

# Bibliometric Analysis and Systematic Literature Review: Digital Leadership Transformation in Higher Education (2019-2025)

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**Abstract :** This study aims to analyze the development of research on digital leadership transformation in higher education during the 2019–2025 period through a bibliometric analysis and systematic literature review (SLR). Research data were obtained from the Scopus database using the PRISMA framework, resulting in 104 documents that met the inclusion criteria. The analysis was conducted using VOSviewer software to map publication trends, collaboration networks, keywords, and dominant research themes. The results indicate that publications related to digital leadership transformation have seen a significant increase since 2023. The most productive countries in this research are the United Kingdom, the United States, Germany, and Malaysia. The most frequently appearing keywords include digital transformation, higher education, digital leadership, leadership, and sustainability. This study also identified challenges such as limited digital competencies, organizational barriers, and infrastructure readiness. However, it offers significant benefits for innovation, efficiency, and institutional resilience through strategies to strengthen competencies, foster collaboration, and integrate technology in a sustainable manner.

**Keywords :** Bibliometric Analysis, Digital Leadership, Higher Education, Systematic Literature Review, Transformation

**Abstrak :** Penelitian ini bertujuan untuk menganalisis perkembangan penelitian tentang transformasi kepemimpinan digital di pendidikan tinggi selama periode 2019 sampai 2025 melalui analisis bibliometrik dan tinjauan literatur sistematis (SLR). Data penelitian diperoleh dari basis data Scopus dengan menggunakan kerangka PRISMA, sehingga menghasilkan 104 dokumen yang memenuhi kriteria inklusi. Analisis dilakukan menggunakan perangkat lunak VOSviewer untuk memetakan tren publikasi, jaringan kolaborasi, kata kunci, dan tema penelitian dominan. Hasil penelitian menunjukkan bahwa publikasi terkait transformasi kepemimpinan digital mengalami peningkatan signifikan sejak 2023. Negara paling produktif dalam penelitian ini adalah Britania Raya, Amerika Serikat, Jerman, dan Malaysia. Kata kunci yang paling sering muncul meliputi transformasi digital, pendidikan tinggi, kepemimpinan

*digital, kepemimpinan, dan keberlanjutan. Penelitian ini juga mengidentifikasi tantangan seperti keterbatasan kompetensi digital, hambatan organisasi, dan kesiapan infrastruktur. Namun, temuan ini menawarkan manfaat penting bagi inovasi, efisiensi, dan ketahanan institusional melalui strategi penguatan kompetensi, pengembangan kolaborasi, dan integrasi teknologi secara berkelanjutan dalam mendukung perubahan tata kelola perguruan tinggi yang adaptif dan kompetitif.*

**Kata Kunci :** Analisis Bibliometrik, Kepemimpinan Digital, Pendidikan Tinggi, Tinjauan Literatur Sistematis, Transformasi

## INTRODUCTION

The rise of the digital age is forcing educational institutions worldwide to overhaul conventional teaching methods through the use of artificial intelligence, cloud computing, and data-driven ecosystems (Williamson, 2019; UNESCO, 2025). The integration of adaptive learning platforms and data analytics is now capable of providing instant personalized feedback, thereby significantly optimizing students' cognitive engagement and study efficiency (Zawacki-Richter et al., 2024; Molenaar, 2025). Meanwhile, the acceleration of immersive technologies such as extended reality (XR) and interactive digital laboratories enables the visualization of abstract concepts and the simulation of high-risk practical experiments without spatial or logistical cost constraints (Emma, 2026; Meccawy, 2022). However, this presents a new challenge in the form of a massive demand for digital literacy standards among educators to prevent a gap from emerging between the academic curriculum and the rapid technological advancements in the industrial sector (OECD, 2026; Dringó-Horváth et al., 2025). For this reason, the effective management of technology within the educational sector is a key determinant in producing graduates who are agile in the digital-age job market.

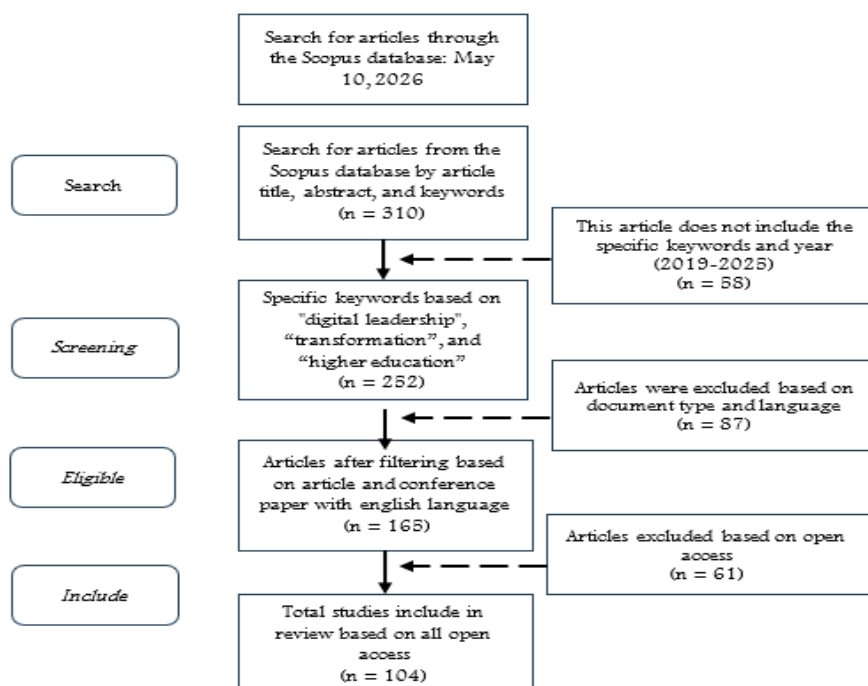
Educational leadership plays a central role as a navigator of strategic direction and a determinant of the success of an institution's organizational culture (Bush, 2007; Harris & Jones, 2020). Conventional top-down educational leadership is now shifting toward instructional and transformational leadership models that focus on teacher empowerment and continuous improvement of academic quality (Hallinger & Heck, 2010; Leithwood et al., 2004). Institutional leaders are expected not only to manage administrative affairs but also to build a shared vision, motivate staff, and create a collaborative work environment that supports pedagogical innovation (Fullan, 2007; Sun, 2026). The effectiveness of this leadership is directly correlated with improved organizational performance, teacher job satisfaction, and student achievement in schools (Spillane, 2005; Hardy et al., 2018). However, the main challenges faced by educational leaders today are resistance to internal change and resource constraints in implementing new policies (Souza & Leung, 2020; Lomba-Portela et al., 2022). Accordingly, strengthening adaptive and visionary leadership capacity is a crucial foundation for institutional sustainability amid a constantly changing external environment.

Educational institutions must transition from traditional leadership to digital leadership (Sterrett & Richardson, 2020; Witthöft et al., 2024). Digital leadership in education is not just the ability of leaders to operate devices, but rather the strategic capacity to integrate technology into the school's vision, work culture, and curriculum (Geresola & Lausa, 2024; Chainda & Boer, 2024). Digital leaders must be able to facilitate teachers' continuous professional development in digital literacy to mitigate the risk of a skills mismatch between teachers' competencies and the dynamics of industrial technology (Gu et al., 2025; Sabharwal & Mitra, 2024). In addition, this transformation demands leaders who are agile in data-driven decision-making and capable of building strategic synergies with the technology industry sector (Seraj et al., 2024; Ambite et al., 2025). Through a digitally oriented leadership transformation, educational institutions will not only be able to survive disruption but also create a future learning ecosystem that is responsive, inclusive, and globally competitive.

Bibliometric analysis is an appropriate method for addressing this research need because it can identify publication trends, scientific collaboration networks, core research topics, citation patterns, and thematic evolution in a quantitative manner (Erduyneeve *et al.*, 2024; Qi, 2025; Strazda, 2025; Hoang, 2025). Meanwhile, a systematic literature review (SLR) enables the identification, evaluation, and interpretation of relevant research findings on a specific topic in an objective and transparent way (Sauer & Seuring, 2023; Shaheen *et al.*, 2023). Based on the urgency and research gap, this study conducts a systematic review and bibliometric mapping of literature on digital leadership transformation in higher education from 2019 to 2025. Specifically, this study examines global publication and citation trends, the most relevant bibliographic documents, sources, authors, and countries, frequently used keywords, implementation challenges, benefits, and strategies related to digital leadership transformation in higher education. Through these objectives, this study is expected to contribute to strengthening the theoretical foundation of digital leadership transformation in higher education so that it becomes more adaptive, accurate, and future oriented.

## RESEARCH METHODS

This study used bibliometric analysis by collecting data from a source using relevant keywords. The articles are then filtered using specific classifications such as year of publication, language, document type, and open access. The results of the analysis visualization were created using VOSviewer software so that later a relationship between keywords, citation networks, and bibliographic coupling could be mapped to identify research trends and dominant themes on digital leadership transformation in higher education. To ensure that the research can be replicated, all methodological steps are carried out using best practices in bibliometrics. With a combination of statistical analysis and graphical mapping, researchers are able to provide a structural quantitative overview of the literature on education in the world. Overall, this research design was developed using a preferred reporting items for systematic reviews and meta-analyses (PRISMA) series of stages in Figure 1, from data collection by search, document screening and selection, to network analysis and thematic mapping relevant to the research objectives.



**Figure 1.** The PRISMA research design

The data collection process was carried out using a systematic approach based on the Scopus database, which was chosen for its extensive literature coverage, standardized metadata quality,

and reputation as a reliable global scientific repository. To maintain transparency and ensure that the selection process could be replicated in subsequent studies, the data search stages followed the PRISMA principles. In the initial stage, researchers used the advance query; (TITLE-ABS-KEY (digital leadership) AND TITLE-ABS-KEY (transformation) AND TITLE-ABS-KEY (higher education)). To obtain documents related with research focus on digital leadership transformation in the higher education, various processes are required. This search process produced an initial collection of documents reflecting a variety of approaches, application contexts, and research orientations related to the topic. To ensure data suitability, the researchers applied inclusion criteria in the form of english language, article and conference paper document types, open access journals, and publications within a time frame relevant to the development of research over the past a decade.

After initial screening, we cleaned the data by removing duplicates, verifying metadata, and assessing topic relevance based on abstracts and keywords. All data that met the criteria was then exported in comma-separated values (CSV) and research information systems (RIS) formats for further quantitative analysis. This final data set was used to map two decades of publication and citation trends, frequently cited articles, productive sources, countries, authors, and author keyword distribution. The bibliometric analysis stage was conducted using VOSviewer. This tool was chosen because of its powerful capabilities in displaying and interpreting patterns of relationships between elements in bibliographic data. VOSviewer was used primarily to produce network visualizations that illustrate collaborative relationships between authors, countries, institutions, and intellectual structures formed through bibliographic coupling and co-occurrence analysis. The resulting visualizations help researchers understand thematic clusters and the direction of concept development in research on digital leadership transformation in education. The results of this network analysis are then interpreted to formulate conclusions about the direction of research, research gaps, and opportunities for future study development.

## RESULTS AND DISCUSSION

### Publication Years and Citation Trends

Figure 2 shows the trend of scientific publications on transformational leadership in industry from 2019 to 2025. The development of research and citations can be divided into two main phases. In the first phase (2019-2022), this topic began to attract the attention of researchers, but the number of publications was still limited with a total of around 20 documents published or contributing around 19.23% of the 104 existing documents, so the impact of citations was still relatively low. In the final phase (2023–2025), the academic attention to this topic increased sharply, with approximately 84 documents published, or about 80.77% of the total publications, and the impact of citations also increased. Overall, the growth in the number of documents and citations shows that the study of digital leadership transformation in higher education is gaining an important position in the international research discourse.

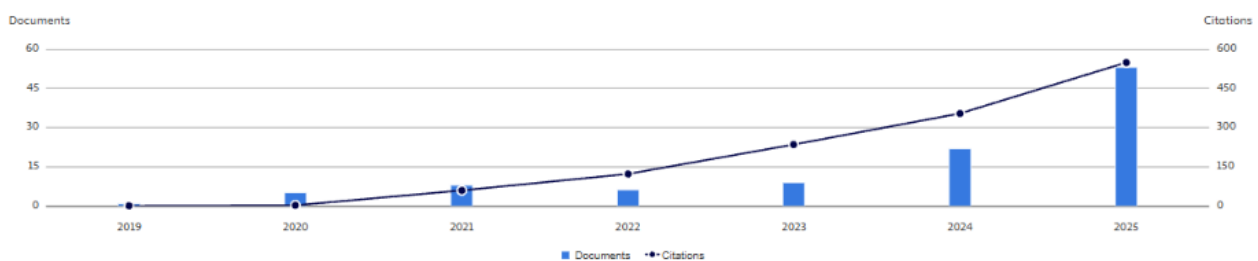


Figure 2. Distribution of publication and citation by year.

### Highly Cited Documents

The results of the analysis based on the Scopus database found that the 10 most frequently cited documents throughout the year are presented in Table 1. This information helps identify which articles from all target articles are the most influential in this field. The total number of citations (column C) from the top 10 articles is 1076. Based on the number of citations, the article

by Rodríguez-Abitia & Bribiesca-Correa (2021) entitled “Assessing Digital Transformation in Universities” is first rank with 181 citations. In second rank is the article by Laufer et al. (2021) titled “Digital higher education: a divider or bridge builder? Leadership perspectives on edtech in a COVID-19 reality” with 176 citations. Then in third rank is Sa & Serpa (2020) with the title “The COVID-19 Pandemic as an Opportunity to Foster the Sustainable Development of Teaching in Higher Education” with 154 citations. In fourth rank is Rodríguez-Abitia et al. (2020) with title “Digital gap in universities and challenges for quality education: A diagnostic study in Mexico and Spain” with 104 citations. In general, there are two articles have 75 and 60 citations, Antonopoulou et al. (2020) and Antonopoulou et al. (2019). And the last three articles from Ehlers (2020) and Cunha et al. (2020), have 50 more citations. And the last two articles by Aditya et al. (2021) and Nita & Gutu (2023) have 40 more citations. This reflects that most publications of digital leadership transformation in higher education have attracted the attention of researchers worldwide.

**Table 1.** Top 10 High Cited Documents

Author(s) & Year	Document Title	Publication Source	C
Rodríguez-Abitia & Bribiesca-Correa (2021)	“Assessing Digital Transformation in Universities”	Future Internet	181
Laufer et al. (2021)	“Digital higher education: a divider or bridge builder? Leadership perspectives on edtech in a COVID-19 reality”	International Journal of Educational Technology in Higher Education	176
Sá & Serpa (2020)	“The COVID-19 Pandemic as an Opportunity to Foster the Sustainable Development of Teaching in Higher Education”	Sustainability (Switzerland)	154
Rodríguez-Abitia et al. (2020)	“Digital gap in universities and challenges for quality education: A diagnostic study in Mexico and Spain”	Sustainability (Switzerland)	104
Antonopoulou et al. (2020)	“Leadership types and digital leadership in higher education: Behavioural data analysis from University of Patras in Greece”	International Journal of Learning, Teaching and Educational Research	75
Antonopoulou et al. (2019)	“Transition from educational leadership to e-leadership: A data analysis report from TEI of western Greece”	International Journal of Learning, Teaching and Educational Research	60
Ehlers (2020)	“Digital Leadership in Higher Education”	Journal of Higher Education Policy and Leadership Studies	54
Cunha et al. (2020)	“Threats, challenges, and opportunities for open universities and massive online open courses in the digital revolution”	International Journal of Emerging Technologies in Learning	53
Aditya et al. (2021)	“Categories for barriers to digital transformation in higher education: An analysis based on literature”	International Journal of Information and Education Technology	47
Niță & Guțu (2023)	“The Role of Leadership and Digital Transformation in Higher Education Students’ Work Engagement”	International Journal of Environmental Research and Public Health	46

### Most Productive Sources

The ten most productive sources are presented in Table 2. The table shows the distribution of the number of articles (column A) and the number of citations (column C) from various publication sources related to this topic. Firstly, Sustainability Switzerland have 5 articles with 270 citations. This is followed by International Journal of Learning Teaching and Educational Research with 3 articles and 139 citations. Then International Journal of Information and Education Technology, Procedia Computer Science, and Education Science have 3 articles and 65, 39, and 34 citations. Followed by Journal of Higher Education Policy and Leadership Studies and Electronics Switzerland both have 2 articles with more 50 citations. Finally, several other sources such as Systems, Frontiers in Education, and Cogent Business and Management each have 2 articles with 35, 9, and 7 citations. Overall, this table illustrates that even though some journals publish only a few articles, their citation rates remain high.

**Table 2.** Top 10 Most Productive Sources

Sources	A	C
Sustainability Switzerland	5	270
International Journal of Learning Teaching and Educational Research	3	139
International Journal of Information and Education Technology	3	65
Procedia Computer Science	3	39
Education Sciences	3	34
Journal of Higher Education Policy and Leadership Studies	2	54
Electronics Switzerland	2	51
Systems	2	35
Frontiers in Education	2	9
Cogent Business and Management	2	7

### Most Productive Authors

We analyzed the productive authors in this publication. (Figure 3) shows a map of productive authors in this publication from 2019 to 2025 with bibliographic coupling of authors. In bibliometric data, only maximum of 25 authors per document. We set the minimum number of documents for an author is 1 with minimum of 30 citations of an author. From 46 of the 379 authors met the threshold. And then from 45 was found 27 items are organized into 6 clusters. The largest cluster consists of 3 authors (red) led by Deacon, Bronwen with 1 document, 247 TLS, and 7 collaborations. The second cluster (green) has 2 authors led by Antonopolou, Hera with 1 document, 174 TLS, and 6 collaborations. The third cluster (blue) consist of 2 authors and is centered by Dewasiri, Narayanage Jayantha Tatjana with with 1 document, 273 TLS, and 9 collaborations. And the fourth cluster (yellow) has 2 authors led by Rodriguez -Abitia, Guillermo with 1 document, 134 TLS, and 6 collaborations with other authors. The fifth cluster (purple) has 2 authors led by Haugsbakken, Halvdan with 1 document, 167 TLS, and 7 collaborations with other authors. And the last cluster (cyan) led by Gutu, Ioana with 1 document, 215 TLS, and 12 collaborations with other authors. Overall, this figure shows that the most dominant authors contributions and impact of this research.



**Figure 3.** The Bibliographic Coupling of Authors

### Most Productive Countries

We also analyzed the collaborative writing relationships between countries. Figure 4 shows a map of collaborative writing between countries with bibliographic coupling of countries. In bibliometric data, only maximum of 25 countries per document. We set the minimum number of documents for a country to 2 with a minimum of 15 citations for each country. And was found 21 met the threshold of the 58 countries. From 21 contributing countries, they are organized into 4 clusters. The largest cluster consists of 9 countries (red) led by the Germany with 7 documents, 359 TLS, and 15 collaborations with other countries. The second cluster (green) has 5 countries and is led by the United States with 8 documents, 485 TLS, and 14 collaborations. The third cluster (blue) consists of 4 countries and is centered on the United Kingdom with 11 documents, 563 TLS, and 16 collaborations with other countries. The last cluster (yellow) consists of 3 countries and is centered on the Malaysia with 8 documents, 815 TLS, and 11 collaborations. As a result, Germany, United States, United Kingdom, and Malaysia are the largest nodes, indicating the productivity of these countries. It can be concluded that these 4 countries are considered leading countries in terms of publications.

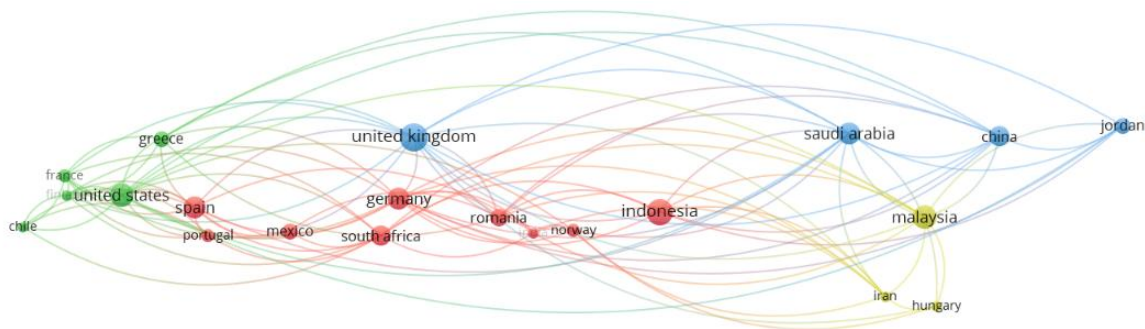


Figure 4. The Bibliographic Coupling of Countries

### Most Frequently Used Keyword

To create a map displaying the most frequently used keywords in titles, abstracts, and keywords, an analysis was performed using co-occurrence of author keywords. To generate the analysis network, we used VOSviewer. A minimum of 2 keyword occurrences with 50 keywords met the threshold of 534 keywords. The visualization map of author keywords is then displayed in Figure 5.

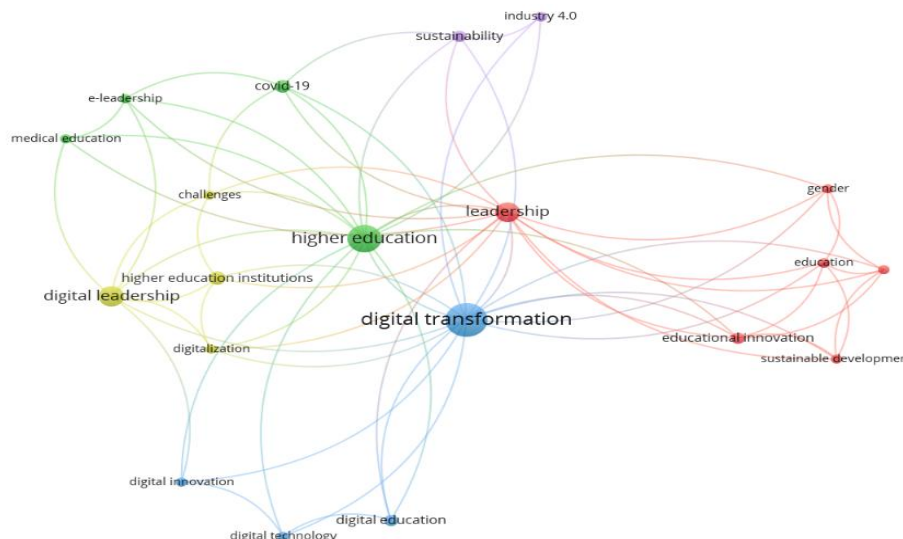


Figure 5. The Co-Occurrence of Author Keywords

The most frequently occurring keywords based on clusters are digital transformation (blue), higher education (green), leadership (red), digital leadership (yellow), and sustainability (purple).

**Table 3.** Most Frequently Used Keywords

No.	Author Keywords	Occ	TLS	Links
1.	digital transformation	43	51	16
2.	higher education	29	48	15
3.	digital leadership	16	16	8
4.	leadership	15	31	15
5.	sustainability	5	9	5

As listed in (Table 3), there are 5 top keywords, indicating that all of these keywords are popular keywords related to this topic. Specific with the topic, the most frequently appearing keywords are digital transformation (43 occurrences, 51 TLS, and 16 links), higher education (29 occurrences, 48 TLS, and 15 links), and digital leadership (16 times, 16 TLS, and 8 links). These findings indicate that these keywords have been used by researchers in recent years.

### **The Challenges of Implementing Digital Leadership Transformation in Higher Education**

The transformation of digital leadership in the context of higher education faces a variety of conceptual and practical challenges. Higher education leaders are frequently unprepared to respond to changes in systems and the demands of digital technology in institutional management (Msila, 2022). Structural barriers within traditional institutions hinder the adoption of agile and digitally oriented management practices (Ehlers, 2020). Additionally, limited information and communication technology (ICT) competencies among faculty and staff create resistance to the modernization of academic and administrative processes (Liao & Ismail, 2025; Morze et al., 2021). The technology access gap in developing institutions also impacts the uneven digital readiness between faculties and campuses (Ayasrah et al., 2025). In the external context, regulatory pressures, a lack of clear institutional policies, adaptation to the disruptions of the industrial revolution 4.0, and psychological pressures resulting from crisis conditions further exacerbate implementation failures (Okunlola & Naicker, 2025; Makhachashvili et al., 2025). Therefore, the success of implementing digital leadership transformation depends heavily on internal readiness and institutional infrastructure support.

### **The Benefits After Implementing Digital Leadership Transformation in Higher Education**

The implementation of digital leadership transformation has demonstrated significant benefits for the holistic performance of higher education institutions. Digital leadership can drive improvements in digital literacy across all campus components, thereby facilitating the integration of technology into academic and administrative services (Suryadi et al., 2024). This transformation also enhances the effectiveness of internal management through the optimization of ERP and CRM platforms and support for digital service innovations (e-Protocol, blended learning, and access to online learning resources) (Antonopoulou et al., 2020; Iqbal et al., 2025). Another benefit is increased institutional flexibility in facing global disruptions such as pandemics or socio-technological changes, allowing the campus to maintain academic quality with greater resilience (Ayasrah et al., 2025; Ulatowska, 2024). Moreover, digital transformation helps accelerate research performance, innovation, and overall operational efficiency at universities (Yuan & Khan, 2024; Javed et al., 2025). In this way, digital leadership transformation yields significant improvements in institutional performance, innovation, and resilience.

### **The Strategies to Implementing Digital Leadership Transformation in Higher Education**

Strategies for implementing digital leadership transformation must be multifaceted, beginning with the development of a strong and clear leadership vision and a commitment to digital competencies. Leadership curricula are being updated with a focus on digital agility and technology-related cognitive abilities (Ehlers, 2020). Strengthening digital education leaders through ICT competency training, the implementation of visionary leadership models, and strategic collaboration among faculty, staff, and top management is crucial to ensuring sustainable transformation (Msila, 2022; Zhu et al., 2024). Optimizing data-driven management processes and digital platforms, along with the use of measurable digital leadership performance indicators, can facilitate collective decision-making (Liao & Ismail, 2025; Suryadi et al., 2024). Other identified strategies include developing transdisciplinary leadership models, mapping strategic

digital projects, and integrating management e-learning to enhance institutional coordination in the face of technological disruption (Ulatowska, 2024; Ayasrah *et al.*, 2025; Suryadi *et al.*, 2024). This means that the implementation of digital leadership transformation must involve improving digital competencies, collaboration, and system integration to achieve sustainable transformation.

## CONCLUSION

Digital leadership transformation in higher education has become an evolving strategic issue that has garnered significant attention in global research during the 2019–2025 period. Based on the results of bibliometric analysis and a systematic literature review, this study indicates a significant increase in the number of publications and citations, particularly since 2023. This indicates that digital transformation in higher education leadership is viewed as a critical necessity to address technological changes, industry demands, and the dynamics of 21st-century learning. Dominant keywords such as digital transformation, higher education, and digital leadership suggest that current research focuses on strengthening technology-based institutional governance and fostering an academic culture adaptable to the digital era.

This study also found that the implementation of digital leadership transformation faces various challenges, such as limited digital competencies among educators, resistance to organizational change, gaps in technological infrastructure, and weak institutional policy support. Nevertheless, the adoption of digital leadership offers significant benefits, including improved management effectiveness, innovation in academic services, operational efficiency, learning flexibility, and institutional resilience in the face of global disruption. Effective implementation strategies require strengthening the vision of digital leadership, ICT competency training, multidisciplinary collaboration, and the optimization of data-driven management systems. Therefore, digital leadership transformation must be viewed as a continuous process that is not only technology-oriented but also focused on human resource development and the sustainability of higher education institutions in the future.

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