

DIGITAL TRANSFORMATION AND SUSTAINABILITY: MAPPING RESEARCH GAPS AND THEMATIC CONNECTIONS

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Abstract

The intersection of digital transformation and sustainability is increasingly recognized as a critical area of research, but the academic literature remains fragmented and lacks integrative frameworks. A review of previous studies shows that while digital technologies such as AI, IoT and big data offer significant opportunities to advance sustainability goals, research has mainly focused on a few sectors and regions, with persistent gaps in standardized impact metrics, theoretical integration and attention to the environmental footprint of digital solutions. To address these limitations, this article applies Systematic Network Literature Analysis, combining systematic literature review with advanced bibliometric analysis using VOSviewer. Our process began with 357 articles identified in the Web of Science database using the keywords “digital transformation” and “sustainability”; after applying category and document-type filters, 68 articles published between 2016 and 2025 were selected for in-depth analysis. Our analysis empirically shows that, in addition to the central concepts of “digital transformation” and “sustainability,” the literature is grouped around subtopics from the fields of business and management: Technological Enablers (e.g., big data, industry 4.0), Innovation and Business Models (e.g., business model innovation), Performance and Impact (e.g., performance, challenges) and Sustainability Dimensions (e.g., environmental sustainability, circular economy). Co-occurrence and citation analyses not only confirm known sectoral and geographical imbalances but also provide new insights by quantifying the density and interconnections of key concepts and highlighting underexplored sectors such as healthcare, agriculture and education. This structured mapping advances the field by offering a visualized knowledge map and revealing actionable research gaps and emerging trends.

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JEL Classification: M1, M2, Q5, O33

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1. Introduction

The end of the last century marks the emergence and consolidation of two concepts, which extremely quickly became areas of major interest, even megatrends (Lichtenthaler, 2021): Digital Transformation (DT) and Sustainability (S). Even though the idea of DT has acquired considerable fame just lately, it goes back to the 90s. (de Souza, et al., 2020). At the same time, the concept of Sustainability was crystallized in one of humanity's most famous reports, the Brundtland Report, Our Common Future, dated 1987. The definition of sustainability presented in this document remains the most prevalent globally even today (Du Pisani, 2006; Fischer, et al., 2023).

In today's corporate and political landscape, digital transformation and sustainability are no longer optional, but have become strategic necessities. Technologies such as AI (Artificial Intelligence), IoT (Internet of Things) and Big Data are not just tools to increase operational efficiency, but are changing the way companies create and deliver value. At the same time, sustainability remains a guiding principle

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that aims to reconcile immediate economic needs with long-term environmental and social responsibility. Sustainability is emphasized at the highest level through global agendas such as the United Nations Sustainable Development Goals (UN SDGs). While these two areas are often treated separately, their overlap presents both opportunities and complexities that merit closer consideration. Digital technologies contribute to sustainability in multiple and tangible ways. For example, real-time monitoring through the Internet of Things (IoT) can help companies track energy consumption, while AI-driven analytics support smarter resource allocation. In practice, these tools have helped companies reduce emissions, minimize waste and engage stakeholders more effectively, although results often depend on context-specific implementation (Guandalini, 2022).

Businesses are exploring digital projects such as data analytics, IoT and AI to reduce resource consumption and enhance sustainability, benefiting both the sector and society (Martínez-Peláez et al., 2023). Aligning digital transformation with sustainability, also known as 'digital sustainability,' is encouraged by leaders to achieve competitive advantage and resilience, but is challenging when it comes to balancing innovation with triple bottom line (TBL) outcomes.

Despite the convergence between DT and S, the academic literature on their intersection remains emerging and fragmented. Scholars have only recently begun to systematically examine how digital transformation can help improve sustainability. For example, Guandalini (2022) conducted a review of 153 studies, identified thematic connections between digitalization and sustainability efforts, and pointed out numerous research gaps in this growing field. Similarly, a critical review by Ologeanu-Taddei et al. (2025) found that there has been no comprehensive analysis of the relationship between these two intertwined concepts, making it difficult to develop a clear understanding of 'digital sustainability' and its implications. Their analysis of 91 relevant articles found that only a small subset explicitly linked DT to sustainability outcomes, highlighting the conceptual ambiguities and the need for an integrative research framework. Given these gaps, scholars have called for more rigorous approaches to map the intellectual structure of this overlap and identify how disparate topics are connected.

This study uses Systematic Network Literature Analysis (SNLA) to map knowledge domains by combining a systematic literature review with a bibliometric network analysis in the same with VOSviewer. The authors focus primarily on examining how digital transformation and sustainability are being researched in the fields of business and management, where these ideas are increasingly seen as key strategic priorities. SNLA surpasses traditional content analysis by employing network-based tools such as co-citation and keyword co-occurrence analysis to identify thematic clusters and development paths (Khitous et al., 2020). We systematically analyze the research on DT and S and identify the thematic structure and under-researched areas. The paper is organized as follows: Section 2 reviews the literature on DT and S and summarizes the main themes and gaps. Section 3 describes the SNLA methodology and data collection. Section 4 presents the results of the network analysis, thematic connections, findings, implications and future research opportunities, followed by conclusions.

2. Literature review

The convergence of digital transformation and sustainability is an area of expanding research as the need for technology to be aligned with environmental, social and economic goals has been recognized. This review delves into the connection between digital transformation and sustainability, highlighting major themes and identifying gaps in the research. Digital technologies present avenues to meet sustainability goals, including the SDGs, but there are still challenges in ensuring that digital initiatives are aligned with sustainability aims. Four principal themes emerged: strategies for digitalization, industry-specific applications, organizational factors and the role of technology (Guandalini, 2022).

Although scholarly interest is rising, research often falls short in addressing tensions between digital efficiency and long-term sustainability and in providing frameworks that adapt to diverse sectoral and regional contexts. A recurring theme in the literature is that digital transformation holds substantial potential for promoting sustainability. For instance, Garg and Kumar's (2024) bibliometric analysis in the banking sector illustrates how digital tools (AI, blockchain, big data) support environmental, social and economic sustainability. Similarly, Del Río Castro et al. (2021) highlight the overlap of digitalization and sustainability in achieving the SDGs, advocating for a comprehensive approach that

integrates both fields. Martínez-Peláez et al. (2023) stress the necessity of aligning digital transformation strategies with sustainability goals through stakeholder engagement and organizational capabilities. Their conclusions indicate that the mere adoption of technology isn't enough; achieving success requires proper governance, stakeholder participation and the cultivation of essential capabilities. Ologeanu-Taddei et al. (2025) further investigate organizational tensions and harmonies, finding that a significant challenge is balancing efficiency-focused digital goals with long-term sustainability. Briatore (2025) reveal the role of DT in advancing sustainable practices in supply chains.

Research indicates that maturity levels vary across different industries. The banking and manufacturing sectors have garnered significant focus, benefitting from digital tools that facilitate financial inclusion and efficient resource use, respectively (Garg & Kumar, 2024; Guandalini, 2022). Meanwhile, smart cities offer a promising yet intricate scenario by employing IoT and data analytics to enhance urban sustainability.

Despite this potential, challenges like digital inequality and privacy issues persist (Guandalini, 2022). Technologies such as IoT, digital twins and AI play a crucial role in promoting sustainability, with IoT enabling real-time monitoring of resources, digital twins aiding in lifecycle management and circular economy initiatives and AI improving decision-making in sustainability conflicts (Guandalini, 2022; Martínez-Peláez et al., 2023). However, these technologies themselves pose emerging environmental concerns. Although academic interest in digital sustainability has grown, the field still lacks a unified theoretical foundation. Much of the current literature either treats digital transformation and sustainability as parallel issues or applies theories developed for one domain to explain the other. Few studies attempt to build integrated models that account for the complex, reciprocal dynamics between technological innovation and sustainable development goals, as noted by Guandalini (2022) and Ologeanu-Taddei et al. (2025).

The notion of "digital sustainability" is yet to be clearly defined and often applied inconsistently, hindering clear theory development and practical guidance. There is a notable absence of standardized, effective metrics for evaluating the triple bottom line effects of digital transformation efforts. Garg and Kumar (2024) highlight the necessity for tools that capture both short and long-term impacts on environmental, social and economic fronts. Current studies predominantly rely on qualitative case studies with limited longitudinal or quantitative analyses to substantiate findings.

Though the link between digital transformation and sustainability is acknowledged, the tensions—like conflicts between efficiency and social equity or the environmental impact of digital infrastructure—remain unexplored. Ologeanu-Taddei et al. (2025) emphasize the need for more research to understand how organizations can manage these competing demands through governance and change management. Research is mainly concentrated in certain sectors and regions, with banking, manufacturing and urban development frequently studied, while fields such as agriculture, healthcare and education are less examined (Del Río Castro et al., 2021). A total of 130 articles were analyzed in a study conducted by Abdullah et al. (2024). The main conclusion of the article is that digital transformation has a significant positive impact on sustainable business performance, encompassing social, environmental and economic aspects. Furthermore, most research is centered on developed economies, leaving a knowledge gap regarding digital sustainability in developing countries that face different technological and sustainability challenges. A growing yet underdeveloped area involves the sustainability of digital technologies themselves. Factors like the environmental cost of data centers, e-waste and the energy usage of AI and IoT often go unconsidered in discussions of digital sustainability, constituting a significant oversight.

The existing literature points to a promising yet intricate connection between digital transformation and sustainability, featuring various thematic links across strategy, technology and sector-specific applications. Despite this, considerable research gaps persist, notably in developing integrated theoretical frameworks, standardized impact metrics and balanced approaches to manage synergies and tensions. Expanding research to cover neglected sectors and regions and addressing the environmental impact of digital technologies are crucial next steps. Connecting these gaps will not only enrich academic discourse but also support organizations in making more informed and responsible digitalization decisions, especially in underserved regions and industries.

3. Methodology

The SNLA's selection criteria were crafted to guarantee that pertinent studies were incorporated, aligning with the research goals and concentrating on perceptions of digital transformation and sustainability. These criteria were employed through a multi-phase process, as outlined here:

- **Relevance of keywords:** in the first stage, studies using the search terms "digital transformation and sustainability" were identified in the Web of Science database. This first criterion ensured that only articles explicitly addressing both concepts were considered, resulting in 357 papers.
- **Web of Science categories:** in the second stage, a filter was applied to narrow the results to specific Web of Science categories relevant to the research objectives, namely business and management. This criterion excluded studies from unrelated fields and ensured that the selected articles were contextually appropriate for the research focus, with the result 90 articles.
- **Document type and relevance:** in the third stage, we used a "quick filter" to further narrow down the selection and find articles that matched the research objectives. In this step, we only selected articles and eventually found 68 documents.

Other implicit criteria were as follows:

- **Publication period:** only articles published between 2016 and 2025 were considered to capture the full range of relevant publications in the Web of Science database during this period.
- **Language:** only articles published in English were considered to ensure accessibility and consistency of the analysis.
- **Availability of sources:** the search was limited to online sources indexed in the Web of Science database to ensure access to peer-reviewed, high-quality academic papers.

Together, these criteria ensured that the final selection of 68 studies was relevant to the research topic and suitable for a detailed analysis as part of the systematic review of the literature.

The aim of this study is to gain a comprehensive understanding of the research landscape at the intersection of sustainability and digital transformation in Business and Management, aiming to identify key research patterns and trends. Consequently, the authors attempt to address the following research questions as part of the study:

RQ1: What are the major themes and emerging sub-themes in the scientific literature on digital transformation and sustainability?

RQ2: What other keywords are associated with digital transformation and sustainability?

RQ3: How are the concepts of digital transformation and sustainability interconnected in the literature?

RQ4: What is the geographical distribution of the origin of the articles?

RQ5: What are the most cited articles?

RQ6: What gaps are there in current research at the intersection of digital transformation and sustainability?

This study intends to enhance comprehension of how digital transformation fosters sustainability in the realms of business and management literature by methodically employing the SNLA methodology and directly tackling the specified research questions. The findings from this structured analysis will provide crucial insights for upcoming research, policy development and managerial strategies, focusing on leveraging digital technologies to attain sustainable results.

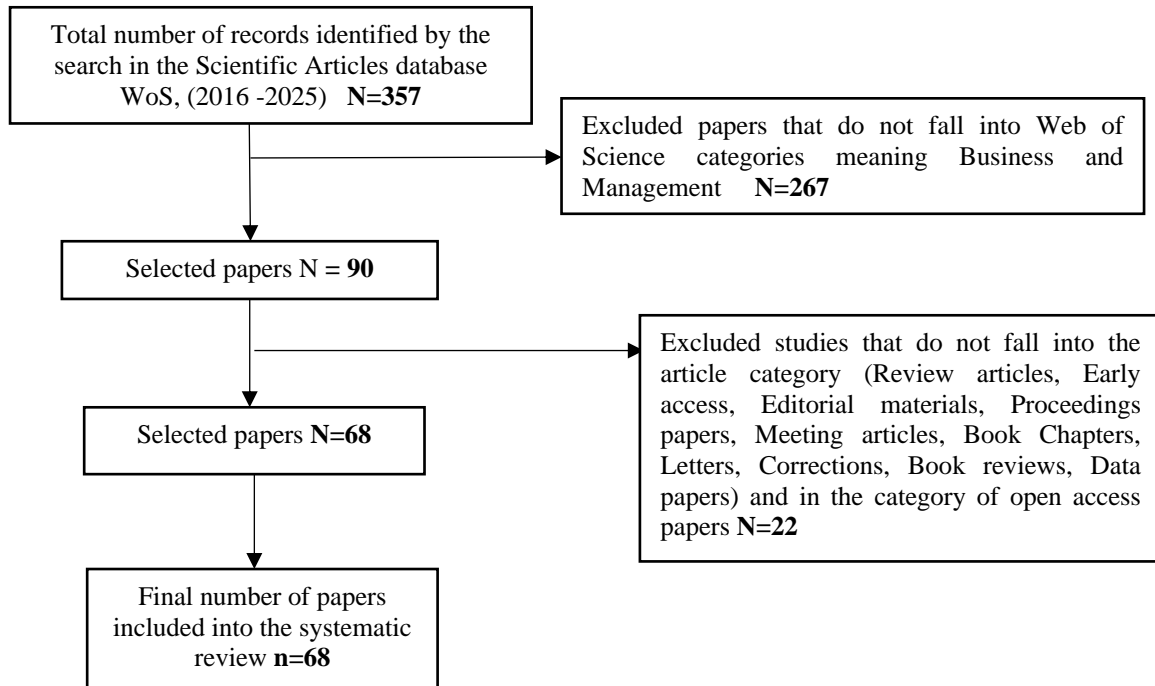


Figure 1. The systematic review process diagram

Source: Authors' own research

4. Results

In order to map the landscape at the intersection of DT and S and test the research questions, we conducted a keyword co-occurrence analysis using VOSviewer. The results provide a comprehensive overview of the thematic clusters, keyword density and conceptual relationships in the recent literature.

RQ1: What are the major themes and emerging sub-themes in the scientific literature on digital transformation and sustainability?

The images we created (Figures 2 and 4) show that the academic literature on digital transformation and sustainability is organized around several important thematic clusters. The most co- occurring keywords are “digital transformation” and “sustainability”, showing their important role in the research field. The following subtopics emerge around these core terms:

- Technological Enablers: Keywords such as “big data”, “big data analytics”, “industry 4.0” and “dynamic capabilities” highlight the technological drivers of digital transformation in the context of sustainability.
- Innovation and Business Models: Terms like “innovation”, “business model innovation” and “transformation” signal a strong focus on how digitalization fosters new business models and organizational change.
- Performance and Impact: The presence of “performance”, “impact” and “challenges” reflects ongoing research into the outcomes and barriers associated with integrating digital and sustainable practices.
- Sustainability Dimensions: Keywords such as “environmental sustainability” and “circular economy” indicate a growing emphasis on specific sustainability outcomes and frameworks.

The identified keyword clusters point to a diverse but interrelated body of research. Notably, themes related to technology, innovation and organizational change frequently overlap, suggesting that scholars are increasingly recognizing the need to examine digital transformation and sustainability in tandem. These interconnections also provide a foundation for understanding where conceptual bridges have already been built — and where gaps remain.

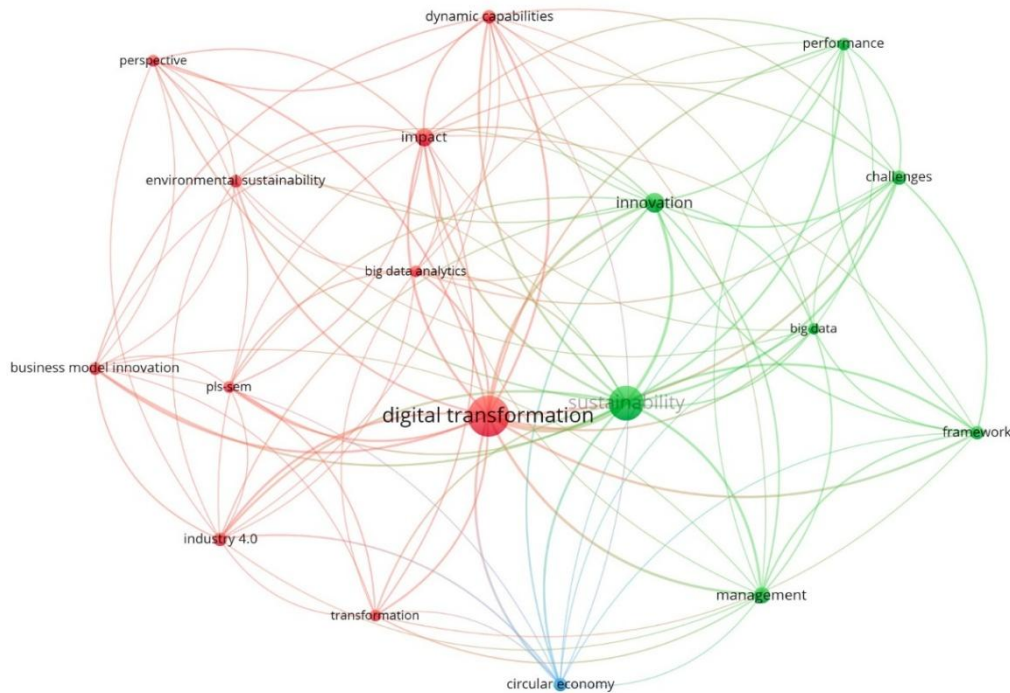


Figure 2. Network visualization of keyword co-occurrence in digital transformation and sustainability literature (VOSviewer, 2016–2025)

Source: Authors' own analysis using VOSviewer and Web of Science dataset (n=68 articles)

RQ2: Associated Keywords and Research Density

Figure 3 presents a density visualization that highlights the concentration of research activity. The most illuminated sections, focused on digital transformation and sustainability, reveal the highest frequency of keyword co-occurrence, confirming their importance. Surrounding these are other high-density nodes like innovation, big data analytics and environmental sustainability, indicating that these topics attract significant academic focus. The visualization also reveals areas with lower density, such as framework, management and circular economy, which could signify emerging or relatively unexplored sub-themes within the discipline.

These visualisations offer significant proof that the literature surrounding DT and S is both thematically extensive and interconnected. RQ1 and RQ2 are supported by the central role of DT and S, surrounded by clusters of keywords related to technology, management and performance. The presence of keywords such as 'innovation' and 'impact' reveals conceptual connections between the digital and sustainable fields, while the density map emphasises both well-established and newly emerging research areas. By visually representing these relationships, our analysis not only highlights the primary research patterns and trends, but also establishes a foundation for recognising research gaps and potential future avenues.

RQ3: Interconnections Between Digital Transformation and Sustainability

The colour-coded cluster visualisation (Figure 2) provides insight into how DT and S are conceptually linked in the literature. The red cluster, anchored by DT and the green cluster, centred on S, are interconnected through shared keywords such as impact, innovation and circular economy. These bridging terms illustrate the multidimensional relationship between digital and sustainable initiatives, highlighting both synergies and points of integration. This network structure suggests that research at the intersection of digital transformation and sustainability is characterised by strong thematic interlinkages, with certain keywords acting as conceptual bridges between technological advancement and sustainability outcomes.

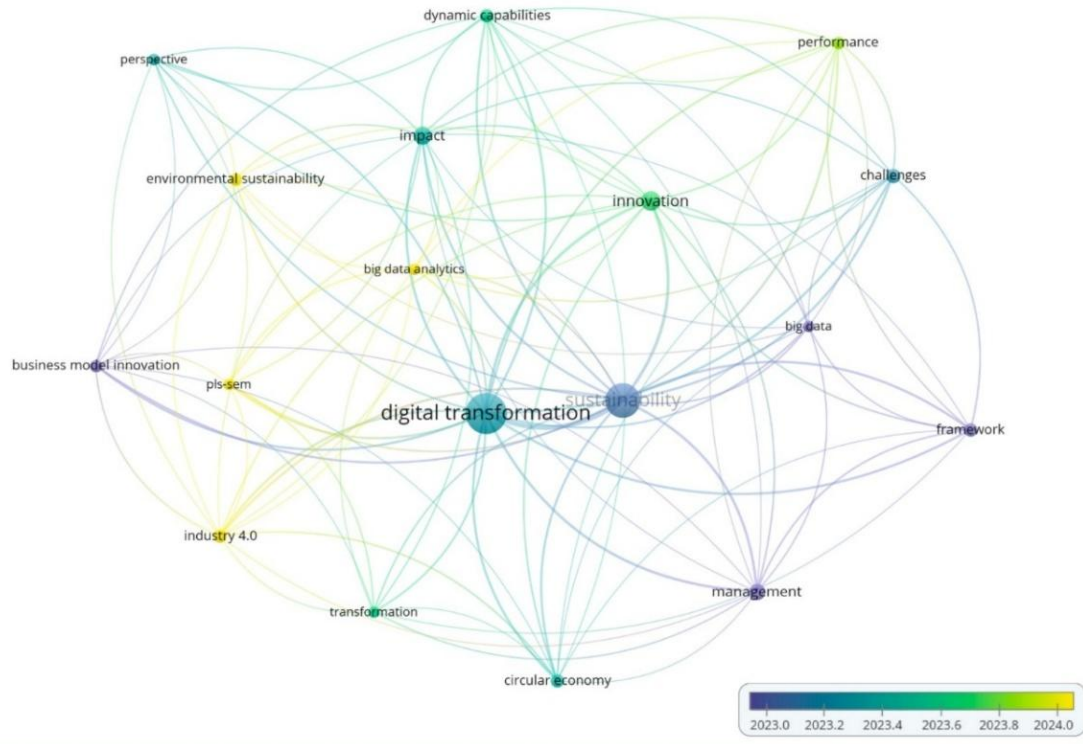


Figure 3. Clustered network visualization showing thematic groupings and interconnections
Source: Authors' own analysis using VOSviewer and Web of Science dataset (n=68 articles)

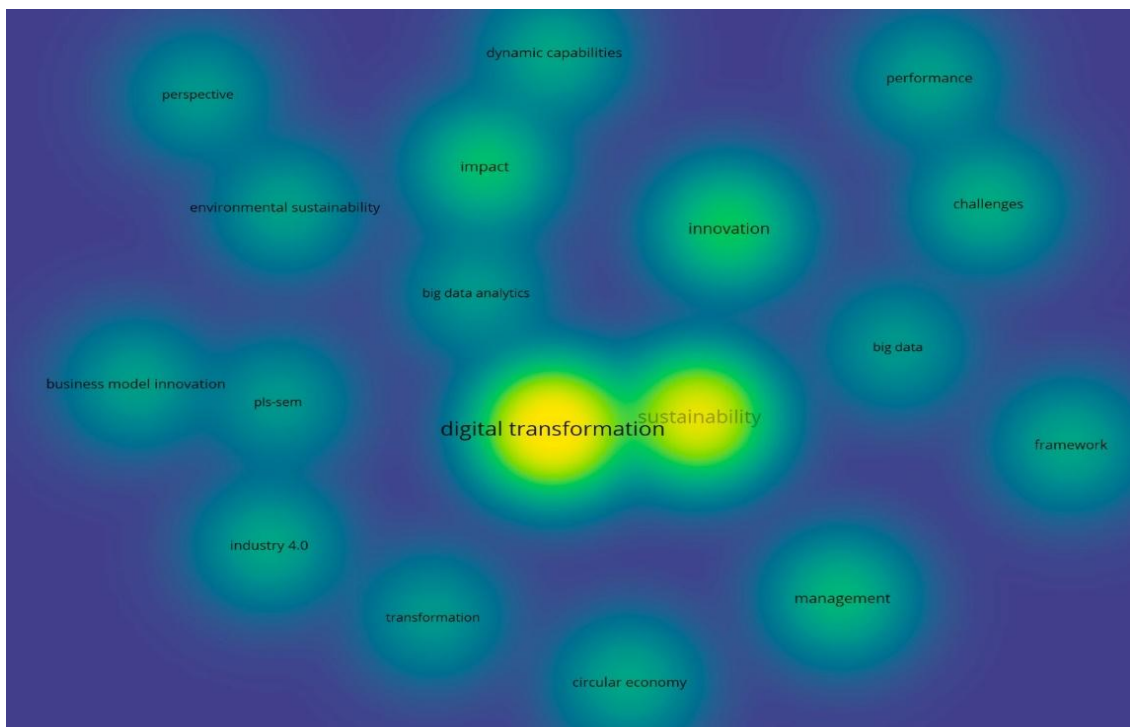


Figure 4. Density visualization of keyword co-occurrence, highlighting research hotspots
Source: Authors' own analysis using VOSviewer and Web of Science dataset (n=68 articles)

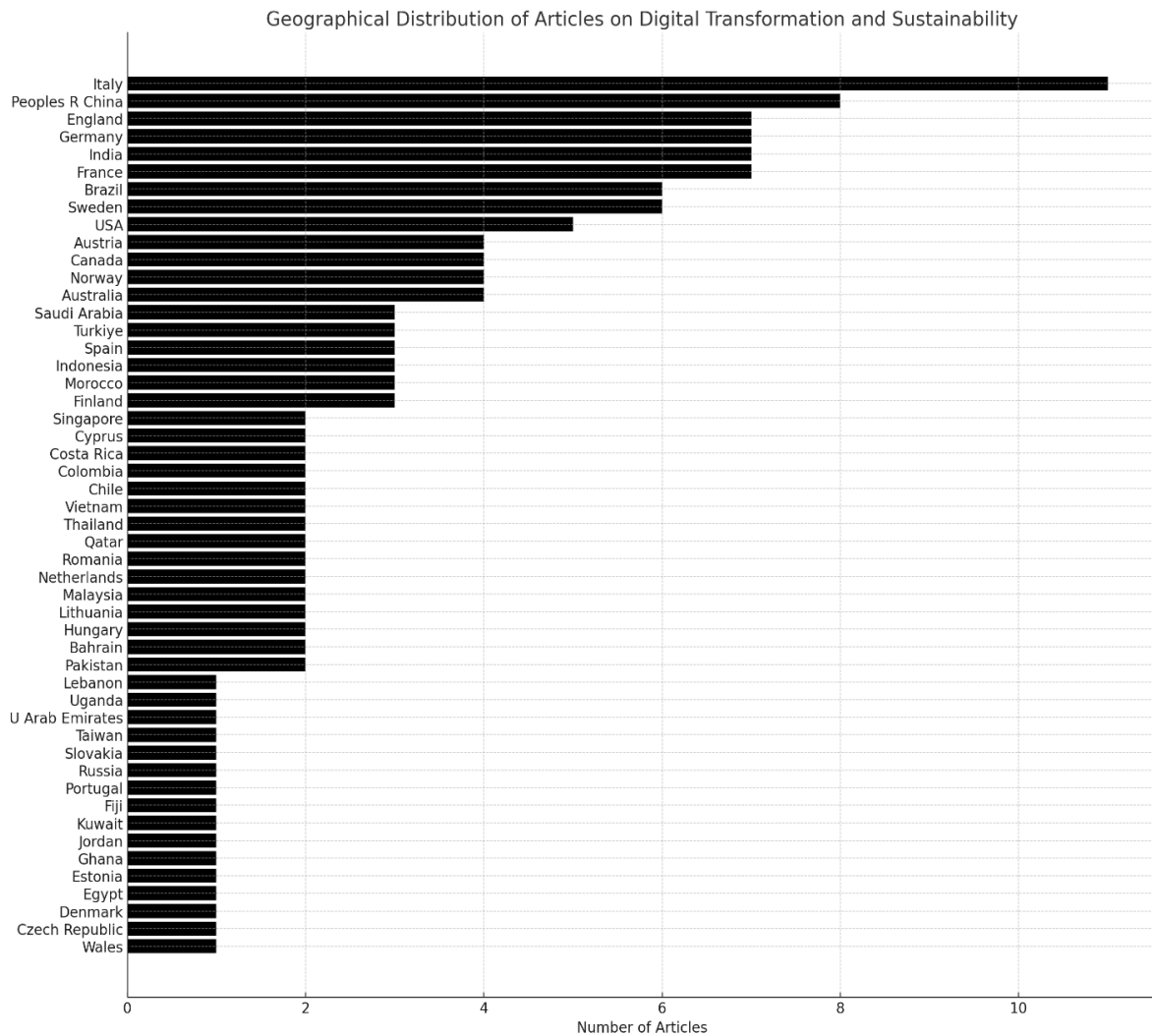


Figure 5. Geographical Distribution Analysis

Source: Authors' own analysis using Web of Science dataset (n=68 articles)

RQ4: Geographical Distribution Analysis

Figure 5 clearly shows the geographical distribution of items across DT and S. This bar chart reveals several important patterns such as:

- **European dominance:** Italy stands as the clear leader with the highest number of publications (about 11 articles), followed by significant contributions from other European countries, including England, Germany, France and Sweden. This shows that Europe is the most important hub for research on this intersection.
- **Asian representation:** China (labeled as "People's Republic of China") has a strong research output and ranks second overall. India also makes a considerable contribution and ranks fifth worldwide. This indicates a significant Asian commitment to these topics.
- **America's contribution:** The USA, Brazil and Canada are among the ten largest contributors, with Brazil ranking well ahead of the USA. This indicates a strong Latin American interest in sustainability-oriented research on digital transformation.
- **Global reach:** The visualization shows that more than 40 countries contribute to this research area, covering all inhabited continents. While interest spans all continents, the concentration of research on Europe and selected Asian countries indicates a possible geographical bias in the literature, while Africa and parts of Latin America are only represented to a limited extent.

- Developing-nation participation: Several developing economies appear in the dataset, including Morocco, Indonesia, Malaysia and various Middle Eastern nations, although their publication counts remain relatively low compared to European leaders.

This geographical analysis supports RQ4, according to which DT and S research reflects different global patterns, with European institutions leading the research effort, but also significant participation from emerging economies, particularly in Asia.

RQ5: What are the most cited articles?

In order to identify the most referenced articles, it is important to assess the development of research in this area.

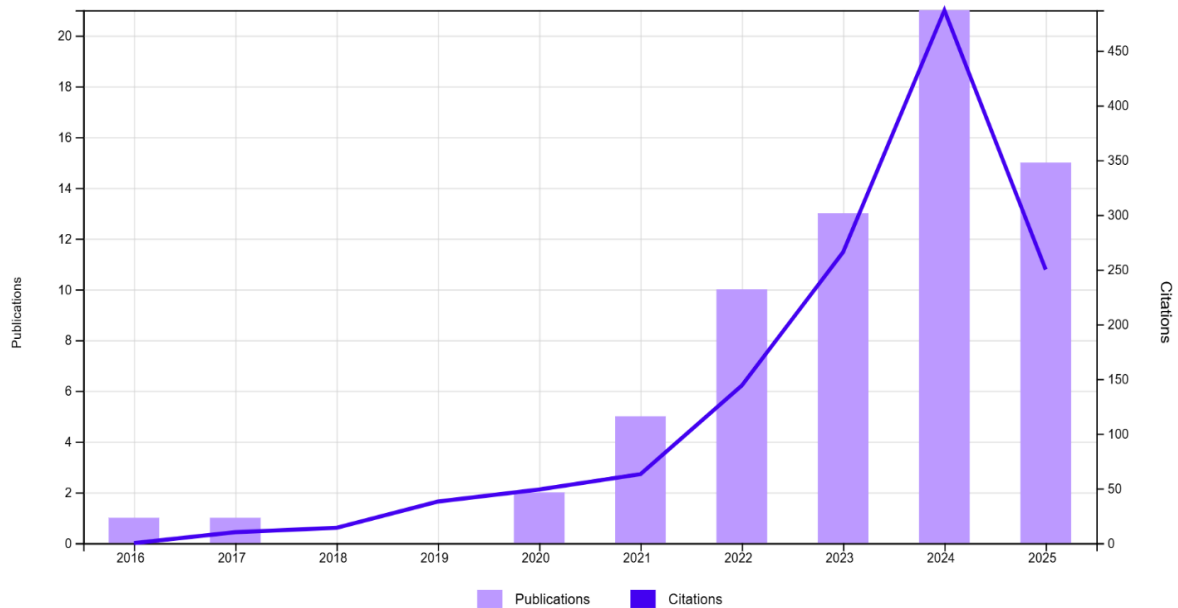


Figure 6. Times Cited and Publications Over Time (N=68 articles)

Source: Author's own research

Figure 6 illustrates the timeline and citation trends for these 68 articles:

- Publication Growth Trajectory: The bar chart shows a steady increase in the number of publications, starting at around 1 in 2016 and rising to around 15 in 2025 (April – first trimester), with a notable acceleration between 2020 and 2024. This shows that scholarship is increasingly focused on this area.
- Citation Patterns: The blue line indicating citations reveals an exponential increase from 2018 to 2024, reaching a peak of around 487 citations in 2024. In 2025 (April), just the first trimester of the year, the number of citations was 269, more than half of 2024. This trend suggests that recent publications are shaping the scientific discussion and that interest in them may be increasing.

The Web of Science search results reveal two highly cited papers that have significantly influenced the field (Figure 7).

The first paper, "A framework of digital technologies for the circular economy: Digital functions and mechanisms" by Liu, Trevisan, Yang and Mascarenhas (2022), published in *Business Strategy and the Environment*, stands out as one of the most influential works in the field. It systematically identifies the digital technologies that drive circular economy practices, detailing specific digital functions and mechanisms enabling more sustainable production and consumption patterns. With an impressive citation count of 141 citations (averaging 35.25 citations per year), this article has substantially impacted subsequent research, highlighting its crucial role in advancing our understanding of digital sustainability.

Expanding on this essential research, the second significant article by Sjödin, Parida and Kohtamäki (2023), titled "Artificial intelligence enabling circular business model innovation in digital

servitization," appeared in Technological Forecasting and Social Change. It explores the transformative role of artificial intelligence (AI) in enabling innovative circular business models within digital servitization contexts. The authors conceptualize how dynamic capabilities, AI capacities and sustainable business models intersect, providing a comprehensive framework to explain how digital technologies can effectively lead to sustainable outcomes. Gathering significant attention with 76 citations (25.33 citations per year), this article underscores the growing recognition of AI's pivotal role in achieving sustainability goals through innovative business practices.

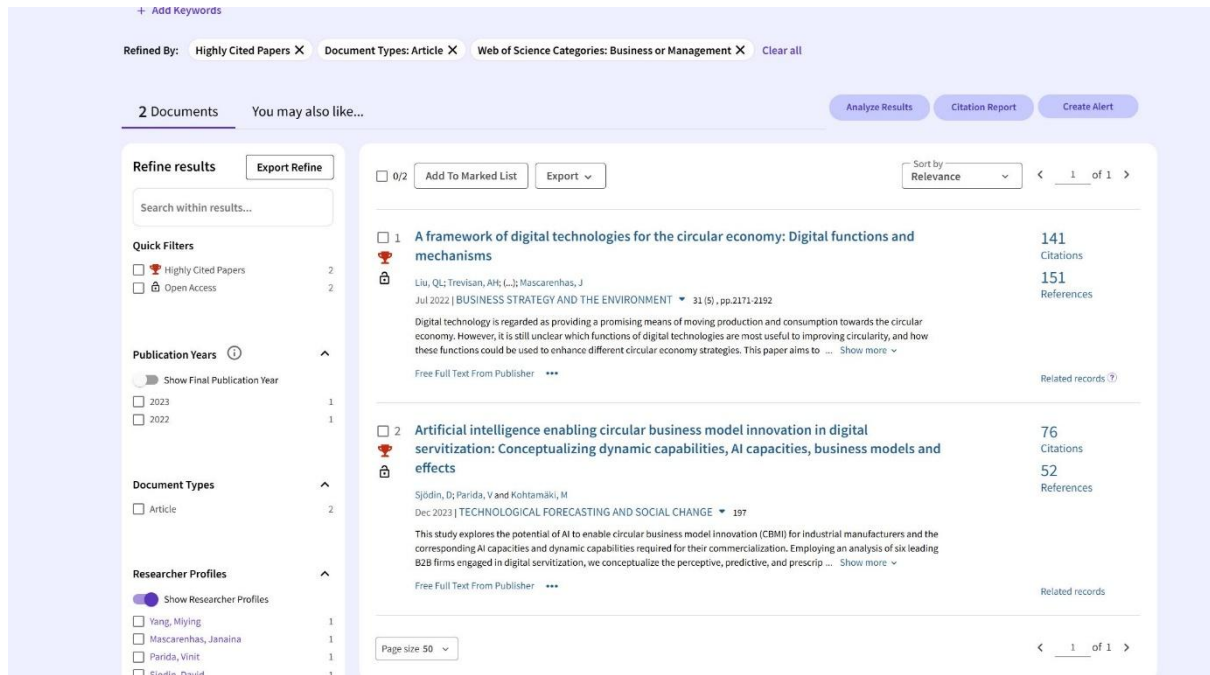


Figure 7. Highly cited papers – print screen Web of Science

Source: Author's own research

Clarivate's Citation Topics are divided into three levels - macro, meso and micro - so that the user can select the desired level of detail for analysis. Using CWTS and ISI, a hierarchy of 10 macro topics, 326 meso topics and 2,444 micro topics has been created. InCites users can navigate from general macro-topics to specific micro-topics for analysis at each level. ISI was used to label macro and meso categories based on their content, while an algorithmic tool labeled the micro-topics by identifying the most important keyword based on their high volume. In this way, InCites users can perform detailed analyses of research outputs from researchers, organizations, countries/regions and funding agencies (Potter, 2020).

Table 1. Citation Topics for highly cited papers

	Citation Topics	
	Fields	% of 2
Meso	6.115 Sustainability Science	50%
	6.3 Management	50%
Micro	6.115.1554 Circular Economy	50%
	6.3.2135 Sharing Economy	50%

Source: Authors' own analysis using Web of Science datasheets (n=2 articles)

Meso-level research is particularly valuable for investigating the link between digital transformation and sustainability and focuses on the collaboration between organizations, business ecosystems and

value chains. This level is critical for understanding how innovation and sustainable practices spread across organizations and industries, beyond individual or global perspectives (Schroder, 2024).

Table 1 reveals that these highly cited works are related to important topics:

a. Meso topics

Table 1 illustrates the citation topics at the meso level and shows intermediate thematic clusters within the hierarchical framework of the Web of Science. In our dataset on Digital Transformation (DT) and Sustainability (S), two primary meso-topics come to the forefront, each covering around 50% of scientific publications: one associated with Sustainability Science (6.115) and the other with Digital Innovation and Transformation (6.3). This distribution underlines the fact that academic work is primarily focused on these two interconnected yet distinct research areas. The strong citation links between these meso-topics indicate a lively interdisciplinary communication, where sustainability issues are increasingly linked to digital transformation approaches. This connection supports the idea that digital transformation and sustainability are mutually reinforcing topics in the context of business and management research. Nevertheless, the data also reveals thematic gaps: While sustainability science and digital innovation are leading, other potentially relevant meso-topics - such as governance, social justice or sector-specific applications - are underrepresented. This observation points to possible avenues for future research addressing these less explored areas to gain a more comprehensive understanding of how digital transformation can comprehensively advance sustainability goals.

b. Micro topics

Table 1 illustrates the categorization of citation topics at the micro level and provides an in-depth thematic analysis within the hierarchy of Web of Science Citation Topics. This micro-level categorization divides the broader meso-topics into specific research clusters, allowing for the identification of specific subfields and emerging niches at the intersection of digital transformation and sustainability. In this analysis, important micro-topics such as 6.115.1554 Circular Economy and 6.3.2135 Sharing Economy are notable, each accounting for around 50% of the documents. The noticeable focus on the Circular Economy micro topic underscores a strong academic interest in how digital technologies can enhance resource efficiency, minimize waste and support closed-loop business models. The Sharing Economy microtopic showcases research on digital platforms and AI-driven advances that promote sustainable consumption and collaborative economic practices. This comprehensive insight at the micro level shows how broad topics identified at the meso level are being implemented in specific research areas. The clustering of highly cited papers within these micro topics indicates that significant work centers on practical applications of digital transformation to achieve sustainability objectives, particularly through circular and sharing economy models. This micro-level insight highlights emerging research niches — particularly in the circular and sharing economy — and provides guidance for studies aiming to link technological innovation to sustainable business outcomes.

The diagram below (Figure 8) provides crucial insights into the disciplinary composition of research in this field:

- **Business and Management Dominance:** The visualization clearly shows that Business (44 publications) and Management (44 publications) account for the majority of research output, indicating this intersection primarily interests business scholars.
- **Environmental Studies Representation:** Environmental Studies (8 publications) forms the third largest disciplinary group, though significantly smaller than the business/management clusters. This suggests potential imbalance in how sustainability is conceptualized.
- **Limited Technical Perspective:** Engineering (5), Computer Science/Information Systems (3) and Telecommunications (2) show relatively limited representation despite being crucial to digital transformation implementation.
- **Minimal Economic Analysis:** Economics (3) and Business Finance (2) show limited engagement, suggesting potential gaps in understanding economic dimensions of sustainable digital transformation.



Figure 8. Times Cited and Publications Over Time

Source: Author's own research (n=68 articles)

RQ6: What gaps are there in current research at the intersection of digital transformation and sustainability?

Figure 9 illustrates the distribution of the 68 analyzed articles according to their alignment with their UN SDGs. The most frequently addressed SDG is Goal 9: Industry, Innovation and Infrastructure, with 46 articles (approx. 68%), emphasizing the strong research focus on how digital transformation supports industrial development, infrastructure modernization and technological advancement.

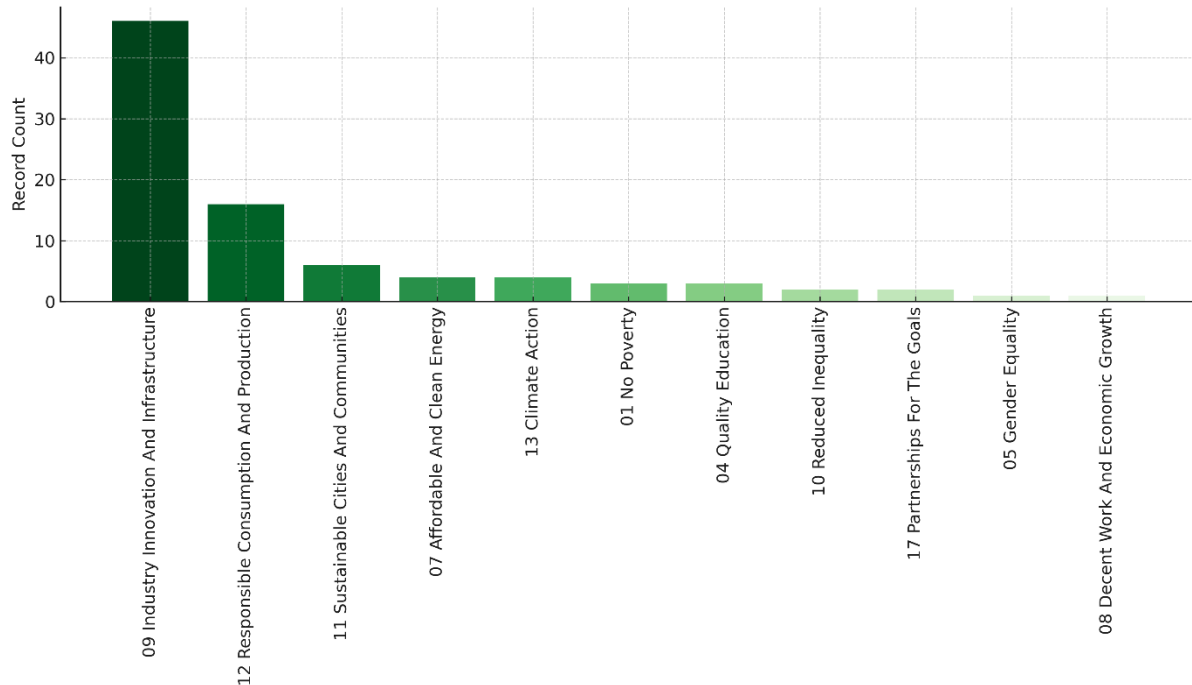


Figure 9. Distribution of Articles by Sustainable Development Goal (SDG)

Source: Author's own research (n=68 articles)

The next goals are:

- Goal 12: Responsible Consumption and Production is the second most represented (16 articles), reflecting interest in the role of digital tools—such as big data, IoT and AI—in improving resource

efficiency, enabling circular economy strategies and reducing environmental impact. Other moderately represented goals include

- Goal 11: Sustainable Cities and Communities (6 articles) and Goal 7: Affordable and Clean Energy (4 articles), suggesting a growing but still limited exploration of digital solutions in urban planning and renewable energy systems.
- Several goals—such as Goal 13: Climate Action, Goal 1: No Poverty, Goal 4: Quality Education, Goal 10: Reduced Inequality, Goal 17: Partnerships for the Goals, Goal 5: Gender Equality and Goal 8: Decent Work and Economic Growth—are addressed only marginally (1–4 articles), indicating that the social, educational and inclusive dimensions of sustainability remain underexplored in the context of digital transformation.

Importantly, seven SDGs are entirely absent from the literature analyzed:

- Goal 2: Zero Hunger
- Goal 3: Good Health and Well-being
- Goal 6: Clean Water and Sanitation
- Goal 14: Life Below Water
- Goal 15: Life on Land
- Goal 16: Peace, Justice and Strong Institutions

The absence of these goals reveals clear research gaps, particularly in areas related to public health, environmental protection, biodiversity, governance and institutional resilience — areas where digital technologies could play a transformative role, but which are not yet adequately addressed in economic and management research.

From the entire analysis it becomes clear that research gaps exist at the crossroads of DT and S. These include sectoral and disciplinary imbalances, with a notably narrow focus that lacks adequate input from fields like engineering, computer science, information systems, telecommunications and a limited economic perspective. There is a noticeable lack of focus on certain SDGs, particularly those addressing public health, clean water, biodiversity conservation and governance. Moreover, there is a geographical skew in research, heavily favoring Europe and select Asian countries, while regions such as Africa, parts of Latin America and developing economies remain underexplored. Furthermore, new areas of interest, including management frameworks, governance and the circular economy are not yet thoroughly investigated and warrant more scholarly work.

5. Conclusions

This study contributes to the academic understanding of the intersection between digital transformation and sustainability. In preparing this paper, we applied a rigorous selection process for the analyzed literature. We applied a multi-stage filtering process that started with an initial pool of 357 articles identified with the keywords “digital transformation” and “sustainability” in the Web of Science database. Successive filtering based on categories and document types ensured a focused and high-quality final selection of 68 articles for in-depth analysis.

The results confirm RQ1 and RQ2 by identifying four major thematic clusters—technological enablers, innovation and business models, performance and impact, and sustainability dimensions such as the circular economy. These clusters reveal a rich and interconnected research landscape in which digital tools are increasingly being explored as mechanisms to advance sustainability goals. Visualizations of keyword co-occurrence and density mapping demonstrate not only conceptual overlaps but also highlight the emergence of niche subfields, underscoring the need for deeper exploration in underdeveloped areas like governance frameworks and social equity.

Research questions 3 and 4 are also confirmed through bibliometric analysis network analysis and geographical distribution insights. The research shows a growing conceptual convergence between digital transformation and sustainability, anchored by bridging keywords such as “innovation,”

“impact,” and “circular economy.” Additionally, the geographical analysis reveals strong contributions from Europe—particularly Italy, Germany and England—as well as China, India and Brazil. However, the global distribution remains uneven, with limited scholarly representation from Africa and parts of Latin America. These findings suggest the necessity of expanding research efforts across more diverse regional and socio-economic contexts to ensure broader applicability and inclusivity of insights.

The citation patterns and topic-level analysis also support research questions 5 and 6. Although widely cited works concentrate on circular and sharing economy applications, the broader body of literature shows inconsistency in its theoretical framing, leaving critical areas such as governance, stakeholder engagement and standardized measurement tools insufficiently developed. Additionally, mapping these articles to the SDGs shows a significant focus on SDG 9 (Industry, Innovation and Infrastructure) and SDG 12 (Responsible Consumption and Production). Conversely, other goals, especially those concerning health (SDG 3), education (SDG 4), biodiversity (SDGs 14 & 15) and governance (SDG 16), receive little to no attention. This observation highlights an imbalance in how digital transformation is framed within sustainability research, suggesting the potential to expand its application to underexplored societal and environmental issues.

By synthesizing existing research, this paper lays the groundwork for future inquiry and application. It offers a roadmap for scholars aiming to build more integrated theoretical models and it equips policymakers and managers with a clearer view of how digital technologies can support long-term sustainability strategies. Future research could build on these findings by expanding the dataset across multiple databases, conducting longitudinal studies and examining underrepresented sectors such as healthcare, agriculture, or education. As digital transformation continues to reshape industries and societies, aligning these changes with sustainability priorities remains both a challenge and a critical opportunity for future academic and practical contributions.

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References

- Abdullah, S., Nawli, M.N.M., Halim, M.A.S.A., Omar, K., Rosli, N.A. and Harun, A.N. (2024). Digital transformation for sustainable business performance: A systematic literature review and the way forward. *UCJC Business and Society Review (formerly known as Universia Business Review)*, 21(80), pp. 48-84. <https://doi.org/10.3232/UBR.2024.V21.N1.02>.
- Briatore, F., Vanni, F., Mosca, M.T., Mosca, R.N., Fruggiero, F. and Mancusi, F. (2025). Exploring Industry 4.0's Role in Sustainable Supply Chains: Perspectives from a Bibliometric Review. *Logistics*, 9, 26. <https://doi.org/10.3390/logistics9010026>.
- de Souza, C.A., Szaifir-Goldstein, C. and Aagaard, A. (2020). IoT in the Context of Digital Transformation and Business Model Innovation: the case of a traditional Brazilian wholesaler. *2020 Global Internet of Things Summit (GIoTS)*, Dublin, Ireland, pp. 1-6. <https://doi.org/10.1109/GIOTS49054.2020.9119527>.
- Del Río Castro, G., González Fernández, M.C. and Uruburu Colsa, A. (2021). Unleashing the convergence amid digitalization and sustainability towards pursuing the Sustainable Development Goals (SDGs): a holistic review. *Journal of Cleaner Production*, 280(1), 122204. <https://doi.org/10.1016/j.jclepro.2020.122204>.
- Du Pisani, J.A. (2006). Sustainable development – historical roots of the concept. *Environmental Sciences*, 3(2), pp. 83-96. <https://doi.org/10.1080/15693430600688831>.
- Fischer, M., Foord, D., Freccè, J., Hillebrand, K., Kissling-Näf, I., Meili, R., Peskova, M., Risi, D., Schmidpeter, R. and Stucki, T. (2023). The concept of sustainable development. In: *Sustainable Business. SpringerBriefs in Business*. Cham: Springer, pp. 17-27. https://doi.org/10.1007/978-3-031-25397-3_2.
- Garg, M. and Kumar, P. (2024). Harnessing digital technologies for triple bottom line sustainability in the banking industry: a bibliometric review. *Future Business Journal*, 10(1), 62. <https://doi.org/10.1186/s43093-024-00336-2>.
- Guandalini, I. (2022). Sustainability through digital transformation: A systematic literature review for research guidance. *Journal of Business Research*, 148, pp. 456-471. <https://doi.org/10.1016/j.jbusres.2022.05.003>.

- Khitous, F., Strozzi, F., Urbinati, A. and Alberti, F. (2020). A systematic literature network analysis of existing themes and emerging research trends in circular economy. *Sustainability*, 12(4), 1633. <https://doi.org/10.3390/su12041633>.
- Lichtenthaler, U. (2021). Digitainability: The Combined Effects of the Megatrends Digitalization and Sustainability. *Journal of Innovation Management*, 9, pp. 64-80. https://doi.org/10.24840/2183-0606_009.002_0006.
- Liu, Q., Trevisan, A.H., Yang, M. and Mascarenhas, J. (2022). A framework of digital technologies for the circular economy: Digital functions and mechanisms. *Business Strategy and the Environment*, 31(5), pp. 2171-2192. <https://doi.org/10.1002/bse.3015>.
- Martínez-Peláez, R., Ochoa-Brust, A., Rivera, S., Félix, V.G., Ostos, R., Brito, H., Félix, R.A. and Mena, L.J. (2023). Role of digital transformation for achieving sustainability: mediated role of stakeholders, key capabilities and technology. *Sustainability*, 15(14), 11221. <https://doi.org/10.3390/su151411221>.
- Ologeanu-Taddei, R., Hönigsberg, S., Weritz, P., Wache, H., Mittermeier, F., Tana, S., Dang, D., Hautala-Kankaanpää, T. and Pekkola, S. (2025). The relationship of digital transformation and corporate sustainability: Synergies and tensions. *Technological Forecasting and Social Change*, 210, 123809. <https://doi.org/10.1016/j.techfore.2024.123809>.
- Potter, I., 2020. *Introducing Citation Topics*. Clarivate. [online] Available at: <<https://clarivate.com/academia-government/blog/introducing-citation-topics/>> [Accessed 8 May 2025].
- Schroder, A. (2024). Piggyback to Green – Digital Transformation for Environmental Sustainability. *MCIS 2024 Proceedings*, article 5. [online] Available at: <<https://aisel.aisnet.org/mcis2024/5>>, [Accessed 8 May 2025].
- Sjödin, D., Parida, V. and Kohtamäki, M. (2023). Artificial intelligence enabling circular business model innovation in digital servitization: Conceptualizing dynamic capabilities, AI capacities, business models and effects. *Technological Forecasting and Social Change*, 197, 122903. <https://doi.org/10.1016/j.techfore.2023.122903>.