

DIGITAL TRANSFORMATION IN THE HEALTHCARE INDUSTRY: A BIBLIOMETRIC REVIEW

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Abstract. This study presents a bibliometric review of digital transformation research in the healthcare industry from 2016 to 2025 using Scopus database. A total of 1,297 publications were analyzed to identify publication trends, influential authors, institutions, journals, and thematic research areas. The findings indicate rapid growth in digital healthcare research, especially after the COVID-19 pandemic. English-language publications dominated the field, while the major subject areas included Business, Management and Accounting, Computer Science, Social Sciences, and Medicine. The analysis identified leading contributors, including Sascha Kraus and several institutions from Italy, Australia, and China. VOSviewer keyword occurrence analysis revealed six major thematic clusters: digital transformation strategies, digital health technologies, data analytics, artificial intelligence, medical education, and sustainability. The findings demonstrate that digital transformation research in healthcare is multidisciplinary and globally expanding. The study contributes by offering an updated overview of the intellectual structure of digital healthcare transformation and highlights future research opportunities, particularly in telehealth, AI-driven healthcare systems, collaboration networks, and longitudinal impact studies.

Keywords: *digital transformation, digital transition, digital innovation, technology advancement, healthcare*

Introduction

Digital transformation has become a major driver of organizational change across industries, fundamentally reshaping how organizations operate, deliver value, and engage stakeholders (Vial, 2019). In healthcare, digital transformation refers to the integration of technologies such as electronic health records (EHRs), telemedicine, artificial intelligence (AI), cloud computing, and data analytics into healthcare delivery and management processes (Verhoef et al., 2021). These technologies are increasingly adopted to improve healthcare efficiency, patient outcomes, operational effectiveness, and evidence-based decision-making. Healthcare organizations have accelerated the adoption of digital technologies due to rising patient expectations, workforce challenges, and the growing demand for personalized healthcare services (S.Kraus et al., 2021). The Covid-19 pandemic further intensified this transformation as healthcare systems worldwide rapidly adopted telemedicine, remote monitoring systems, and AI-supported diagnostics to maintain healthcare accessibility during movement restrictions and health crises (Golinelli et al., 2020).

Recent studies suggest that digital transformation improves diagnostic accuracy, patient engagement, healthcare accessibility, and service quality (Wong et al., 2024; Kraus et al., 2021). Technologies such as AI and predictive analytics also support clinical decision-making and operational planning. However, several challenges remain, including data interoperability, cybersecurity risks, digital inequality, organizational readiness, and resistance to technological change (Apostolakis and Lonstantinidis, 2024). Although previous bibliometric studies have examined digital transformation in healthcare, many have focused on specific regions or earlier publication periods. Since healthcare digitalization has expanded rapidly since the pandemic, an updated bibliometric review is necessary to identify current research trends, influential contributors, and emerging themes. Therefore, this study aims to analyze the scholarly landscape of digital transformation in healthcare between 2016 and 2025. The study addresses the following research questions: (i) How has research on digital transformation in healthcare evolved across disciplines and publication types? (ii) Who are the most influential authors, institutions, and countries in this field? (iii) What major research themes emerge from keyword co-occurrence analysis?

Literature review

Digital transformation in healthcare involves integrating advanced technologies into healthcare systems to improve service delivery, operational efficiency, and patient care. Technologies such as AI, telemedicine, big data analytics, and wearable devices are increasingly shaping healthcare operations and decision-making processes (Vial.,2019). AI-driven healthcare systems support predictive analytics, personalized treatment planning, and decision support systems, contributing to improved diagnostic accuracy and patient outcomes (Rangarajan et al., 2024). Telemedicine and remote healthcare technologies have also improved access to care, particularly for patients in rural and underserved areas. The Organization for Economic Co-operation and Development (OECD, 2023) emphasized that strong digital health systems enhance evidence-based policymaking and improve healthcare responsiveness. Furthermore, digital transformation enables healthcare organizations to optimize resource allocation, improve coordination, and reduce operational costs (Bachuk, 2024). Bibliometric analysis has become a useful method for evaluating the intellectual structure of research fields by identifying publication trends, influential contributors, collaboration networks, and thematic developments (Aria and Cuccurullo,2017). Therefore, this study applies bibliometric analysis to provide a systematic overview of digital transformation research in healthcare.

Materials and Methods

This study employed a bibliometric analysis to examine publications on digital transformation in healthcare. The Scopus database was selected because of its extensive coverage of peer-reviewed academic publications across multiple disciplines. The search strategy focused on article titles using the search string TITLE("digital transformation" OR "digital transition" OR "digital evolution" OR "technology advancement" AND "healthcare"). The search covered publications from 2016 to 2025. No restrictions were imposed on document type, language, or subject area to ensure comprehensive coverage. Data extraction was conducted on 17 January 2025, yielding 1,297 publications. Data cleaning and harmonization were performed using

biblioMagika (Ahmi, 2023) and OpenRefine to standardize author names, affiliations, and keywords. Bibliometric performance analysis was conducted using biblioMagika, while VOSviewer was utilized to visualize keyword co-occurrence networks. The analysis focused on: (i) publication growth trends; (ii) leading authors, institutions, and countries; (iii) influential journals and highly cited documents; (iv) thematic clusters through keyword co-occurrence analysis

Results and Discussion

The dataset comprised 1,297 publications from 2016 to 2025, indicating substantial growth in research on digital transformation in healthcare. The publications generated 25,994 citations, averaging 20.09 citations per paper, reflecting strong scholarly impact. English language publications dominated the dataset (94.83%), followed by German and Spanish publications. The major contributing subject areas included Business, Management, and Accounting (38.47%), Computer Science (35.62%), Social Sciences (26.14%), Engineering (22.51%), and Medicine (15.57%). This demonstrates that digital healthcare transformation is highly multidisciplinary. The annual publication trend showed significant growth after 2020, reflecting increased global interest in digital healthcare during and after the COVID-19 pandemic. The rise in publications also indicates expanding academic and industry attention towards healthcare technologies, AI integration, and digital service delivery. Among the most productive authors, Sascha Kraus emerged as one of the most influential contributors, with 6 publications and over 1,300 citations. Other notable contributors included Baharak Makki, Clair Sullivan, and Helmut Krcmar. Leading institutions included Nanyang Technological University, Queensland University of Technology, University of Turin, and Free University of Bozen-Bolzano. These institutions contributed significantly to advancing research on digital healthcare transformation.

At the country level, China, Germany, the United Kingdom, the United States, and Italy recorded the highest publication outputs. Malaysia also appeared among the countries actively contributing, reflecting growing regional interest in digital healthcare research. The most active journals publishing research on digital transformation in healthcare included Sustainability, Technological Forecasting and Social Change, IEEE Access, and Journal of Business Research. These journals played an important role in disseminating multidisciplinary research on digital healthcare. Highly cited studies mainly focused on digital transformation frameworks, healthcare innovation, AI implementation, organizational transformation, and digital strategy. The findings indicate that digital healthcare research increasingly intersects with management, technology, sustainability, and innovation studies (*Table 1* and *Table 2*).

Table 1. Document profile.

Main Information	Data
Publication Years	2016-2025
Total Publications	1297
Citable Year	10
Number of Contributing Authors	1296
Number of Cited Papers	878
Total Citations	25,994
Citation per Paper	20.09
Citation per Cited Paper	27.69
Citation per Year	2004
Citation per Author	20.09
Author per Paper	1.00

Citation sum with h-core	19328
h-index	76
g-index	132
m-index	5.429

Source: Generated by the author(s) using biblioMagika® (Ahmi, 2023).

Table 2. Most productive author.

Full Name	Current Affiliation	Country	TP	NCP	TC	C/P	C/CP	h	g	m
Makki, Baharak	Qatar University	Qatar	6	6	47	7.83	7.83	3	6	0.500
Kraus, Sascha	Free University Of Bozen-Bolzano	Italy	6	6	1358	226.33	226.33	6	6	1.200
Sullivan, Clair	University of Queensland	Australia	5	5	105	21.00	21.00	4	5	0.667
Bohnet-Joschko, Sabine	Witten/Herdecke University	Germany	5	5	15	3.00	3.00	2	3	0.667
Krcmar, Helmut	Technical University of Munich	Germany	4	4	393	98.25	98.25	4	4	0.667
Lee, Ching-Hung	Xi'an Jiaotong University	China	4	4	190	47.50	47.50	4	4	0.667
Schiavone, Francesco	Parthenope University of Naples	Italy	4	4	610	152.50	152.50	3	4	0.600
Gunduz, Murat	Qatar University	Qatar	4	4	43	10.75	10.75	3	4	0.750
Kamble, Sachin	EDHEC Business School Roubaix	France	4	4	342	85.50	85.50	3	4	0.750
Tortorella, Guilherme Luz	University of Melbourne	Australia	4	2	42	10.50	21.00	2	4	0.667
Massaro, Maurizio	Ca' Foscari University of Venice	Italy	4	4	246	61.50	61.50	4	4	1.333
Santarsiero, Francesco	University of Basilicata Italy	Italy	4	4	49	12.25	12.25	3	4	1.000

Note: TP=total number of publications; NCP=number of cited publications; TC=total citations; C/P=average citations per publication; C/CP=average citations per cited publication; h=h-index; g=g-index; m=m-index.

Source: Generated by the author(s) using biblioMagika® (Ahmi, 2023)

Sources, Titles, and Highly Cited Documents

Co-occurrence analysis and VOSviewer analysis identified six major thematic clusters

Cluster 1 (Digital Transformation Strategies): This cluster likely includes keywords such as "digital transformation," "strategy," "digital innovation," "digital maturity," "change management," and potentially "implementation." This cluster focuses on planning and executing digital transformation initiatives. Cluster 2 (Digital Health and Technology): Keywords in this cluster would likely include "e-health," "healthcare," "telemedicine," "electronic health record," "hospital," "medical education," and possibly "cybersecurity." This cluster centers on the application of digital technologies in healthcare. Cluster 3 (Data and Analytics): This could group keywords around "big data," "big data analytics," "internet of things (IoT)," and potentially "data protection," with a focus on the data-driven aspects of digital transformation. Cluster 4 (Artificial Intelligence): This cluster might encompass keywords such as "artificial intelligence (AI)," "digital twin," and "blockchain," indicating a focus on cutting-edge technologies that drive digital transformation. Cluster 5 (Medical Education): This cluster likely centers on keywords such as "e-learning," "higher education," "digital divide," and "education," reflecting aspects of digital transformation in educational settings. Cluster 6 (Example: Sustainability and Digitalization): This cluster might contain keywords

relating to the intersection of digital transformation and sustainability, including "sustainable development" and possibly "green innovation." (Figure 1).

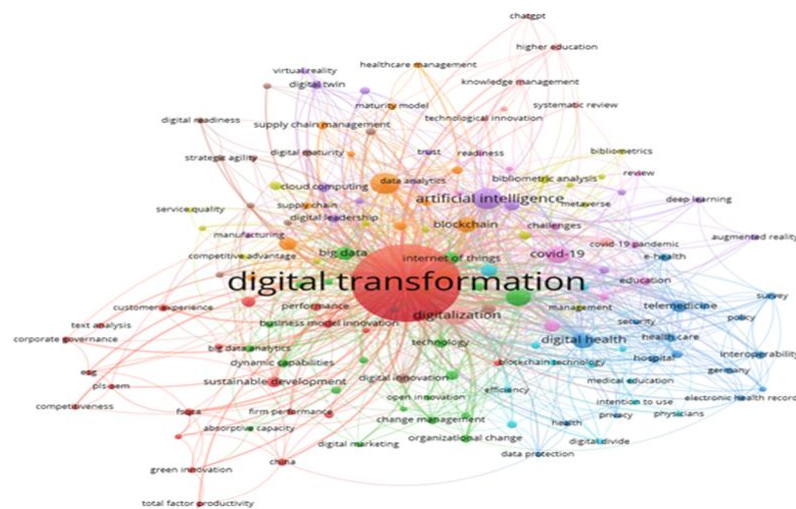


Figure 1. Network visualization of the co-occurrence analysis by author keywords.
Source: Generated by the author(s) using VOSviewer (Van Eck and Waltman, 2014).

Limitations and future directions

The study's reliance on the Scopus database might have resulted in an incomplete representation of all relevant research. Furthermore, the use of keyword searches may have introduced some bias. Future studies should consider employing multiple databases and diversifying search strategies to enhance inclusivity and mitigate potential bias. Qualitative approaches, which directly analyze the content of publications, can provide a better understanding of the field. Despite these limitations, this bibliometric analysis provides valuable insights and a strong foundation for future research. This bibliometric study provides a comprehensive analysis of the existing literature on digital transformation in healthcare. The key findings highlight this field's rapid growth and substantial influence, identifying key themes and contributors. This analysis is valuable for healthcare providers, policymakers, and technology developers, informing strategic planning and decision-making. It lays a strong foundation for ongoing research in this field. While providing a broad overview of digital transformation in healthcare, the preceding bibliometric analysis reveals several avenues for future research that would significantly contribute to the body of knowledge. The limitations inherent in a purely quantitative approach, particularly the broad scope of keyword searches and the reliance on bibliometric indicators alone, highlight the need for a more comprehensive approach in future studies.

Conclusion

In conclusion, this bibliometric analysis provides a comprehensive overview of the scholarly literature on digital transformation in healthcare from 2016 to 2025. The findings demonstrate rapid growth in digital healthcare research, particularly after the COVID-19 pandemic, highlighting the increase and importance of digital technologies in healthcare systems worldwide. The study identified influential authors, institutions,

journals, and countries contributing to the field, and revealed six major thematic research clusters through keyword co-occurrence analysis. The findings also confirm that the digital healthcare transformation is multidisciplinary, integrating management, computer science, medicine, sustainability, and innovation. Overall, this study contributes to the understanding of the intellectual structure and evolution of digital transformation research in healthcare. It also provides useful insights for researchers, healthcare practitioners, and policymakers in supporting future digital healthcare initiatives and research development.

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Conflict of interest

The author confirmed that there are no conflict of interest involve with any parties in this research study.

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