resources. The work of Konopik et al. (2022) reinforce this interpretation by conceptualizing DM as an evolving capability configuration supporting transformation processes. Research grounded in dynamic capability theory emphasizes that organizations require distinct organizational capabilities at different stages of digital transformation, including sensing, seizing, and transforming activities. Similarly, Haryanti et al. (2023) conceptualizes DM as a multidimensional organizational capability rather than a purely technological condition, highlighting the importance of organizational structure, strategy, employee preparedness, and process integration, while positioning technology as a necessary but insufficient enabler of transformation. Evidence from more recent empirical studies like Orero-Blat et al. (2025) and Tortora et al. (2024) also suggests that digitally mature organizations are better positioned to translate managerial data-driven orientations into operational capabilities, particularly when supported by cohesive organizational cultures and leadership commitment. Taken together, the findings challenge technology-centric interpretations frequently associated with digital transformation and Industry 4.0 (Dubey, et al., 2024; N'Dri & Su, 2024; Alajmi, 2026).

Although technologies such as artificial intelligence, analytics, automation, and cloud-based systems are repeatedly identified as important transformation mechanisms, they are rarely portrayed as independent drivers of organizational responsiveness. Instead, technological capabilities are consistently framed as enabling mechanisms whose effectiveness depends on alignment with organizational culture, strategic intent, leadership, and managerial coordination (Forliano, et al., 2023; Kolog, et al., 2020). Volberda et al. (2021) and Chen et al. (2025) examine organizational transformation processes further demonstrate that firms derive value from digital technologies primarily when they are capable of redesigning routines, overcoming cognitive barriers, and integrating digital resources into broader organizational processes. This interpretation is further supported by research examining advanced technological capabilities in digitally transforming organizations like Ragmoun & Aloulou (2026) and Sagala

& Őri (2025). The authors are focusing on artificial intelligence and digital platform capabilities indicating that technological sophistication alone rarely translates directly into resilience, innovation, or adaptive capacity. Instead, organizational outcomes appear to depend on the presence of broader dynamic capabilities enabling firms to reconfigure resources, adapt decision-making structures, and integrate digital initiatives into existing organizational systems. This findings challenge technology-centric narratives frequently associated with Industry 4.0 and suggest that organizational transformation is primarily dependent upon the organization's ability to orchestrate strategic, cultural, and technological elements simultaneously. Consequently, DM may be better understood as an organizational transformation capability, reflecting the extent to which organizations successfully align strategic, cultural, structural, and technological elements to support adaptation in dynamic environments (Zhang, et al., 2025; AlNuaimi, et al., 2022).

The findings reveal a clear tendency within the reviewed literature to conceptualize OA through an execution-oriented perspective, with acting agility emerging as the dominant agility dimension. Scholarly attention appears to focus primarily on how organizations operationalize responses to environmental turbulence, implement digital initiatives, and reconfigure internal processes following disruption rather than on how they proactively anticipate change (Damnjanović, et al., 2025; Karadağ, et al., 2026). This suggests that OA in digitally intensive environments is frequently understood as a capability rooted in rapid execution, organizational responsiveness, and adaptive implementation. This study shows the predominance of acting agility indicating that the current body of research places considerably greater emphasis on organizations' ability to implement change than on their ability to anticipate it. This suggests that agility is operationalized through observable implementation outcomes rather than through the complete cycle of sensing, decision-making, and acting. Across the reviewed studies by Akkoca (2025), Duvivier & Gupta (2023), and Fachrunnisa et al. (2020) acting agility is consistently associated with capabilities such as rapid decision-making, flexible resource deployment, process redesign, operational responsiveness, and implementation speed. Research on digital agility and organizational adaptation repeatedly emphasizes organizations' capacity to respond swiftly to technological disruptions, changing market conditions, and emerging operational challenges through resource reconfiguration and organizational adjustment. Rather than emphasizing opportunity recognition or anticipatory strategic behaviour, the dominant conceptualization portrays agility primarily as an adaptive execution capability enabling organizations to sustain performance under uncertainty. In practice, OA is therefore frequently portrayed through capabilities such as resource reconfiguration, process redesign, operational flexibility, implementation speed, and adaptive execution, all of which support organizational responsiveness under conditions of uncertainty (Asghar, et al., 2026; Rubio-Andrés, et al., 2025).

The comparatively lower representation of sensing agility introduces an important theoretical observation. Existing conceptualizations of OA commonly assume that adaptive capability emerges through a dynamic process involving environmental sensing, managerial interpretation, and organizational action. However, the reviewed literature demonstrates a stronger emphasis on organizational reaction after change has occurred rather than on proactive opportunity recognition and anticipation of disruption (Almajali, et al., 2025; Ge, et al., 2026). This imbalance suggests that contemporary digital transformation research may privilege observable implementation-related capabilities over less tangible anticipatory mechanisms. The finding of Kolog et al. (2020) and Ghobakhloo et al. (2025) emphasize that organizations operating in Industry 4.0 environments frequently face continuous technological turbulence, shortened innovation cycles, and elevated competitive pressure, encouraging a stronger emphasis on immediate responsiveness than on long-term foresight. Studies examining SMEs and digitally transforming firms suggest that organizations often prioritize operational adaptation, restructuring, skills development, and process implementation to address immediate technological and market disruptions. Under such conditions, responsiveness may be perceived as more valuable than proactive sensing because organizations are required to adapt continuously to rapidly evolving environments. the predominance of acting agility may also reflect methodological tendencies within empirical research. Execution-related capabilities, such as process adaptation, implementation speed, resource flexibility, and organizational restructuring, are generally more observable and measurable than sensing mechanisms associated with managerial cognition, environmental scanning, or strategic foresight (Priyono, et al., 2020; Sagala & Őri, 2026; AlNuaimi, et al., 2022). As a result, empirical studies may unintentionally overrepresent acting agility while underestimating the strategic role of sensing capabilities in enabling organizations to recognize opportunities and disruptions before they materialize. This imbalance has important implications for how OA is currently understood in digital transformation research. By predominantly emphasizing acting agility, the literature risks conceptualizing agility primarily as an adaptive implementation capability, while underestimating the strategic importance of sensing mechanisms required to anticipate technological and market shifts proactively. From an Industry 4.0 perspective, this distinction appears particularly relevant, as digitally interconnected environments increasingly require organizations not only to respond rapidly to disruption but also to anticipate emerging technological developments and competitive changes before they fully materialize.

The relationship between DM and OA appears to be strongest when digital capabilities are successfully translated into adaptive organizational action. Across the reviewed studies, strategic and cultural dimensions of DM consistently demonstrate the strongest associations with acting agility, suggesting that organizational responsiveness depends less on technological sophistication alone and more on managerial alignment, organizational preparedness, and change-oriented capabilities. (Çallı, et al., 2022; Karadağ, et al., 2026). In this regard,

digitally mature organizations appear better equipped to convert technological investments into adaptive responses because they possess the structural and cultural conditions necessary to implement change effectively. Kwiotkowska (2025) as well as Kaszás et al. (2023) argues that the organizational conditions through which DM strengthens agility. Research consistently demonstrates that organizations characterized by coherent digital strategies, committed leadership, employee preparedness, collaborative cultures, and long-term managerial orientation exhibit stronger adaptive capabilities and greater responsiveness to environmental change. Rather than emerging automatically from investments in digital technologies, agility appears to depend on organizations' ability to align technological initiatives with organizational culture, managerial commitment, and employee capabilities. This finding reinforces the broader argument that digital transformation is fundamentally an organizational process requiring strategic coordination and readiness for change rather than a purely technological undertaking. It can be said that organizations characterized by clear digital strategies, committed leadership, collaborative cultures, and employee readiness appear more capable of implementing rapid organizational responses and sustaining agility under conditions of uncertainty. This research demonstrates that the relationship between DM and OA is not limited to a single digital maturity domain. Acting agility was the dominant agility dimension across all five maturity domains, indicating a remarkably consistent pattern throughout the reviewed literature. This consistency strengthens the argument that digital maturity contributes primarily to organizations' execution capabilities irrespective of the specific maturity dimension being examined.

At the same time, technological and process maturity appear to play a complementary, though still important, role in strengthening agility-related capabilities. Integrated workflows, process standardization, automation, and digitally enabled infrastructures improve information exchange, cross-functional coordination, and the speed of organizational decision-making, thereby facilitating organizational responsiveness (Castillo-Vergara, et al., 2025; Forliano, et al., 2023). Empirical evidence of Wang et al. (2025) argue that system integration reduces fragmentation, improves cross-functional coordination, and enhances the quality and consistency of organizational data, creating the technological foundation necessary for faster adaptation and more responsive decision-making. Oncioiu et al. (2025) also suggests that technological integration enhances transformation outcomes particularly when accompanied by employee resilience, organizational flexibility, and supportive managerial practices, enabling organizations to respond more effectively to environmental turbulence. However, the reviewed literature consistently indicates that technological and process maturity function primarily as enabling rather than independent sources of agility. Although digital infrastructures, automation systems, and artificial intelligence capabilities may facilitate adaptation, their contribution appears contingent upon supportive organizational arrangements and strategic alignment. Technologies improve organizational responsiveness when embedded within coherent managerial frameworks that enable coordination, interpretation, and implementation of digital initiatives. Consequently, agility should not be viewed as a direct consequence of technological

advancement, but rather as the outcome of organizational conditions that allow technological resources to be mobilized effectively (Mele, et al., 2024; Haryanti, et al., 2023). Taken together, the findings suggest that the relationship between DM and OA is both organizationally embedded and predominantly execution oriented. DM strengthens agility not through technological advancement alone, but through the interaction of strategic alignment, cultural readiness, organizational preparedness, process integration, and technological support mechanisms that collectively enhance adaptive capability in Industry 4.0 environments. This interpretation further explains why strategic and cultural maturity consistently demonstrate stronger relationships with acting agility than technological maturity alone.

The socio-technical perspective offers a more comprehensive explanation of how DM translates into OA in Industry 4.0 environments. The findings reveal a clear predominance of social system enablers over purely technical enablers, indicating that agility is shaped more strongly by organizational and human-related conditions than by technology alone. The study revealed that the difference between social and technical enablers was systematic rather than incidental. Across the reviewed studies, structural arrangements, leadership involvement, governance mechanisms, employee capabilities, collaborative cultures, and organizational flexibility emerge as more consistently represented determinants of adaptive capability than technological infrastructure itself. This pattern aligns closely with the assumptions of socio-technical systems theory, according to which organizational effectiveness results from the alignment between social and technical subsystems rather than from technological advancement in isolation (Chen, et al., 2025; Gillani, et al., 2024). From this perspective, the findings challenge deterministic interpretations of Industry 4.0 that portray digital technologies as the principal drivers of competitiveness and agility. Although digital infrastructures, analytics capabilities, automation systems, and AI-enabled technologies undoubtedly facilitate organizational responsiveness, the reviewed studies rarely conceptualize them as sufficient conditions for agility on their own. Instead, organizations appear capable of deriving value from technological investments only when supported by organizational structures and human capabilities that enable interpretation, coordination, and implementation of digital initiatives (Ghobakhloo, et al., 2026; Ragmoun & Aloulou, 2026). Consequently, DM contributes to agility not through a direct technology-performance relationship, but through a broader process of socio-technical alignment in which technological capabilities are embedded within supportive organizational contexts. The socio-technical interpretation also provides an important explanation for the predominance of acting agility identified across the reviewed literature. Acting agility may represent the most visible organizational manifestation of successful socio-technical alignment, emerging when organizations combine enabling structures, digitally competent employees, and integrated technological systems to support rapid adaptation and effective execution. By contrast, sensing agility depends more strongly on anticipatory capabilities such as environmental scanning, managerial cognition, and strategic foresight, which are generally more difficult to operationalize and empirically capture (Zhang,

et al., 2025; Malik, et al., 2025). Given the increasing pace of technological disruption, shortened innovation cycles, and growing competitive pressure characteristic of Industry 4.0 environments, organizations may naturally prioritize immediate responsiveness and implementation over long-term anticipation. As a result, acting agility appears to dominate both organizational practice and scholarly attention because it constitutes the most observable expression of adaptive capability in digitally intensive contexts (Tortora, et al., 2024; Ueasangkomsate, 2025; Peter, et al., 2020). Overall, the findings suggest that OA should not be understood as a technologically determined capability, but rather as the outcome of organizational alignment across people, structures, technologies, and operational arrangements. DM strengthens OA when technological resources are integrated with strategic intent, organizational readiness, and human capabilities that collectively support adaptive action. This perspective strengthens the explanatory value of the identified relationships between DM and OA while emphasizing that successful adaptation in Industry 4.0 environments depends fundamentally on socio-technical coherence rather than technological sophistication alone.

Based on the findings of this systematic literature review, a conceptual framework was developed to synthesize the identified relationships between DM, OA, and socio-technical enablers within Industry 4.0 environments. Since the reviewed literature frequently examined these constructs separately or emphasized only selected relationships, the proposed framework aims to provide a more integrated explanation of how DM contributes to OA and, ultimately, organizational performance. Figure 4 presents the proposed conceptual framework derived from the synthesis of the reviewed studies. The framework conceptualizes OA as an outcome enabled by DM and facilitated through socio-technical alignment, while simultaneously acknowledging the contextual influence of Industry 4.0 conditions.

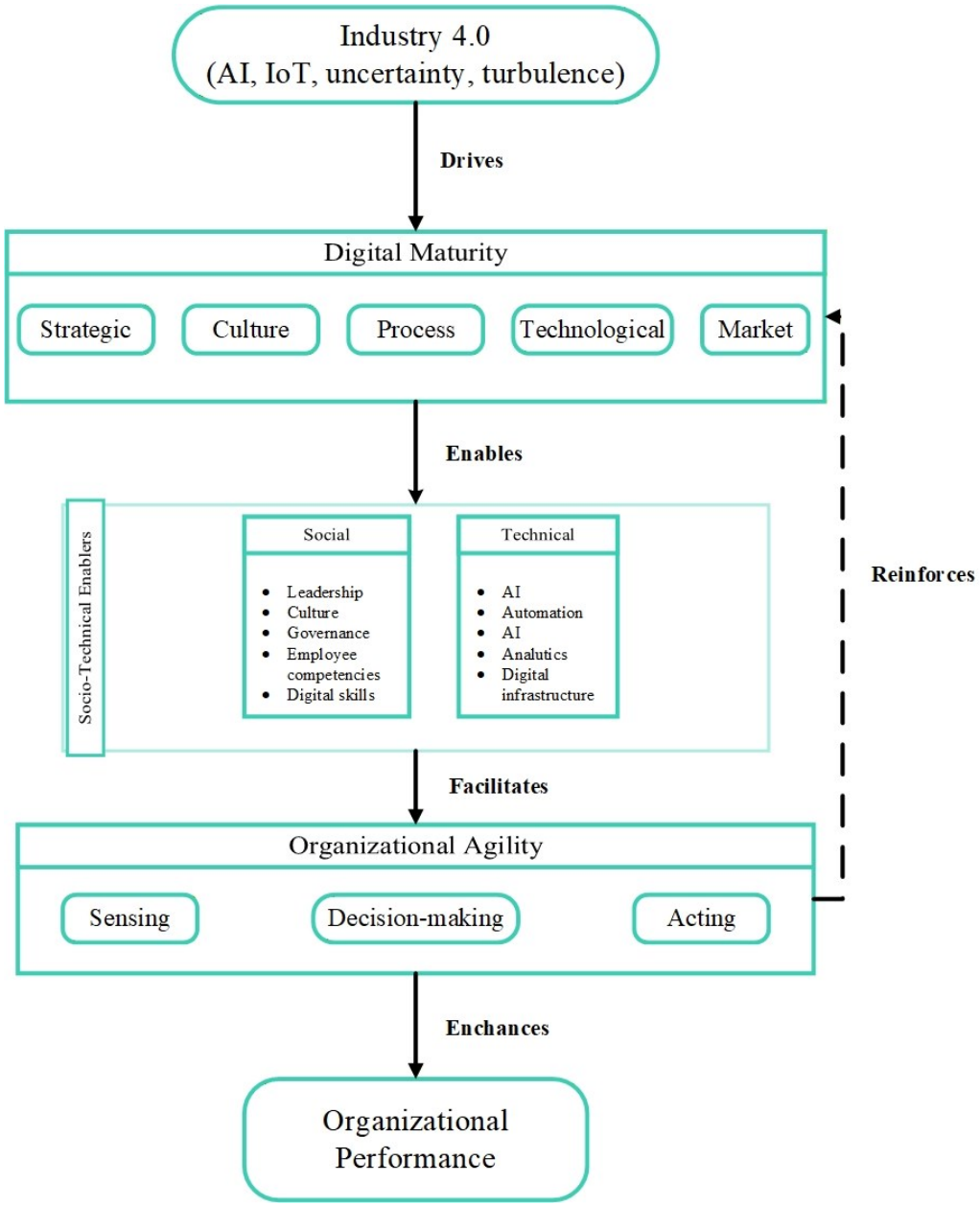

Figure 4. Proposed conceptual framework of the relationship between DM and OA in Industry 4.0 environments.

Source: Own elaboration.

The framework positions Industry 4.0 as the contextual driver shaping organizational transformation efforts towards higher levels of DM. The increasing technological turbulence creates pressure for organizations to develop digital capabilities, redesign processes, and strengthen strategic and cultural readiness. In this context, DM emerges as an organizational response to the technological and competitive demands of digitally intensive environments. At the organizational level, DM is conceptualized as a multidimensional capability composed of strategic, cultural, process, technological, and market maturity. The framework assumes that DM enables the development and alignment of socio-technical enablers required for effective organizational transformation. As organizations become more digitally mature, they are more likely to establish supportive leadership, governance structures, employee competencies,

and digital cultures while simultaneously investing in technological infrastructures such as analytics, automation, AI, and digital systems. Thus, DM creates the organizational conditions necessary for socio-technical integration. The framework further proposes that the relationship between DM and OA is facilitated through socio-technical enablers by translating digital capabilities into adaptive organizational behaviour. The literature consistently suggests that technologies alone rarely generate agility unless combined with complementary organizational conditions such as leadership, employee competencies, governance mechanisms, and supportive culture. Agility therefore emerges through the alignment of social and technical systems rather than through technological investments in isolation. Importantly, the framework does not assume that technological advancement alone directly produces agility. Instead, it proposes that OA emerges through the alignment of technological capabilities with supportive organizational structures and people-related capabilities. Through sensing, decision-making, and especially acting agility, organizations become more capable of maintaining responsiveness, operational continuity, innovation, and competitive performance. The literature further suggests that agility contributes to performance not merely through flexibility, but through execution-oriented adaptation. Additionally, the proposed reinforcing relationship between OA and DM reflects the possibility that organizations capable of agile adaptation may further strengthen their DM over time through organizational learning, accumulated digital capabilities, and continuous transformation efforts. Overall, the findings suggest that the relationship between DM and OA is considerably more organizational than technological in nature. Although advanced digital technologies constitute an important prerequisite for Industry 4.0, the reviewed evidence indicates that organizations derive agility primarily through strategic alignment, organizational culture, leadership, and employee capabilities.

This study contributes to the literature, by providing a structured synthesis of the fragmented relationship between DM and OA in Industry 4.0 contexts by identifying how specific DM domains relate to distinct agility dimensions. In particular, the findings suggest that DM should be conceptualized primarily as an organizational capability rather than solely a technological condition, as strategic and cultural maturity emerged as the dominant domains supporting agility. The findings also extend OA literature by demonstrating a clear predominance of acting agility, suggesting that agility in digitally intensive environments is increasingly conceptualized through an execution-oriented perspective focused on implementation and organizational responsiveness. The comparatively lower representation of sensing agility also indicates the need for greater theoretical attention to anticipatory capabilities. By applying a socio-technical perspective, this study highlights that OA emerges through the alignment between people, structures, and technologies, rather than through technological advancement alone. The proposed conceptual framework therefore contributes to a more integrated understanding of digitally enabled organizational adaptation. From practical point of view the findings suggest that managers should avoid approaching digital transformation primarily through technology investments. Although digital infrastructure and

advanced technologies remain important, OA appears to depend more strongly on leadership, culture, governance mechanisms, and employee capabilities supporting adaptive responses. The strong relationships between strategic and cultural maturity and acting agility further indicate that organizations seeking greater responsiveness should prioritize strategic alignment, employee readiness, and collaborative organizational cultures alongside digital implementation efforts. From a socio-technical perspective, the findings imply that OA is most likely to emerge when technological capabilities are aligned with supportive structures and people-related competencies. Consequently, managers should focus not only on adopting digital technologies but also on integrating them into organizational routines, decision-making processes, and workforce development efforts.

Despite providing a comprehensive synthesis of the relationship between DM and OA, this study is subject to several limitations that should be acknowledged. The review included only studies indexed in Scopus and ProQuest, limited to English-language publications from 2020–2026, which may have excluded relevant research from other databases and contexts. Additionally, the reviewed literature was strongly concentrated in Asian regions, while other geographical contexts remained underrepresented, limiting the broader generalizability of the findings. Although the review followed the PRISMA protocol, the categorization of socio-technical enablers required interpretive assessment, as reviewed studies rarely explicitly classified organizational conditions into socio-technical dimensions. Furthermore, as a systematic literature review, this study synthesizes existing evidence rather than empirically testing causal relationships between DM and OA. Future research could further explore the relationship between DM and OA at the micro level, particularly focusing on employee and managerial capabilities. Greater attention should also be devoted to market maturity and sensing agility, which appeared relatively underrepresented in the literature. Finally, future empirical studies may validate and further refine the proposed conceptual framework, particularly across different regional and organizational contexts.

4. Conclusion

This study examined the relationship between DM and OA in the context of Industry 4.0 through a systematic literature review conducted under the PRISMA protocol. By synthesizing findings from 68 studies, the review identified how different domains of DM contribute to distinct dimensions of OA and explored these relationships through a socio-technical perspective. The findings indicate that DM should be understood primarily as an organizational capability rather than solely a technological condition. While technological and process-related capabilities remain important, the reviewed literature places stronger emphasis on strategic and cultural maturity, highlighting the importance of leadership, organizational readiness, employee

capabilities, and governance mechanisms in supporting digital transformation. Similarly, OA was predominantly conceptualized through an execution-oriented perspective, with acting agility emerging as the dominant dimension, suggesting that existing research focuses more strongly on organizational responsiveness and implementation than on anticipatory capabilities. The study further demonstrates that the relationship between DM and OA is strengthened through socio-technical alignment, where organizational structures, people-related capabilities, and technological systems collectively support adaptive organizational behaviour. In this regard, the findings challenge technology-centric assumptions frequently associated with Industry 4.0 and suggest that OA emerges not from technology adoption alone, but from the organization's capability to align digital resources with supportive organizational conditions. By integrating fragmented findings and proposing a conceptual framework linking DM, socio-technical enablers, and OA, this study contributes to a more comprehensive understanding of digitally enabled organizational adaptation. As organizations continue to face increasing technological turbulence and competitive pressures, understanding how DM supports agility may become increasingly important for sustaining long-term organizational performance in Industry 4.0 environments.

Authors contribution

Conceptualization: A.G; Methodology: A.G; Formal analysis: A.G; Investigation: A.G; Validation: A.G; Visualization: A.G; Writing-original draft: A.G; Writing-review & editing: A.G., L.H; Supervision: L.H.

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