

Exploring the Nexus of Digital Transformation and Sustainable Development: A Systematic Review with Bibliometric Evidence

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ABSTRACT: In light of growing concern regarding the planet's environmental future, it is important for companies to prioritize sustainable development in their digital transformation initiatives, driving growth that is both environmentally responsible and technologically advanced. This study aims to document and synthesize the trends in the field of 'digital transformation and sustainable development over the period of time. By analysing 976 Scopus indexed documents, the review uncovers a rapidly growing body of literature. The literature is globally diverse, with notable contribution from both developing and developed countries. Citation analysis identified key authors and influential work that have played an important role in shaping this field. A lot of individuals in the field are directly affected by this study, for instance consultant, managers, and policymakers.

Keywords: Digital transformation, Sustainability, Systematic literature review, Bibliometric analysis, Sustainable development

1. Introduction

The digital revolution is transforming industries by improving efficiency and creating sustainability. Digital technologies are changing the basics of business operations, resource management, and stakeholder engagement just as smartphones had been changing the communication processes, and streaming services had changed the entertainment (Tiwari et al., 2024; Chen and Kim, 2023). Artificial intelligence, IoT, blockchain, cloud computing, and big data analytics are some of the technologies that are transforming the nature of business, supply chain management, and energy efficiency (Nambisan, 2017). This technological change is essential in enhancing sustainability through the minimization of waste, resource optimization, and environmentally friendly conduct (Dutta et al., 2020).

Sustainable development aims at creating a balance between the current demands and keeping resources to be use by future generations (Schonherr et al., 2023). This applies to the energy industry in reducing the effects on the environment by introducing sustainable consumption trends (Hoang & Nguyen, 2021). Digital transformation and sustainability convergence is a recent field of research, which discusses the urgent environmental and socioeconomic issues (Pauliuk et al., 2022). Digital resources, like big data analytics and IoT, will make the use of resources smarter, will decrease carbon emissions into the atmosphere, and will better city living conditions. (Xu et al., 2023).

This study employs bibliometric analysis using VOSviewer and a systematic review of 976 articles from the Scopus database to explore key trends in digital transformation and sustainable development. It aims to answer the following research questions:

- **RQ1:** What are the emerging research trends linking digital transformation and sustainable development?
- **RQ2:** Who are the leading contributors (authors, countries, and journals) in this domain?
- **RQ3:** How do researcher collaborations, citation networks, and keyword co-occurrence shape the field?

The paper is structured as follows: Section 2 details the research methodology, Section 3 presents findings and analysis, Section 4 discusses limitations, and Section 5 concludes with key insights and future research directions.

2. Methodology

In this section, the procedure and methods which used to identify and analyse the data are described (Udomsap and Hallinger, 2020). The purpose of this research paper is to distinguish and systematically dissect the relationship between digital transformation and sustainable development and identify emerging research trends of this area. To achieve this objective, systematic literature review and bibliometric analysis (Donthu et al., 2021) was used on content analysis basis.

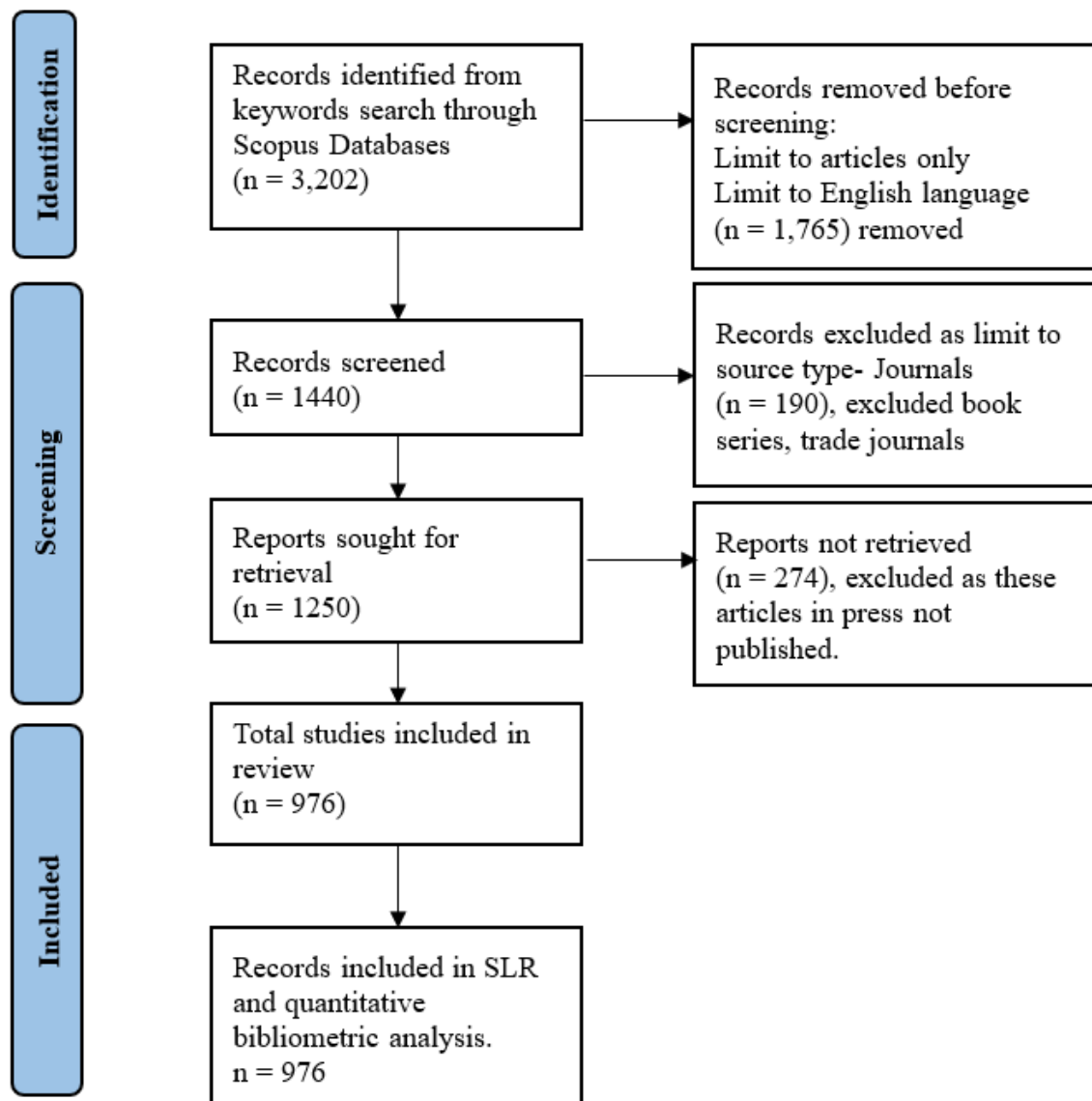


Figure 1. PRISM flow chart used to identify the sources for review.

2.1 Identification of data source

The study utilized the Scopus database for data extraction, given its comprehensive coverage and ease of use (Gan et al., 2022; Mongeon & Paul-Hus, 2016). The search was limited to 2005–2024 using the keyword "digital transformation and sustainable development."

Following PRISMA guidelines (Moher et al., 2010), the initial search yielded 3,202 documents. After filtering for English-language articles and excluding book series, trade journals, and in-press publications, the dataset was narrowed to 976 final articles for analysis.

2.2 Analysis of data

The study analyzed 976 Scopus-indexed articles, examining bibliographic details such as titles, authors, publication years, citations, and keywords. VOSviewer (Martins et al., 2024; Van Eck & Waltman, 2014) was used for bibliometric analysis, mapping networks of research, journals, countries, and keywords through co-authorship, co-occurrence, bibliographic coupling, and co-citation (Van Eck & Waltman, 2010).

To explore research trends, author co-citation analysis was employed to identify frequently cited authors and track evolving knowledge structures (Zupic & Cater, 2015). A two-tier approach was applied: a systematic literature review followed by an in-depth bibliometric analysis using keyword co-occurrence in VOSviewer to address the research questions.

3. Results and statistical analysis

In this part the results of systematic literature review and bibliometric analysis of the 976 documents are described.

3.1 Analysis of general trends of publications

Table No.1 shows the no. of articles published over the period of time. The data which was extracted from Scopus database shows no article prior to the year 2007 in the field of digital transformation and sustainable development, though we use the filter to extract data from 2005-2024.

Table No.1 Year wise no. of publications in the field of digital transformation and sustainable development

YEAR	No.	YEAR	No.	YEAR	No.
2024	224	2018	18	2012	2
2023	302	2017	11	2011	2
2022	194	2016	4	2010	1
2021	113	2015	2	2009	1
2020	58	2014	3	2008	1
2019	34	2013	5	2007	1

As shown in Figure.2, it is observed that in the initial years the papers were very less as the area "digital transformation and sustainable development" was still evolving. It is noticed that the trend increased after the year 2015 and a very rapid increase after the year 2020. During this time the trend increased in terms of more digitalised approach towards sustainability. Highest number of publications was in the year 2023 till date which was 302 articles.

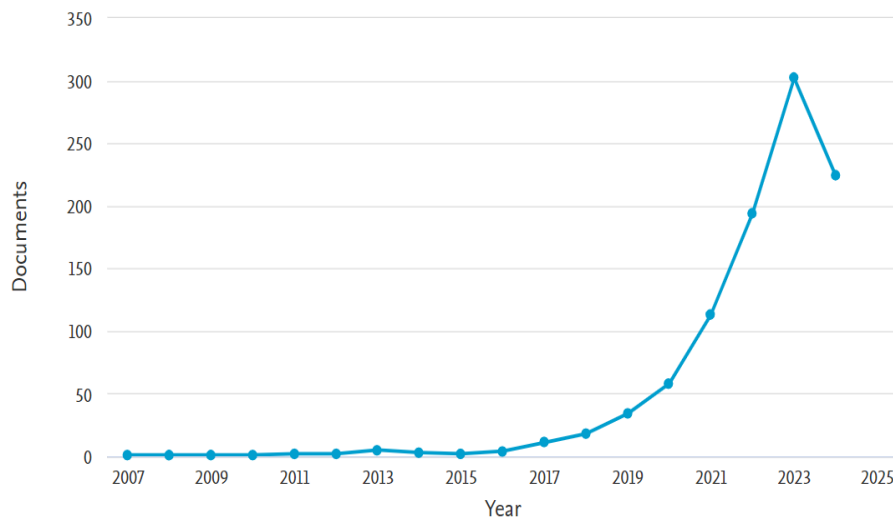


Figure 2. Trends published in the area of digital transformation and sustainable development

3.2 Most influential journals and authors in terms of contribution

As shown in Figure. 3, the top six Scopus sources with the number of documents presented with different colours. The maximum number of documents were covered by 'Journal of cleaner production' which was 44 articles during the years in the field of digital transformation and sustainable development. There were 20 documents in the journal 'Energies' and 17 documents in 'Resource policy'. Frontiers in environmental science had 16 articles and Technological forecasting and social change had 15 articles. Heliyon, which started contributing in the year 2023 onwards had 11 articles. Taking into account the top leading journal identified by the studies Mallawaarachchi et al., (2020) and Yu et al., (2014) arrived at similar result. Journal of cleaner production holds the leading position in both the studies.

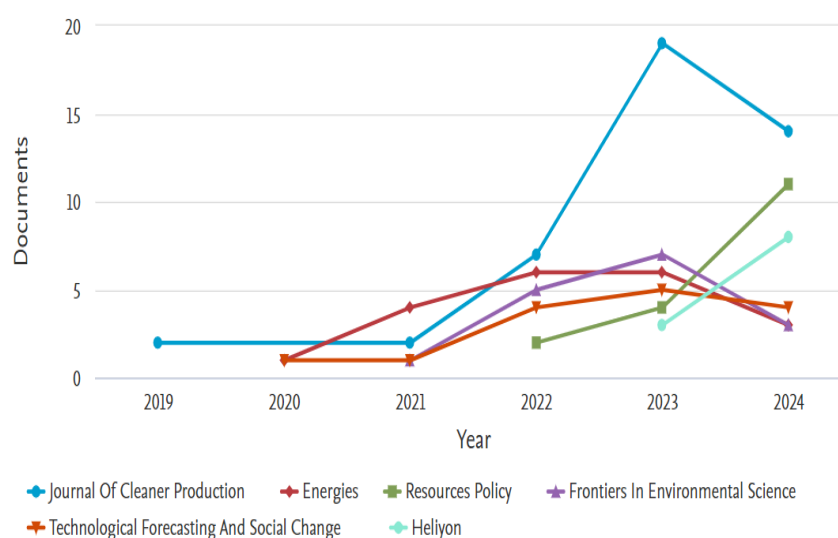


Figure 3. Most contributing journals in the field of digital transformation and sustainable development during the years

In Figure. 4 the articles of authors are displayed according to their contribution respectively. As per the results the author with most publications is Ghobakhloo, M and second one is Ha, L.T. Researchers who want to work in the area of digital transformation and sustainable development must acknowledge and give credit to authors mentioned above. They have established a significant presence in the field of digital transformation along with sustainable development (e.g., Ghobakhloo M et al., 2023; Ha, LT, 2022; Ghobakhloo M et al., 2021). Reading these renowned authors' work provides aspiring research with invaluable knowledge. It helps to their better understanding and grasp the subject matter better. This data is presented with the help of radar chart, where the size of radar is according to the number of publications by these authors (Mallawaarachchi et al., 2020). Only the top ten authors are included to make this radar chart with the help of metadata extracted from Scopus database.

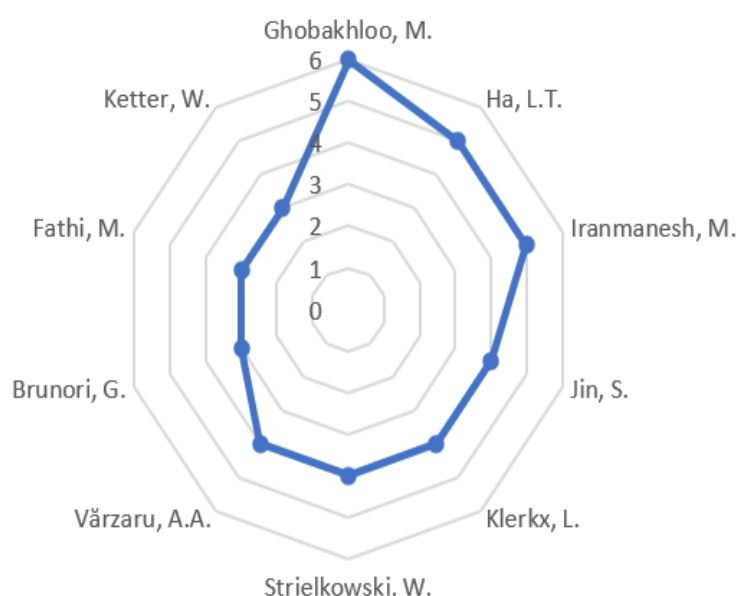


Figure 4. Most influential authors based on publications.

3.3 Subject areas as per documents

Figure 5 highlights ten subject areas in digital transformation and sustainable development (Chakraborty et al., 2021). Business and management (15.5%), engineering (14.4%), social science (13%), and environmental science (11.1%) are the most prominent fields.

While engineering dominates digital transformation research, business and management lead in sustainable development. The interdisciplinary nature of this field underscores the integration of technological, economic, and social perspectives to drive sustainable innovation. Increasingly, digital technologies are being leveraged to promote environmental sustainability, reflecting a holistic approach to addressing global challenges.

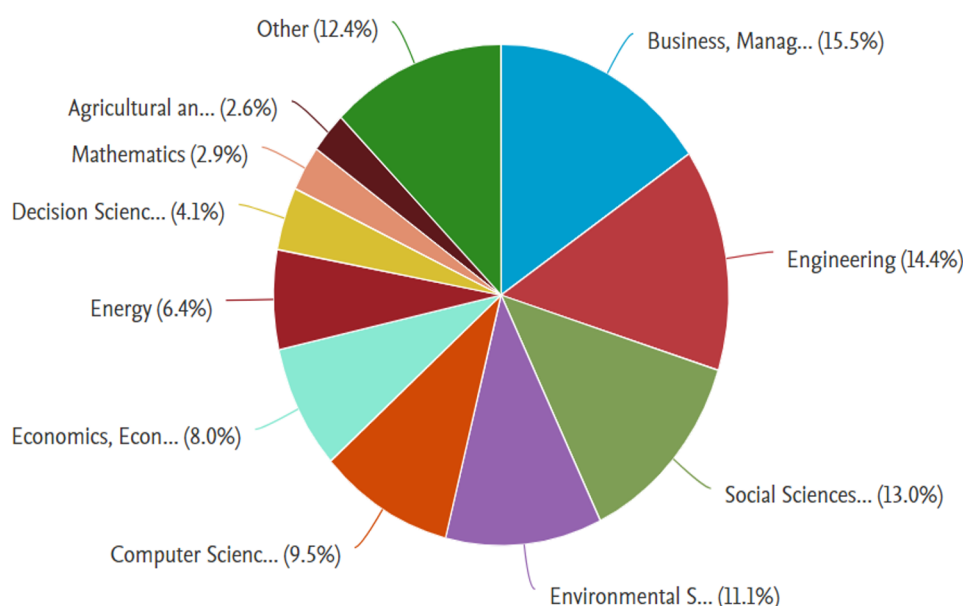


Figure 5. Documents by subject area in the field of digital transformation and sustainable development

3.4 Network analysis

Network analysis is a key component of bibliometric research. Both network analysis and graphical analysis have been used to the 976 papers in this study through the creation of noteworthy linkages. Numerous tools for network analysis and graphical visualization are available in the literature. The network analysis in this study makes use of VOS Viewer (Chakrabort et al., 2021; Van Eck and Waltman, 2010). With the help of this tool, we can do co-occurrence analysis of author keywords, citation analysis, bibliographic coupling, and co-citation analysis of authors and journals.

3.4.1 Co-occurrence analysis of author keywords

Figure 6 presents the co-occurrence network of author keywords from 976 articles, identifying 225 keywords across 16 clusters using VOSviewer (Bornmann et al., 2018). A minimum occurrence threshold of 3 was set for inclusion.

Key clusters include:

- Red: Carbon emission, CSR, digital economy, ESG, enterprise digital transformation.
- Green: Bibliometric analysis, circular economy, fintech, Industry 5.0, sustainable development.
- Blue: Business transformation, climate change, eco-innovation, energy policy, smart grid.
- Olive: Digital inequality, agriculture 4.0, financial performance, rural development.
- Purple: Business models, IT, SDGs, mobility, sustainable growth.
- Light blue: Automation, digital maturity, energy, open innovation.
- Orange: Big data analytics, IoT, smart cities, e-governance, digital financial inclusion.

These clusters highlight diverse research themes, showcasing the broad application of digital transformation in sustainability.

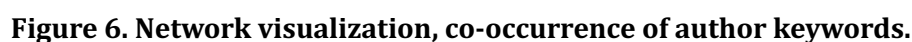


Figure. 7 indicates that the various countries were categorized into four clusters. China is the country with the largest number of co-authored documents (232 articles). In second place, Germany belongs; the difference between the co-authorship document between China and Germany is very high. The studies that have been conducted on the various co-authorship reveal how authors across nations and associations collaborate with each other in the world on the issues being researched and associated with the digital transformation and sustainable development. Ranking of countries by the number of documents, in decreasing order. As it was anticipated, the network of collaboration between the nationalities is positively correlated with the co-citation of work (Mourao and Martinho, 2020; Liu and Chen, 2012). As illustrated in figure, of the results 110 countries only 23 countries have reached the minimum no. of documents which should be 20 documents per country.

As it is stated in reference to Figure 8, which illustrates the network diagram in terms of the co-citation between various journals (Ferreira, 2018). (Ferreira, 2018). The “Journal of cleaner production” is in the center, with the largest number of link strength and number of citations, shows its significant influence in the field of digital transformation and sustainable development. The clusters are displayed under varied colors, which implies clusters of journals that are often co-cited. Such clusters are often associated with some themes or research areas. For instance, “Journal of cleaner production”, “Technological forecasting and social change”, “Energies” were at the center position, showing their important role in the academic discourse of sustainable development and digital transformation. The red cluster, as shown in Figure. 8 is related to energy and resource management. Next is the green cluster, it is regarding environmental and

technological integration. Journals in this cluster are: “Heliyon”, “Frontiers in environment science”, and “System”. It dwells on the technological improvement through incorporation of the environmental science. Blue cluster is for sustainable production and social implication. These journals are primarily concerned about the ways of sustainable production and consequences of this practice on society. Other minor clusters comprise such areas as finance and economics. Journals such as “Finance research letters” and “Agriculture system” represent these areas. Journals in Table No. 3, like “Heliyon” and “Applied Science”, which have a higher average publication year, are indicative of newer research contributions.

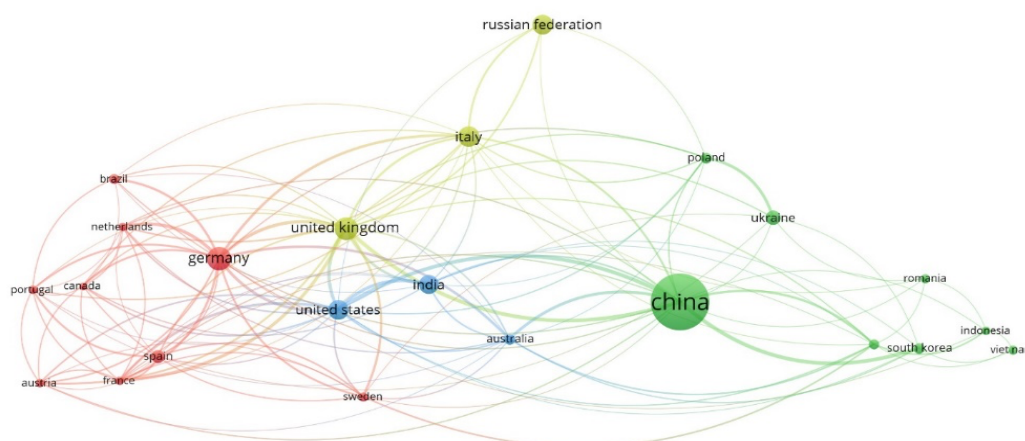


Figure 7 Visualization map of co-authorship-country network

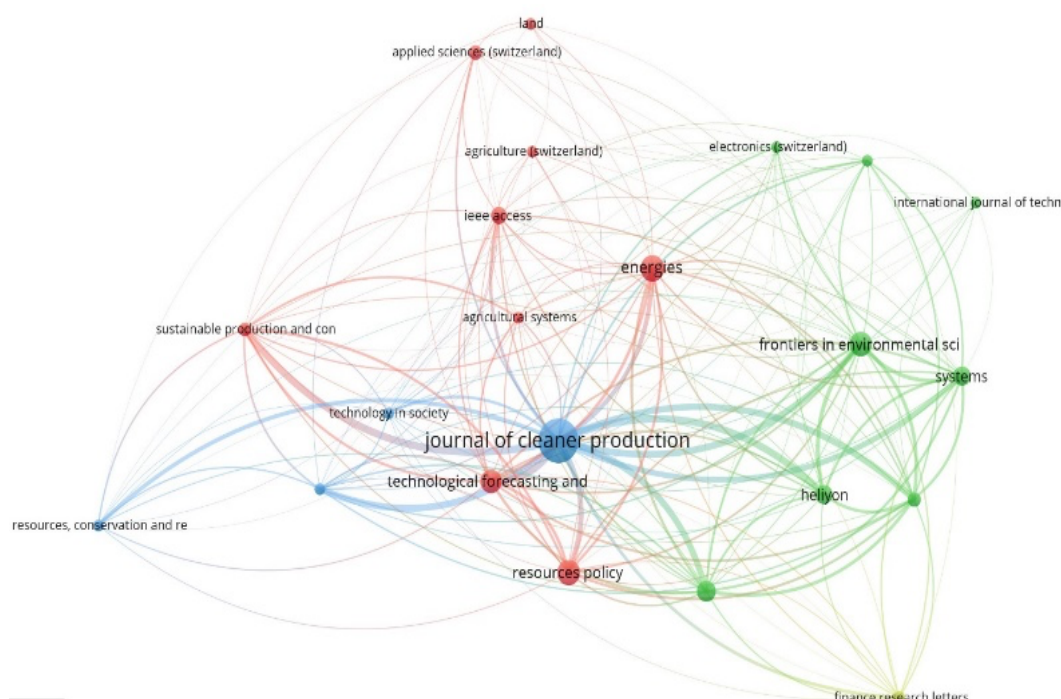


Figure 8. Visualization map of network based on bibliographic coupling- journals (bibliographic data).

3.4.4 Co-authorship /Bibliographic coupling- authors

Figure 9 visualizes the author network based on bibliographic coupling, which measures research similarity through shared references (Kleminski et al., 2022). When two documents cite the same third source, they form a bibliographic connection, with coupling strength determined by the number of shared references (Dwivedi et al., 2023). A stronger coupling indicates closer research alignment.

The network highlights key scholars like Ghobakhloo M. and Fathi M., who exhibit high bibliographic coupling, reflecting their significant research impact. The visualization further illustrates thematic clusters and collaboration patterns, providing insights into the intellectual landscape of digital transformation and sustainability.

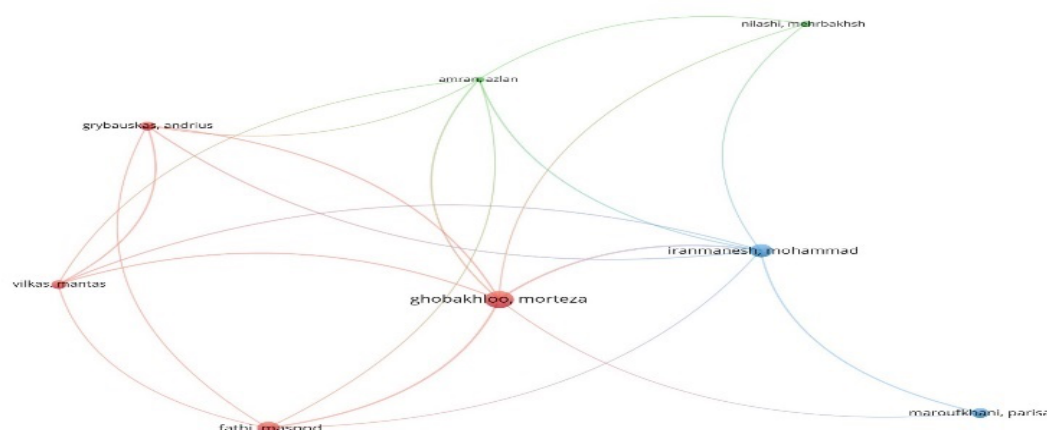


Figure 9. Visualization map of network based on bibliographic coupling, authors (Bibliographic data)

4. Discussion

4.1 Implications

This study provides an extensive review of the current trends in research at the nexus of sustainable development and digital transformation, with resource efficiency and sustainable business model being some of the themes that it highlights. With the introduction of IoT, AI, big data, and smart grids into the work on sustainability, there is a high potential for innovations. Digital technologies provide businesses with the opportunity to minimize inefficiencies and create environmentally-friendly models, and policymakers can facilitate the change with regulatory frameworks that advance green technology. Through industry and government cooperation, the digital transformation can promote resilient, efficient, and sustainable economies and be an excellent base for future research and policy development.

4.2 Limitations and future research directions

The study has some weaknesses, such as the possibility of having bias as a result of selecting the database and keywords that might have left out quality research. Although bibliometric indicators are helpful in quantitative studies, they disregard the theoretical richness and contextual details. The citation metrics are not always indicators of research quality since there are some extraneous factors, such as the exposure of the publication. The results suggest that the subject of digital transformation as a way of achieving sustainability is on the rise after 2020, and the core themes in this area include IoT, AI, and big data, which can improve resource efficiency. The study should focus on the regional and sectoral disparities of digital transformation adoption in the future since the contextual differences influence effectiveness. Longitudinal research might

offer a more significant contribution to the sustainability impacts of the long term. Considering both qualitative and quantitative methods, i.e., case studies, would provide a more nuanced insight than bibliometric analysis. New technologies such as machine learning, blockchain, and cloud computing are to be explored on how they can contribute to sustainability, especially supply chain transparency and energy management. It is necessary to create interdisciplinary frameworks that will combine environmental, technological, and social aspects. The relationship between sustainability and digital transformation is more multifaceted, and therefore, a more holistic approach will reflect it. This will facilitate actionable insights that will inform policymakers and businesses towards sustainable digital approaches. By solving these limitations with various methodologies, one will be able to deepen the field. Future research should prioritize practical applications and industry-specific strategies. A balanced methodological approach will ensure more comprehensive findings.

5. Conclusion

The intersection of sustainable development and digital transformation is fast transforming and has huge potential for resource efficiency and sustainable business practices. This paper points out the recent increased post-2020 curiosity in the use of IoT, AI, and smart grids to solve global issues such as climate change and resource depletion. Policymakers can help businesses make the transition by supporting such a move with rules and incentives, and businesses can do the same by using digital technologies to waste less and use less to develop sustainable models. A collaborative approach between industry, government, and academia can drive sustainable growth, job creation, and environmental benefits. Moving forward, longitudinal studies are needed to assess the long-term impact of digital transformation on sustainability. A holistic, interdisciplinary approach is crucial to ensuring that digital advancements benefit both society and the environment.

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