A Meta-Analysis of the Relationship Between Digital Maturity and Digital Transformation

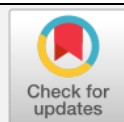**Nurul Wahdaniyah [1],* , Achmad Nurmandi [1], ,
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ABSTRACT

This study examines the evolving relationship between digital maturity and digital transformation by conducting a bibliometric analysis. Employing a qualitative literature review supported by VOSviewer, it visualizes keyword co-occurrences and topic clusters. 67 Scopus-indexed publications from 2019 to 2023 were analyzed to uncover research trends and thematic patterns. The findings indicate a substantial rise in scholarly attention to this topic over the past five years. Core concepts such as digital transformation, maturity, technology adoption, and sustainable development emerged as central themes. In contrast, e-government and digital capability remain underexplored, suggesting future research opportunities. Theoretically, this study contributes to a more nuanced understanding of digital maturity, not merely as technological readiness but as a strategic enabler of long-term digital transformation. The study's key contribution is identifying well-developed and under-researched areas and proposing a three-phase digital transformation framework: capability development, strategic alignment, and data-driven sustainable transformation. A key limitation lies in the absence of empirical validation, which underscores the need for future research using primary data and integrating complementary databases.

1. Introduction

Digital transformation has become a foundational pillar in developing technology and business strategies across education, government, and industry (Beulen, 2020). It simultaneously affects multiple facets of an organization, involving diverse stakeholders in shaping transformation strategies, ranging from marketing and IT to product development, strategic planning, and human resources (Nasiri et al., 2022). These stakeholders must establish a shared understanding of the priorities and scope of digital transformation efforts (Snowdon et al., 2024). Digital transformation refers to the process by which organizations incorporate digital technologies into all operational areas, fundamentally changing how they function and deliver value to stakeholders (Zaozerskaya et al., 2022). The readiness of an organization to embark on digital transformation is closely tied to its level of digital maturity (Escoz Barragan et al., 2024). A higher degree of digital maturity generally indicates a stronger capacity to implement successful digital transformation initiatives (Glebova et al., 2023).

Digital maturity is commonly defined as the extent to which an organization has integrated digital technologies into its processes, culture, and strategic operations (Pucihar & Borštnar, 2022). It indicates preparedness and the ability to effectively leverage digital innovations (Velu, 2024). Existing models for assessing digital maturity typically encompass indicators such as digital literacy, digital management capacity, and organizational confidence in using digital tools (Teichert, 2023). The concept plays a crucial role in determining the success of transformation efforts, as it reflects an organization's capacity to harness the full potential of digital technologies (Brown & Brown, 2019). Entities with higher digital maturity tend to respond more efficiently to external changes, thereby supporting the long-term success of digital transformation (Mohammadi et al., 2023).

Assessing digital maturity is a critical preliminary step in any digital transformation journey (Barry et al., 2022). It enables organizations to evaluate their current digital capabilities and identify areas in need of enhancement. As emphasized by Krakovskaya et al., higher digital maturity enhances readiness for transformation initiatives (Krakovskaya et al., 2024). Frameworks for measuring maturity often include eight core dimensions: strategy, leadership, business and operating models, human resources, organizational culture, governance, and technology (Herceg et al., 2020).

The interdependence between digital maturity and transformation is pivotal to success in today's digital economy (Acerbi et al., 2023). A higher level of maturity correlates with improved readiness, innovation capacity, operational efficiency, and competitiveness (Brusakova, 2022). Organizations are therefore encouraged to assess their maturity levels, address existing barriers, and formulate strategic roadmaps to navigate transformation effectively (Petrova & Petrov, 2024). Digital maturity is multifaceted, encompassing technological, strategic, operational, human, cultural, and performance dimensions (Haryanti et al., 2024). Focusing on these indicators enables organizations to evaluate their current standing and identify key development areas for successful transformation (Thordsen & Bick, 2023).

Several studies have investigated the link between digital maturity and digital transformation. For instance, Fernández et al. conducted a multivocal literature review on digital transformation initiatives in higher education institutions (Fernández et al., 2023). They found that successful transformation in universities depends on aligning digital maturity with strategic organizational objectives, which fosters synergy between technology and institutional vision, enhances return on investment, and strengthens long-term sustainability. Tubis proposed a Digital Maturity Assessment Model focusing on organizational and process dimensions (Tubis, 2023). The organizational component examines the integration of digital

initiatives into corporate strategy and structure, while the process component assesses readiness at the operational level. The model includes eleven maturity domains and five evaluation levels, offering a systematic tool for identifying gaps and advancing transformation.

Similarly, Kırmızı and Kocaoglu introduced a digital transformation maturity model based on a design science approach, validated through case studies in the manufacturing sector (Kocaoglu & Kirmizi, 2024). Their model captures the maturity progression across transformation phases and proposes five maturity levels. These levels form a structured self-assessment mechanism that helps organizations determine their current status and formulate appropriate transformation strategies. Prototype testing confirmed the model's effectiveness in guiding sustainable digital transformation.

Despite growing scholarly interest, applying digital maturity concepts across different organizational settings continues to encounter challenges. Variability in conceptual understanding, measurement approach differences, and limitations in human capital and organizational culture remain significant obstacles. Moreover, systematic reviews do not comprehensively map global research landscapes and identify conceptual and thematic gaps in the existing literature.

The present study adopts a bibliometric approach to address this gap to identify global research trends, conceptual voids, and potential avenues for future inquiry in digital maturity and transformation. Bibliometric analysis provides a quantitative foundation for evaluating research impact and exploring relationships among concepts, authors, institutions, and countries. Using the VOSviewer software, this study visualizes research networks, collaborative patterns, and the development of central themes shaping the discourse. The primary contribution lies in offering a conceptual mapping that has yet to be synthesized in previous research, which can serve as a strategic foundation for scholars and practitioners in designing informed policies and structured digital transformation agendas. However, as the study is based solely on bibliometric data, it lacks empirical validation. Future research should include field-based evidence and integrate datasets from other major indexes to enrich the analysis and enhance applicability.

2. Literature Review
2.1. Digital Maturity

Digital maturity refers to an organization's readiness and capability to adopt, manage, and optimize digital technologies to enhance operational efficiency, foster innovation, and achieve sustainable competitiveness (Westerman et al., 2015). It reflects how digital technologies are strategically embedded within business operations to generate added value, whereas digital transformation focuses on implementing these capabilities to meet defined objectives (Holt & Wiedner, 2023).

Digital maturity goes beyond the mere use of technology; it also encompasses integrating digital tools into an organization's strategic direction and cultivating a culture that supports innovation and transformation (Hess et al., 2020). It includes key dimensions such as technological infrastructure, strategic alignment, organizational culture, and leadership. Organizations with high levels of digital maturity are better positioned to leverage digital tools strategically, optimize decision-making through data-driven insights, and create sustainable value within the digital ecosystem (Schallmo & Williams, 2018). In contrast, organizations with low digital maturity often struggle to adapt to technological change and are at greater risk of failing to implement transformation effectively (Nottbrock et al., 2023).

The level of digital maturity within an organization can be assessed using a range of variables. One of the primary dimensions is technological infrastructure, which involves deploying advanced digital tools such as cloud computing, big data, artificial intelligence (AI), and the Internet of Things (IoT) to improve efficiency and service delivery. Another critical dimension is digital strategy, which refers to the organization's ability to formulate forward-looking strategies aligned with its mission while navigating opportunities and risks within the digital environment (Hess et al., 2020). A third key dimension is organizational culture, which emphasizes the role of innovation, leadership commitment, and openness to change in facilitating the adoption of new technologies (Tutak & Brodny, 2022).

Maturity models serve as frameworks for evaluating and comparing progress across these dimensions. They help organizations monitor capability development over time and generate structured reports that inform targeted improvement efforts within specific functional areas.

2.2. Digital Transformation

Digital transformation refers to a fundamental shift within an organization that involves integrating digital technologies across all areas of business and operations to enhance efficiency, innovation, and competitiveness in the digital era (Brisco, 2022). It encompasses more than adopting new technologies; it also entails significant changes in business strategy, organizational culture, and the development of flexible, data-driven work models (Silva, 2024). In today's rapidly evolving markets, digital transformation has become essential for organizations seeking to remain adaptive and responsive to technological advancements and shifting consumer demands (Chen et al., 2024).

Digital transformation comprises several core dimensions structurally. The first is the technological dimension, which involves applying innovations such as big data analytics, artificial intelligence (AI), the Internet of Things (IoT), cloud computing, and blockchain to enhance business processes (Escoz Barragan et al., 2024). The second dimension focuses on strategy and business models, emphasizing how organizations formulate digital approaches to create added value, develop technology-based services, and improve customer engagement (Kocaoglu & Kirmizi, 2024).

The third dimension relates to organizational culture and human resources. This includes initiatives to develop employee digital competencies and foster more collaborative, technology-enabled work environments (Šimberová et al., 2022). The fourth dimension centers on business processes, which involve automating and optimizing operations through digital technologies to drive efficiency and effectiveness (Wang et al., 2024).

Successful digital transformation is contingent upon an organization's readiness to embrace change (Kokot et al., 2023). Technical, cultural, and strategic capabilities shape this readiness. One critical enabler is digital leadership, which is pivotal in guiding transformation efforts, aligning technological initiatives with long-term goals, and fostering a culture of continuous innovation (Calzati & Van Loenen, 2023).

3. Research Methodology

This study employs a literature review approach using bibliometric analysis to map research developments, thematic trends, and future research directions in digital maturity and digital transformation. The bibliometric method was selected for its ability to provide an objective, systematic, and replicable analytical framework based on structured bibliographic data. Although the interpretation of results is qualitative, the primary analytical process is quantitative, as reflected in the measurement of bibliographic metrics and the visualization of

scientific patterns (Setyaningsih et al., 2016). Bibliometric analysis is fundamentally quantitative, yet its findings can be interpreted qualitatively to gain deeper insights into the scientific landscape (Martín-Martín et al., 2018).

The data for this study consist of journal articles published between 2019 and 2023 and indexed in the Scopus database. Scopus was chosen as the data source due to its reputation as one of the most comprehensive and reliable indexing platforms for high-quality academic publications. A total of 67 articles were retrieved based on the following search query: TITLE-ABS-KEY ('Digital Maturity') AND TITLE-ABS-KEY ('Digital Transformation') AND PUBYEAR >= 2019 AND PUBYEAR <= 2023 AND DOCTYPE = 'ar' AND PUBSTAGE = 'final' AND SRCTYPE = 'j' AND LANGUAGE = 'English' AND (SUBJAREA = 'SOCI' OR SUBJAREA = 'COMP') AND (EXACTKEYWORD = 'Digital Transformation' OR EXACTKEYWORD = 'Digital Maturity' OR EXACTKEYWORD = 'Industry 4.0').

Figure 1 presents the selection criteria, filters, and analysis procedures employed.
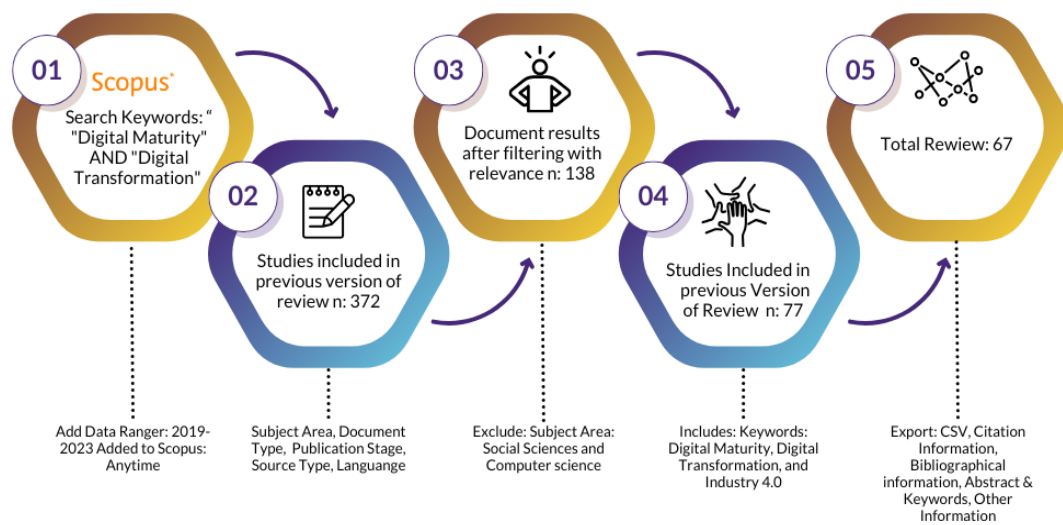

Figure 1. PRISMA flow diagram for identifying, screening, and including articles in the bibliometric review
Source: Authors' data processing, 2025

Figure 1 outlines the literature selection process using a modified PRISMA diagram. Initially, 372 documents were identified. After applying subject area filters for Social Sciences and Computer Science, 138 articles remained. Further refinement through keyword filtering related to digital maturity, digital transformation, and Industry 4.0 reduced the total to 77 articles. Finally, by limiting the publication period to January 1, 2014, through December 31, 2023, the dataset was narrowed down to 67 articles. This selection process follows PRISMA guidelines to ensure methodological transparency and replicability, thereby enhancing the reliability and credibility of the literature review.

The bibliometric analysis was conducted using VOSviewer software. Three visualization types were generated: network, overlay, and density maps. Two primary analytical approaches were used. The first is evaluative analysis, which includes examining publication trends, citation counts, geographical distribution, and identifying the ten most prolific authors. The second is relational analysis, which involves exploring keyword co-occurrence, co-authorship patterns, and co-citation relationships. Before mapping, keywords were cleaned manually and

with the VOSviewer thesaurus to eliminate term duplication. Clustering was performed using the full counting method and the association strength algorithm, with a minimum occurrence threshold of five instances. Cluster names were determined inductively, based on the dominant themes emerging within each group.

The resulting visualizations and cluster analyses provide insight into dominant research themes, emerging collaborations between scholars and institutions, and underexplored areas in the literature. These findings form the basis for identifying future research agendas in the domain of digital maturity and digital transformation.

4. Results and Discussion
4.1. General Information and Annual Publication Output

The search conducted through the Scopus database using the keywords "*Digital Maturity*" and "*Digital Transformation*" yielded 372 academic articles. Following a screening process based on the relevance of each article to the research focus, 67 articles were selected for further analysis. This selection was guided by criteria such as topic relevance, analytical depth, and contribution to advancing scholarly discourse in digital transformation and digital maturity. The selected publications generally offer substantive insights into key issues within these domains and were used as the basis for the bibliometric analysis presented in this study.

Figure 2 illustrates the publication trend related to digital maturity and digital transformation between 2019 and 2023. The graph demonstrates a steady increase in publication volume each year, highlighting the growing academic interest in the strategic dimensions of digital readiness and organizational transformation.
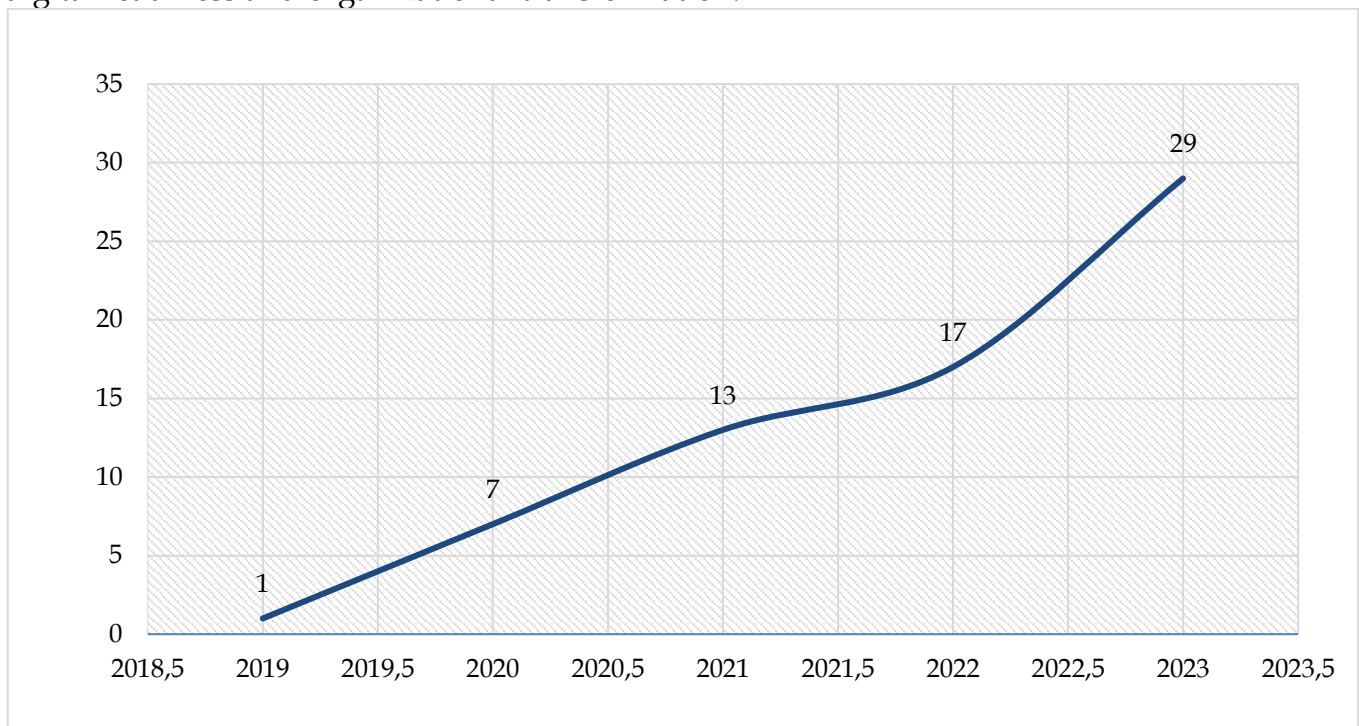

Figure 2. Trends in publications on Digital Maturity and Digital Transformation, 2019–2023
Source: Processed from Scopus by the authors, 2025

As shown in **Figure 2**, the number of publications addressing the relationship between digital maturity and digital transformation increased consistently from 2019 to 2023. This upward trend indicates a shift in research focus from purely technical aspects of digitalization to more strategic concerns, such as organizational readiness and capacity building. The post-

2020 surge in publications reflects how the COVID-19 pandemic acted as a catalyst for accelerated digital adoption across various sectors.

This pattern underscores the importance of digital maturity as a foundational component of successful digital transformation. It also opens up new research opportunities to explore how organizations manage transformation processes based on differing levels of digital maturity. The theoretical implications can be associated with perspectives such as dynamic capabilities, the Technology-Organization-Environment (TOE) framework, and institutional theory. These frameworks are useful for analyzing the interplay between internal resources, external pressures, and technology adoption across different industries.

Figure 3 presents the geographic distribution of publications on digital maturity and digital transformation from 2019 to 2023.
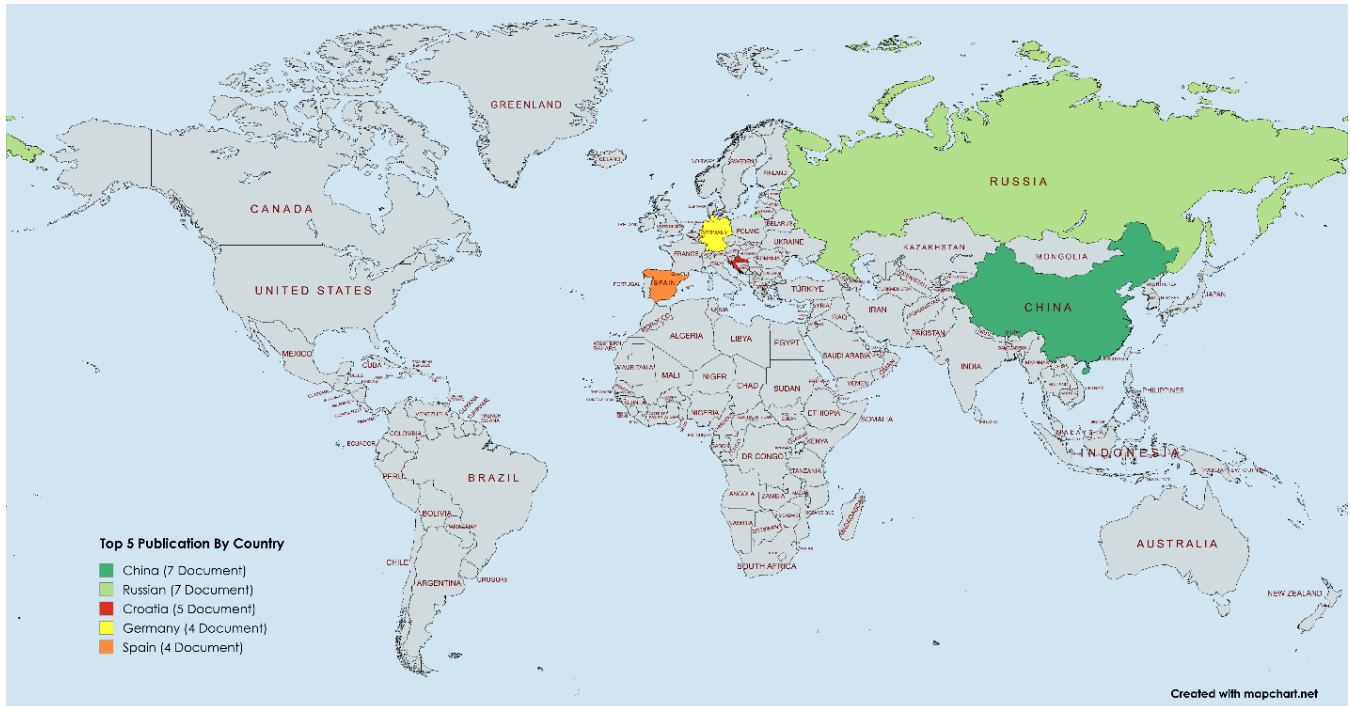

Figure 3. Leading contributing countries in Digital Maturity and Digital Transformation research, 2019–2023
Source: Processed from Scopus by the authors, 2025

Figure 3 shows that scholarly output on this topic has been dominated by five countries: China, Russia, Croatia, Germany, and Spain. China and Russia each produced seven articles, highlighting the influence of rapid technological development and strong national policies promoting digitalization. Croatia followed with five publications, reflecting increased research engagement from emerging economies in Eastern Europe, particularly in digital adoption among micro, small, and medium enterprises (MSMEs). Germany and Spain each contributed four publications, signaling a systematic approach to digital integration in industry and public administration.

It is worth noting that contributions from other developing countries, including Indonesia, remain relatively limited. Indonesia was not among the top five contributing countries throughout the study period. This indicates a gap in global academic participation and highlights the need to strengthen research capacity at the national level. Supporting national research policies and contextualizing global findings for domestic implementation can help

bridge this divide. These comparative insights offer a valuable foundation for shaping future national research agendas and policy interventions.

The most influential studies in this field are in **Table 1**, which lists the top-cited articles related to digital maturity and digital transformation.

Table 1. Most cited articles in Digital Maturity and Digital Transformation research

No	Document Title	Authors/Year	Source	Cited by	Journal Rank
1	Identifying digital transformation paths in the business model of SMEs during the COVID-19 pandemic	(Priyono et al., 2020)	Journal of Open Innovation: Technology, Market, and Complexity	389	Q1
2	Digital transformation during a lockdown	(Fletcher & Griffiths, 2020)	International Journal of Information Management	220	Q1
3	Development and Implementation of a Maturity Model of Digital Transformation	(Ifenthaler & Egloffstein, 2020)	TechTrends	81	Q1
4	Digital transformation initiatives in higher education institutions: A multivocal literature review	(Fernández et al., 2023)	Education and Information Technologies	49	Q1
5	Business Digital Maturity in Europe and Its Implication for Open Innovation	(Tutak & Brodny, 2022)	Journal of Open Innovation: Technology, Market, and Complexity	41	Q1

As shown in **Table 1**, the most frequently cited article is by Priyono et al., which explores pathways for digital transformation in the business models of SMEs during the COVID-19 pandemic (Priyono et al., 2020)The study identifies three distinct approaches shaped by each enterprise's contextual factors. First, SMEs with high levels of digital maturity responded to the pandemic by accelerating full-scale digitalization. Second, firms with liquidity constraints and low maturity levels tended to limit digitalization efforts to core functions such as sales. Third, SMEs with limited digital literacy but strong social capital addressed transformation challenges through partnerships with external actors possessing higher digital competencies.

The second most cited article, by Fletcher and Griffiths, examines the impact of the pandemic on organizational digital transformation (Fletcher & Griffiths, 2020). It highlights three key lessons: organizations must enhance their digital maturity to remain adaptable during periods of uncertainty; those with low digital maturity are more vulnerable to operational disruptions and instability; and firms with higher maturity are better equipped to adopt innovative strategies and ensure business continuity. Together, these studies affirm the pivotal role of digital maturity in fostering organizational resilience, particularly in times of crisis, and provide actionable insights for institutions seeking to enhance competitiveness through digital transformation.

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4.2. Network, Development Trends, and Research Density

This section presents a network and density analysis of research publications on the relationship between digital maturity and digital transformation from 2019 to 2023. The purpose of this network analysis is to identify keywords closely associated with the two central themes of the study.
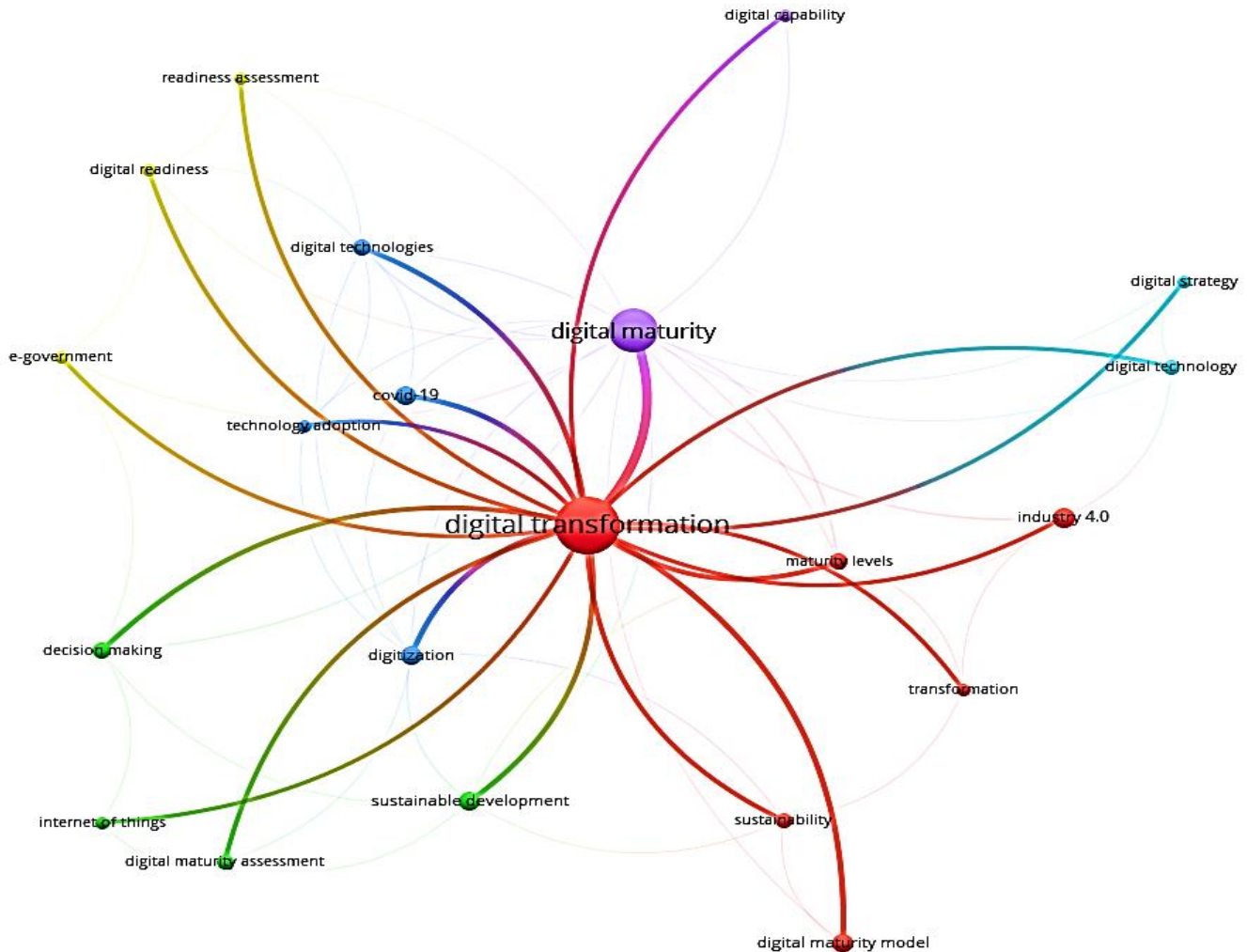

Figure 4. Keyword Network Mapping
Source: Author's data processing using VOSviewer

Figure 4 illustrates a complex network of interconnected concepts related to digital maturity and digital transformation. This diagram highlights the key nodes that represent the core terms explored in the study (Paños-Castro et al., 2024). Each node is connected to others based on the strength of their co-occurrence, as reflected by the thickness of the connecting lines (Ji et al., 2020). The size of each node indicates the frequency with which the term appears in the literature, with larger nodes signifying more prominent roles within the academic discourse. Notable keywords in this network include *Digital Transformation*, *Digital Maturity*, *Technology Adoption*, *Digitalization*, *Digital Maturity Model*, *Maturity Levels*, *Industry 4.0*, and *Sustainable Development*. These terms delineate the thematic focus and conceptual scope of recent research in the field.

The network is further classified into six thematic clusters, as summarized in **Table 2**.

Table 2. Cluster Analysis Results

Cluster	Item Themes
Cluster 1	Digital Maturity, Digital Transformation Model, Industry 4.0, Maturity Levels, Sustainability, Transformation
Cluster 2	Decision Making, Digital Maturity Assessment, Internet of Things, Sustainable Development
Cluster 3	COVID-19, Digital Technologies, Digitization, Technology Adoption
Cluster 4	Digital Readiness, E-Government, Readiness Assessment
Cluster 5	Digital Capability, Digital Maturity
Cluster 6	Digital Strategy, Digital Technology

As shown in **Table 2**, the cluster analysis organizes the major research themes into six categories, each representing different dimensions of digital maturity and transformation. Cluster 1 comprises foundational concepts such as *Digital Maturity*, *Digital Transformation Model*, *Industry 4.0*, *Maturity Levels*, and *Sustainability*. This cluster emphasizes that digital transformation involves not only technological integration but also the establishment of frameworks to assess digital maturity.

Cluster 2 underscores the role of data-driven decision-making supported by tools such as *Digital Maturity Assessment* and the *Internet of Things*, which facilitate real-time data acquisition. Cluster 3 focuses on accelerating digital technology adoption in response to the COVID-19 pandemic and its widespread effects on organizational digitization. Cluster 4 examines the public sector's digital readiness, particularly concerning implementing *E-Government* systems and readiness assessments. Cluster 5 connects *Digital Capability* with *Digital Maturity*, suggesting that an organization's technological competence significantly influences its maturity level (Westerman et al., 2015). Finally, Cluster 6 highlights the importance of Digital Strategy in ensuring that investments in digital technologies align with organizational objectives.
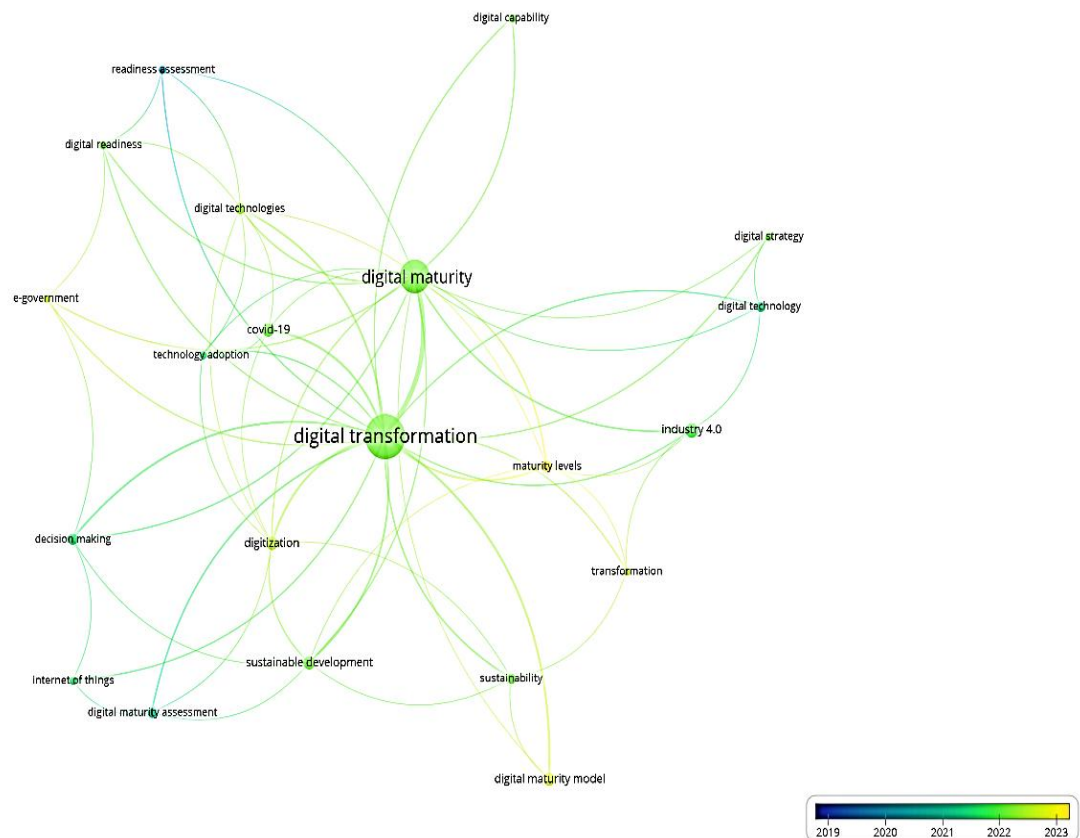
Figure 5. Research Development Trends in Digital Maturity and Digital Transformation, 2019–2023
Source: Author's data processing using VOSviewer

Figure 5 outlines the evolution of research themes between 2019 and 2023. In 2019, studies primarily focused on foundational topics such as *Digital Maturity Assessment*, *Readiness Assessment*, and *E-Government*, reflecting concerns about organizational and governmental preparedness for digital transformation. These early studies were mainly exploratory, aiming to understand the conditions required for successful digital adoption.

By 2020, research began concentrating more on technological dimensions, with increased attention to keywords such as *Digital Technologies*, *Technology Adoption*, and *Digital Readiness*. The onset of the COVID-19 pandemic acted as a catalyst, prompting rapid shifts in organizational strategies and reinforcing the need for adaptability and digital resilience.

In 2021, the research focus became more specific, highlighting themes such as *Industry 4.0*, *Digitalization*, *Maturity Levels*, and *Transformation*. Discussions around *Sustainable Development*, the *Internet of Things*, and *Decision Making* also emerged, reflecting an interest in how digital tools can improve operational efficiency and support informed decision-making.

From 2022 to 2023, the research landscape further evolved to emphasize the strategic links between digitalization and sustainability. Key terms such as *Sustainability*, *Digital Maturity Model*, and *Digital Strategy* became more prominent, indicating a growing interest in how digital transformation can contribute to long-term competitiveness and sustainable development. The emergence of *Digital Capability* and *Digital Technology* as core themes demonstrates a deeper exploration into how organizations integrate technology into their operational and strategic frameworks.

Overall, research trends from 2019 to 2023 show a shift from basic readiness assessments toward more advanced implementation strategies, emphasising sustainability, innovation, and data-driven decision-making. The increasing relevance of digital strategy, capability development, and transformative leadership reflects the broader movement toward comprehensive digital transformation across sectors.
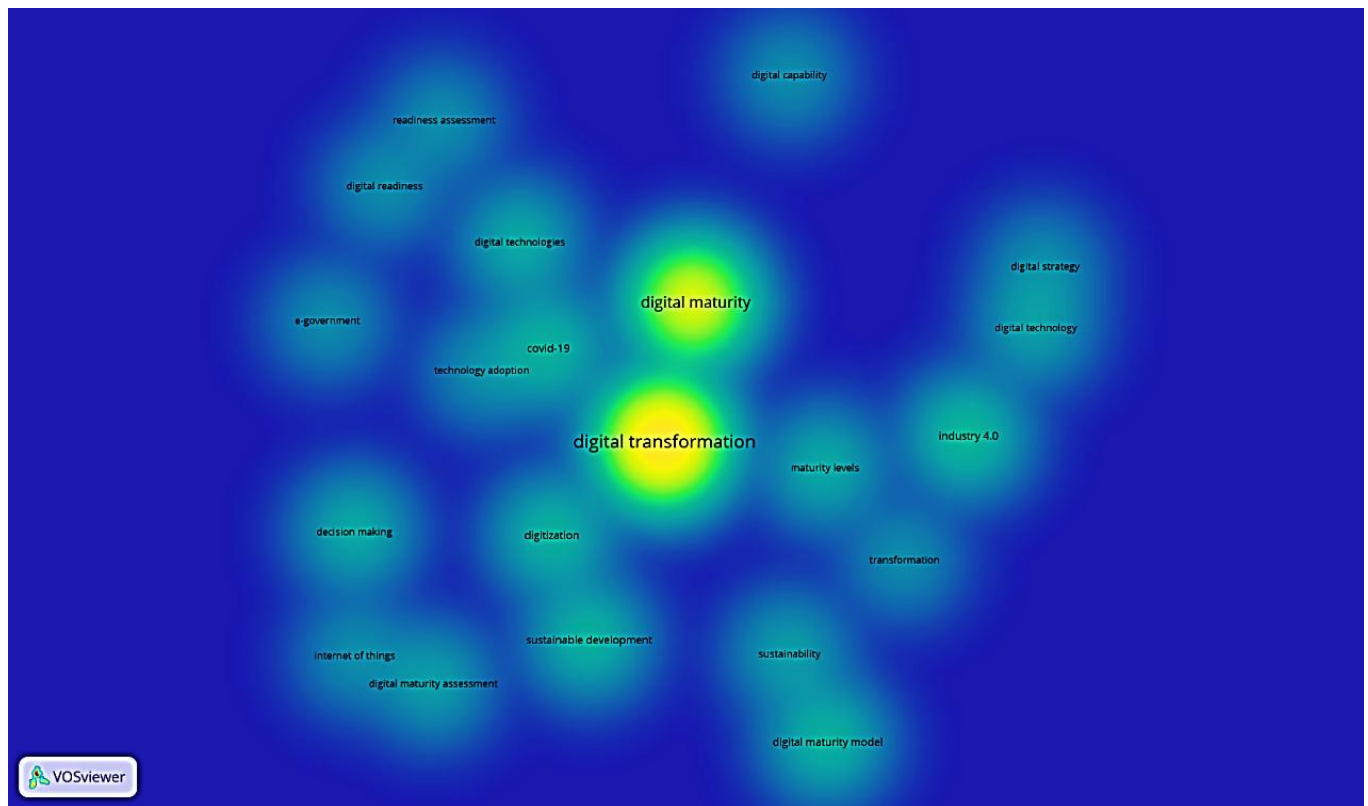

Figure 6. Research Agenda and Future Directions in Digital Maturity and Digital Transformation
Source: Author's data processing using VOSviewer

Figure 6 presents a density visualization that maps the frequency and co-occurrence of key terms in the literature. Yellow areas represent frequently discussed and strongly interconnected terms, while green and blue areas represent topics with lower occurrence levels or weaker conceptual ties.

Terms such as *Digital Transformation*, *Digital Maturity*, *Maturity Levels*, *Digitization*, *Industry 4.0*, and *Sustainable Development* dominate the central space in the visualization, indicating their role as central themes in the literature. In contrast, terms such as *E-Government*, *Digital Maturity Model*, *Sustainability*, *Internet of Things*, *Decision Making*, *Digital Capability*, *Digital Strategy*, *Transformation*, *Digital Readiness*, *Readiness Assessment*, and *Digitalization* appear at the periphery, suggesting underexplored areas that present opportunities for future inquiry.

The identification of these research gaps opens important avenues for future studies. For example, further exploration of digital maturity models and readiness assessments could support the development of more robust tools to evaluate organizational preparedness. Similarly, more research is needed on the role of digital strategy in driving sustainable innovation, and on how digital capabilities enable organizations to make effective, data-informed decisions.

These findings reinforce the role of digital maturity as a critical determinant of successful digital transformation. It encompasses the extent of technology adoption and strategic alignment, leadership, organizational culture, and governance. This is consistent with the Digital Capability Framework (Westerman et al., 2015), which includes four dimensions: technological capability, digital leadership, organizational culture, and governance mechanisms.

Organizations with higher levels of digital maturity are typically more capable of aligning transformation initiatives with long-term goals and driving sustainable innovation. Conversely, those with lower maturity levels often encounter significant obstacles, such as resistance to change, limited human capital, and inadequate infrastructure. Therefore, integrating digital maturity assessment models into strategic planning is essential for bridging the gap between readiness and successful implementation.

These insights offer theoretical and practical contributions. Academically, they highlight areas that warrant deeper investigation, such as the role of readiness assessment in digital transformation roadmaps and the integration of maturity frameworks with emerging technologies such as artificial intelligence, IoT, and cloud computing. Practically, they provide a basis for organizations to strengthen internal capabilities and formulate strategic responses that enhance digital competitiveness in increasingly dynamic environments.

5. Conclusion

This study affirms that digital maturity is pivotal in successfully implementing digital transformation. Organizations with higher levels of digital maturity are generally more capable of adopting new technologies, enhancing operational efficiency, and effectively leveraging digital innovations. Elements such as digital capability, strategic orientation, and organizational readiness further reinforce this relationship, while the advancement of Industry 4.0 and emerging digital technologies accelerates the transformation process.

Theoretically, this research contributes to a broader understanding of digital maturity, positioning it not merely as technological readiness but as a strategic determinant of long-term digital sustainability. The observed transition in research focus, from basic digital readiness toward more complex, integrated strategies, reflects the increasing emphasis on sustainability, innovation, and data-driven decision-making. This underscores the need for a holistic and multidimensional approach to digital transformation.

From a practical standpoint, the findings suggest several policy implications. These include the development of regulatory frameworks that promote accelerated digital transformation across sectors, the provision of technology adoption incentives for micro, small, and medium enterprises (MSMEs) and larger corporations, and expanding digital skills training programs across the workforce. Government bodies and industry associations can be essential in fostering a more inclusive and sustainable digital ecosystem.

This study also proposes a three-stage digital transformation framework, derived from bibliometric insights: (1) Digital Capability Development, which focuses on building internal digital infrastructure and enhancing organizational digital literacy; (2) Strategic Alignment, which involves formulating digital strategies aligned with sustainability objectives and adaptive business models; and (3) Data-Driven and Sustainable Transformation, which emphasizes evidence-based decision-making and the integration of sustainability principles across business processes. This framework may guide business leaders aiming to develop more focused, effective, and enduring digital strategies.

Despite the comprehensive insights provided, the primary limitation of this study lies in its reliance on bibliometric analysis, which does not capture empirical practices or outcomes in real-world settings. Future research should extend this work by incorporating empirical case studies across different sectors and by triangulating data from additional sources, such as Web of Science, IEEE Xplore, and industry-specific databases. Further investigation into the interplay between digital maturity, government policy, and business sustainability is also necessary to formulate transformation strategies that are not only innovative but also contextually relevant and actionable.

6. Acknowledgment

7. Declaration of Conflicting Interests

The authors have declared no potential conflicts of interest regarding this article's research, authorship, and/or publication.

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