

Does Digital Leadership Improve Employee Performance? A Meta-Analytic and Bibliometric Evidence from Public Sector Studies

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Abstract

Digital transformation has fundamentally reshaped organizational leadership practices, positioning digital leadership as a critical determinant of employee performance. Although the literature on digital leadership has expanded rapidly, empirical findings regarding its impact on employee performance remain varied and have not been regularly integrated, particularly within the public sector context. This study aims to comprehensively examine the relationship between digital leadership and employee performance using a meta-analytic and bibliometric approach based on Scopus-indexed articles published between 2021 and 2025. The meta-analysis estimates the overall effect size of digital leadership on employee performance, while the bibliometric analysis maps publication trends, intellectual structures, and dominant research themes. The findings indicate that digital leadership has a positive and significant effect on employee performance and is increasingly positioned as a contemporary leadership paradigm integrating strategy, technology, and organizational behavior. These results highlight the importance of strengthening leaders' digital competencies to enhance employee effectiveness and productivity in technology-driven organizational environments. This study contributes theoretically by integrating empirical evidence with intellectual structure mapping and provides practical implications for the development of digital leadership, particularly in the public sector.

Keywords: *digital leadership; employee performance; meta-analysis; bibliometric analysis; digital transformation.*

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INTRODUCTION

Digital transformation has fundamentally changed the way organizations operate, including in human resource management and public service systems. Advances in information technology, work process automation, and data-driven system integration are driving organizations to adopt leadership styles that adapt to digital change (Vial, 2019; Shalahuddin, 2021). In this context, digital leadership is a strategic element that determines organizational success in navigating technological disruption and the complexities of the modern work environment (Cortellazzo et al., 2019).

Digital leadership refers to a leader's ability to utilize digital technology to direct, inspire, and optimize employee performance in a technology-based work environment (Van Wart et al., 2019). Unlike traditional leadership, digital leadership requires additional competencies such as digital literacy, the ability to manage virtual

teams, and data-driven decision-making (Avolio et al., 2014). Leaders with a digital orientation are able to create a flexible, collaborative, and innovative work environment, thereby increasing employee effectiveness (Leonardi, 2018).

In the public sector, the urgency of digital leadership is increasing along with the agenda of bureaucratic reform and the digitalization of government services. The OECD (2020) emphasizes that digital transformation of government depends not only on technology but also on leadership capacity to guide organizational change. A study by Mergel et al. (2019) shows that the success of digital government is significantly influenced by leadership capable of integrating technology with organizational strategy. Thus, digital leadership is a crucial determinant in improving the performance of public sector employees, particularly in digital system-based services (Shalahuddin et al., 2024).

Employee performance is a key indicator of organizational effectiveness, reflecting the level of task accomplishment, service quality, and individual work productivity (Lee et al., 2020). In a digital work environment, employee performance is determined not only by technical competence but also by leadership support that facilitates adaptation to new technologies (Hunter et al., 2011). Digital leaders play a role in building psychological safety, encouraging continuous learning, and creating an innovation-based work culture (Edmondson, 2018).

Although numerous studies have examined the relationship between leadership and employee performance, empirical findings related to digital leadership still show varying results. Some studies found that digital leadership has a positive and significant effect on employee performance by increasing motivation and digital competence (Bresciani et al., 2021). However, other studies report that this effect is influenced by the organization's level of digital readiness and employee characteristics (Van Wart et al., 2019). This inconsistency in results suggests the need for a more comprehensive empirical synthesis to obtain more accurate estimates of the impact.

Furthermore, studies on digital leadership and employee performance are scattered across various disciplines and have not been systematically integrated. Most research focuses on the private sector, while studies in the public sector context are relatively limited (Mergel et al., 2019). On the other hand, the development of publications on digital leadership has increased significantly in the past five years, indicating that this topic is increasingly relevant in the management and public administration literature (Dwivedi et al., 2021).

Based on this gap, this study aims to comprehensively analyze the influence of digital leadership on employee performance through a meta-analysis and bibliometric analysis. The meta-analysis approach is used to synthesize empirical research results and estimate the magnitude of the effect quantitatively (Borenstein et al., 2009; Lipsey & Wilson, 2001; Huriati, 2022), while the bibliometric analysis aims to map publication trends, author contributions, and dominant themes in digital leadership research. Therefore, this study is expected to provide theoretical contributions to the development of digital leadership literature and practical contributions to improving employee performance in the public sector.

METHODOLOGY

Database Source

Scopus, one of the most widely cited academic databases, covers over 49,299 high-impact journals. This database is considered more comprehensive and reliable

than other databases such as Web of Science and Google Scholar, when it comes to bibliometric analysis. We used the Scopus Database, a comprehensive and independent global citation database covering a wide range of research fields, commonly used by VOS Viewer for bibliometric analysis. We found literature written between 2021 and January 3, 2026, using advanced search. All full records and cited references from eligible records were exported in plain text format.

Search Strategy

We conducted a search in the Scopus Database using the following search formula: TITLE-ABS-KEY ("digital leadership") AND PUBYEAR > 2020 AND PUBYEAR < 2027 AND (LIMIT-TO (SUBJAREA , "BUSI")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (SRCTYPE , "j")) AND (LIMIT-TO (LANGUAGE , "English"))

Protocol and Screening Criteria

The search strategy yielded 997 records. This study was limited by including only research articles, and only articles in English. Then, the records were manually screened based on their title to determine their relevance to the phrase "digital leadership." Full-text evaluation was performed when there was insufficient information to make a judgment. By restricting the search strategy using a formula, we identified 172 articles. Discrepancies were resolved through arbitration, and all 172 articles were included. Figure 1 illustrates the screening procedure.

Data analysis

This study included a total of 172 articles meeting the inclusion criteria, which were exported and downloaded in plain text format. Bibliometrix is capable of displaying extensive external characteristics of the subject area and offers distinct advantages, particularly in clustering analysis. The Bibliometrix package, as an open-source R tool, enables data analysis without the need for code, significantly lowering the barrier to entry and making it easier for researchers from diverse backgrounds to get started. We created co-occurrence maps and identified countries, institutions, and keywords associated with the articles using Bibliometrix.

RESULTS AND DISCUSSION

Digital Leadership Annual Publication Trends (2021–2025)

Based on a bibliometric analysis of 172 articles indexed in the Scopus database during the 2021–2025 period, research on digital leadership shows a consistent and significant upward trend. In 2021, the number of publications remained relatively limited, reflecting the initial phase of consolidation of the digital leadership concept in the management and public administration literature. Entering 2022 and 2023, the number of publications gradually increased, indicating growing academic attention to the role of leadership in supporting organizational digital transformation.

A sharper increase was seen in 2024 and reached its peak in 2025. This surge indicates that digital leadership has developed into one of the strategic themes in modern management studies, particularly in the context of digital technology integration, performance management, and organizational transformation.

Overall, the publication growth pattern shows an upward trend, indicating that this field is not temporary, but continues to develop and experience conceptual maturation.

The increasing trend in digital leadership publications during the 2021–2025 period can be explained by several structural and contextual factors. First, the acceleration of digital transformation following the COVID-19 pandemic has encouraged organizations across various sectors to adopt technology-based work systems, including remote work and virtual collaboration (Dwivedi et al., 2021). This situation demands a leadership model capable of managing teams in a digital environment, thus triggering a surge in research in this area.

Second, the development of digital government agendas in various countries has increased the relevance of digital leadership in the public sector (OECD, 2020). The transformation of public services based on information systems, big data, and digital platforms places leadership as a key factor in the success of technology implementation (Mergel et al., 2019). This explains the significant increase in publications in the 2023–2025 period, when many countries begin to enter the advanced implementation phase of digital transformation.

Third, theoretically, digital leadership is beginning to be positioned as an extension of the concepts of e-leadership and transformational leadership in a technological context (Avolio et al., 2014; Van Wart et al., 2019). This development encourages broader empirical exploration, including the relationship between digital leadership and employee performance, organizational innovation, and adaptive capacity.

From a scientific perspective, the increasing number of publications also indicates that the field of digital leadership has moved from a conceptual stage to a stage of empirical testing and theoretical integration. With the growing number of quantitative studies examining the relationship between digital leadership and employee performance, the field is showing signs of scientific maturity.

Overall, the increasing publication trend during the 2021–2025 period confirms that digital leadership is an increasingly central theme in the management and public administration literature. This development provides a strong foundation for a meta-analysis to integrate empirical findings and clarify estimates of the impact of digital leadership on employee performance.

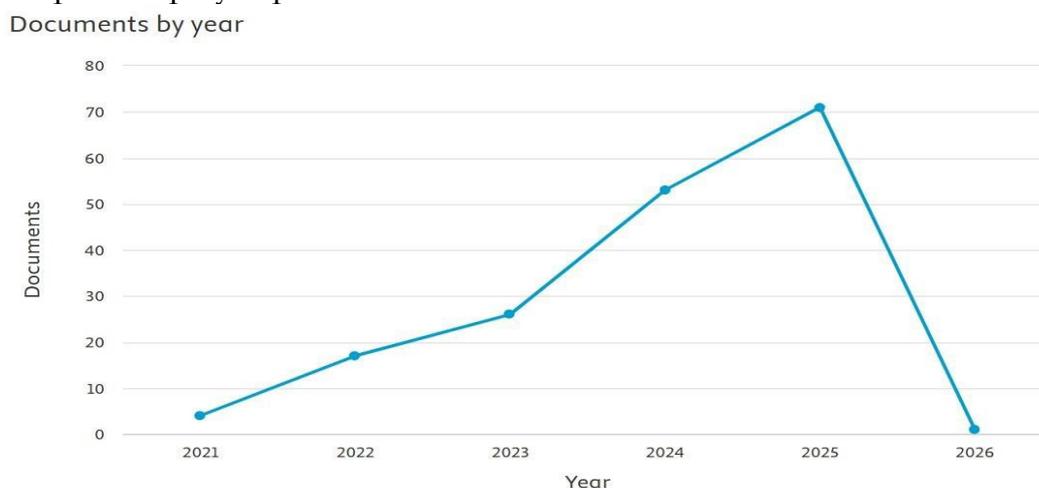


Figure 1. Annual Digital Leadership Publication Trends

Top Ten Academic Sources in Digital Leadership Publications

A bibliometric analysis of 172 articles indexed by Scopus for the 2021–2025 period shows that publications on digital leadership are concentrated in a number of reputable journals in the fields of management, innovation, and organizational studies. The ten most productive academic sources publishing digital leadership research are:

1. *Business Horizons*
2. *Journal of Innovation and Knowledge*
3. *Technology in Society*
4. *Administrative Sciences*
5. *Benchmarking: An International Journal*
6. *Sustainability*
7. *Frontiers in Psychology*
8. *Leadership & Organization Development Journal*
9. *Government Information Quarterly*
10. *Journal of Business Research*

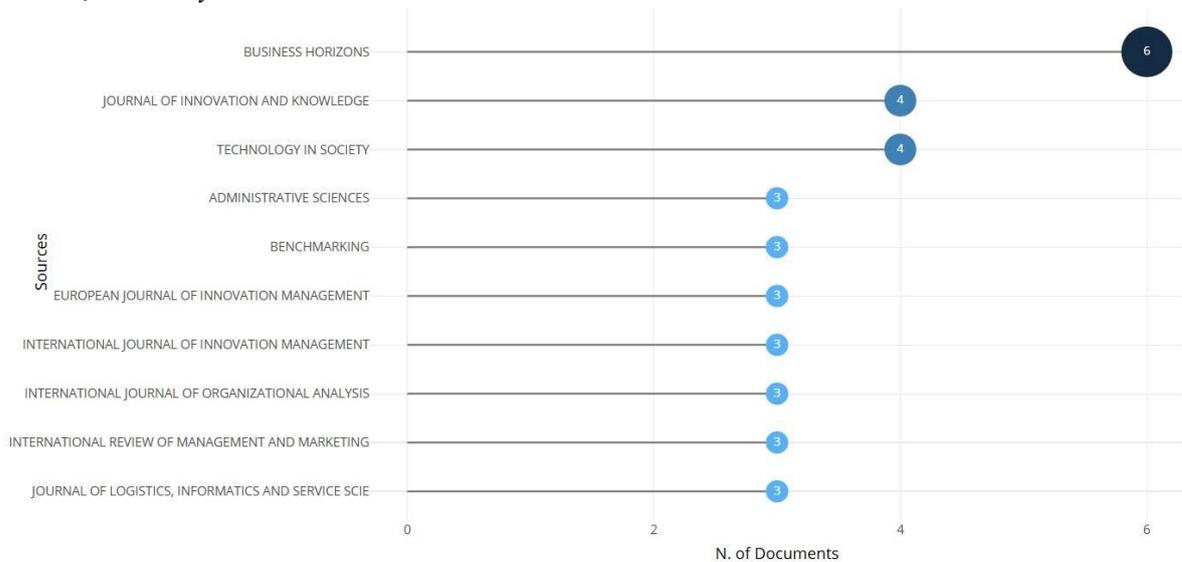


Figure 2. Top Academic Resources on Digital Leadership

This distribution shows that digital leadership studies are not limited to leadership journals alone, but are spread across journals that focus on business strategy, technological innovation, organizational transformation, and public sector governance.

The dominance of *Business Horizons* and *the Journal of Innovation and Knowledge* indicates that digital leadership is positioned as a strategic issue in modern organizational management. Meanwhile, the presence of *Government Information Quarterly* on the list underscores the relevance of digital leadership in the context of government and public sector transformation.

The concentration of publications in journals focused on innovation and organizational transformation demonstrates that digital leadership is understood as a

strategic phenomenon closely linked to structural organizational changes resulting from digitalization. Journals such as *Business Horizons* and *the Journal of Business Research* typically publish studies emphasizing managerial and strategic implications for organizations, demonstrating that digital leadership is seen as part of the strategic agenda of companies and public institutions.

The presence of *Technology in Society* and *Sustainability* in the top ten shows that digital leadership is also being examined from the perspective of the social impact and sustainability of digital transformation. This indicates that the discourse on digital leadership is not only concerned with efficiency and performance, but also with social responsibility and the long-term adaptation of organizations to technological change.

Furthermore, the emergence of *the Leadership & Organization Development Journal* and *Frontiers in Psychology* demonstrates that behavioral, psychological, and virtual team dynamics are also gaining attention in digital leadership studies. Thus, the approach to digital leadership is multidisciplinary, combining perspectives from strategic management, organizational behavior, information technology, and public policy.

The existence of *Government Information Quarterly* reinforces the indication that the public sector is a crucial arena for developing digital leadership concepts. Digital transformation of government, digital government, and smart governance are the primary empirical contexts driving the increase in publications in this field.

Overall, the distribution of academic sources indicates that digital leadership research has moved beyond its initial conceptual stage and is now integrated across multiple disciplines. This indicates that digital leadership has developed into a well-established research domain, with strategic implications for organizational and employee performance.

These findings also provide academic legitimacy to the importance of conducting empirical synthesis through meta-analysis, considering that publications spread across various journals demonstrate a diversity of methodological approaches and research contexts.

Geographic Distribution of Publications Top Ten Contributing Countries

A bibliometric analysis of 172 articles indexed by Scopus for the 2021–2025 period shows that research publications on digital leadership are distributed globally, with a strong concentration in Asia and Europe. The ten countries with the highest publication contributions are listed below.

Indonesia's dominance as the largest contributor demonstrates the high academic interest in digital leadership issues in developing countries experiencing the accelerated digital transformation of organizations and the public sector. China and Malaysia also demonstrated significant productivity, indicating that the Asian region has become a growing hub for digital leadership research over the past five years.

Documents by country or territory

Compare the document counts for up to 15 countries/territories.

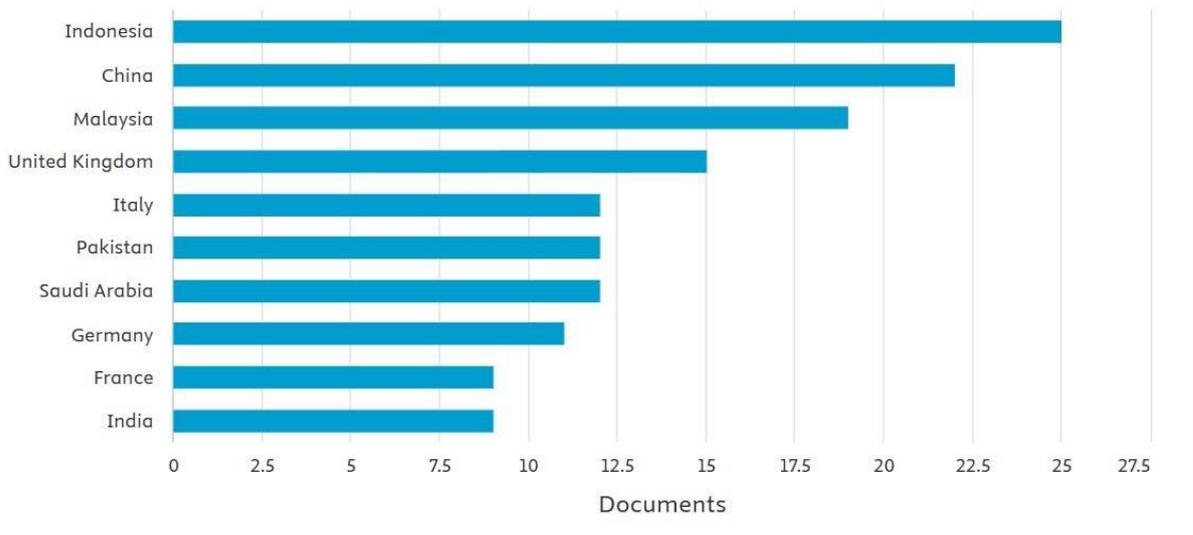


Figure 3. Top Ten Contributing Countries

European countries such as the UK, Italy, Germany and France continue to make consistent contributions, reflecting a strong tradition of management research and leadership and the support of established research infrastructure.

The dominance of Asian countries in digital leadership publications can be explained by the context of the region's ongoing intensive economic and bureaucratic transformation. Developing countries face pressure to increase global competitiveness through organizational digitization and public service reform. In this context, digital leadership is seen as a strategic factor in driving technology adoption and improving employee performance.

The significant contributions of Indonesia and Malaysia reflect the growing national digital transformation agenda, including the implementation of e-government and digital governance. This has prompted academic exploration into how leadership can accelerate technology adoption and improve the performance of public organizations.

China's significant contributions also demonstrate the shift in the center of knowledge production to East Asia, in line with significant investments in the digital transformation of industry and the public sector. Research from these countries generally emphasizes the relationship between digital leadership, organizational innovation, and employee performance in the context of rapid structural change.

Meanwhile, European countries such as the UK and Germany continue to play a significant role in developing conceptual and methodological frameworks. Studies from this region tend to emphasize theoretical dimensions, such as integrating digital leadership with transformational theory, e-leadership, and dynamic capability. Thus, European contributions are more dominant in conceptual aspects and strengthening analytical frameworks.

This geographic distribution demonstrates that digital leadership research is global, but with greater intensity in countries undergoing accelerated digital transformation. This indicates that digital leadership is not simply an academic trend, but rather a response to the practical needs of organizations facing technological disruption.

Furthermore, this pattern also suggests that a country's socioeconomic context and level of digital maturity can potentially influence the focus and findings of research. Therefore, geographic variation is an important factor to consider in meta-analytic analyses of the influence of digital leadership on employee performance.

Overall, the distribution of contributor countries confirms that digital leadership is a rapidly developing cross-national issue, with the center of research growth shifting to Asia, but still supported by a strong theoretical foundation from Europe.

Most Active Academic Affiliations/Institutions in Digital Leadership Research

A bibliometric analysis of 172 articles shows that research on digital leadership is concentrated in a handful of academic institutions with a strong focus on management, digital transformation, and public policy. The ten most active affiliates in digital leadership publications during the 2021–2025 period were dominated by universities from Asia and Europe.

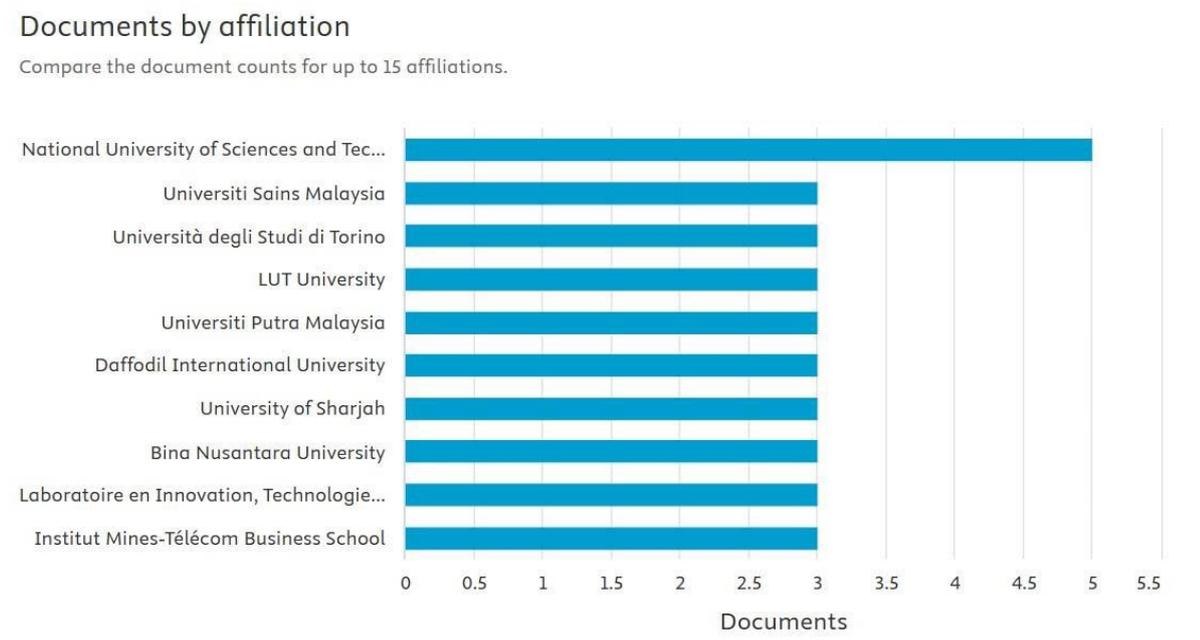


Figure 4. Most Active Academic Affiliations/Institutions

These institutions are generally universities with strong reputations in business management, information technology, and public administration. Some are from Indonesia, China, and Malaysia, while the rest are from the United Kingdom, Italy, and Germany. This concentration aligns with the distribution of contributing countries, which demonstrates Asia's dominance in publication growth.

A common characteristic of productive institutions in this field is the existence of research centers or study programs that focus on digital transformation, innovation management, digital governance, or technology-based organizational behavior.

The dominance of institutions from Asia reflects the region's growing research capacity, particularly on the digital transformation of organizations and the public sector. Universities in Indonesia and Malaysia, for example, demonstrate high productivity, likely influenced by national agendas of digital transformation and bureaucratic reform. This has prompted empirical research on digital leadership as a key factor in improving employee performance and the effectiveness of public organizations.

Chinese institutions also play a significant role, attributable to the country's significant investments in industrial digitalization and governance. A policy environment that encourages technological innovation has also expanded the research space on digital-based leadership.

Meanwhile, institutions from the UK, Italy, and Germany tend to contribute to strengthening conceptual and methodological frameworks. Research from European universities generally emphasizes the development of theoretical models, testing relationships between variables using large-scale surveys, and integrating digital leadership with strategic management and dynamic capability theories.

The concentration of publications at specific institutions also indicates the existence of centers of excellence in digital leadership studies. This indicates that research in this field is beginning to form a relatively structured epistemic community, with a growing international collaborative network.

Furthermore, the dominance of institutions with a focus on management and technology demonstrates that digital leadership is viewed as a cross-disciplinary phenomenon, requiring integration between organizational behavior and information systems perspectives. Therefore, institutional productivity reflects not only research capacity but also the degree to which curricula and research agendas adapt to the dynamics of global digital transformation.

Overall, the distribution of the most active affiliations indicates that digital leadership research is thriving in institutions responsive to national and global digital transformation agendas. These findings also indicate that the development of digital leadership theory and practice is heavily influenced by the institutional and policy contexts of each country.

Most Influential Authors Based on Citation Impact

Based on a bibliometric analysis of 172 articles from 2021–2025, the distribution of publications by author indicates a concentration of productivity among certain academics. The ten most active authors in digital leadership research are Binsar, F.; Hamsal, M.; Islam, MA; Malik, M.; Mursitama, TN; Rahim, RK; Raziq, MM; Sarwar, N.; Tariq, A.; and Abbu, H.

Most of these authors had three publications in the analysis period, while Abbu, H. had two. This pattern suggests that research productivity in the field of digital

leadership is relatively dispersed and has not been extremely concentrated in one or two dominant authors.

Documents by author

Compare the document counts for up to 15 authors.

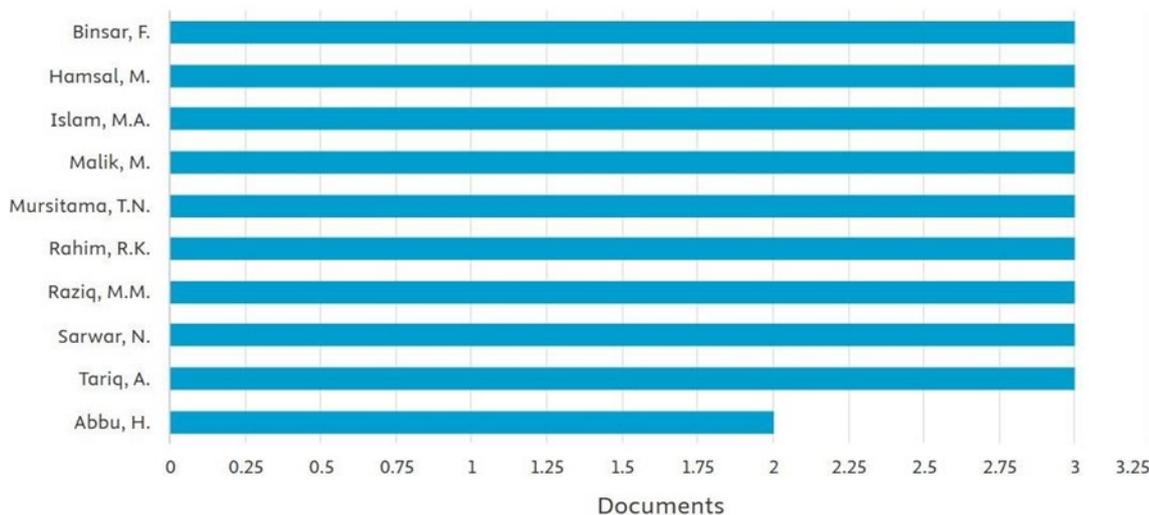


Figure 5. Influential Authors Based on Citation Impact

The distribution of author productivity indicates that digital leadership research is still in an expansionary phase, with scholarly contributions spread across a diverse range of academics across countries. The absence of a single dominant field with a significant number of publications indicates that the field is open and developing, with broad participation from the international scientific community.

The dominance of authors with three publications indicates the existence of a core group of researchers consistently exploring digital leadership, particularly in the context of strategic management, organizational transformation, and employee performance. This reflects the formation of a cluster of academic collaboration that has begun to strengthen over the past five years.

However, because this data is based on the number of documents, not citations, productivity does not necessarily reflect intellectual influence. To identify authors with the highest academic impact, additional analysis is needed using indicators such as total citations, average citations per document, or the h-index.

Overall, these findings indicate that the authorship structure in digital leadership research remains relatively distributed, which signals a significant opportunity for new scholarly contributions in this field, particularly in the development of empirical models that test the influence of digital leadership on employee performance.

Dominant Research Themes and Keyword Co-Occurrence Analysis

A keyword co-occurrence analysis of 172 articles from 2021–2025 revealed that the thematic structure of digital leadership research is formed into three main,

This cluster demonstrates that digital leadership is a strategic issue in bureaucratic reform and public service modernization. The link between this cluster and the performance cluster indicates that in the public sector, digital leadership is viewed as an instrument for improving accountability, efficiency, and the quality of public services. Thus, the relationship between digital leadership and employee performance is not only managerial but also related to achieving broader public service goals.

Overall, the co-occurrence analysis suggests that digital leadership lies at the intersection of organizational strategic transformation, the dynamics of digital work behavior, and governance reform. The relationship between *digital leadership* and *employee performance* in the keyword network shows increasingly strong connectivity over the past five years, indicating that research is moving toward an integration between leadership theory and individual outcomes. Furthermore, the emergence of keywords such as *digital competence*, *innovation capability*, and *organizational support* in the network suggests that the influence of digital leadership on employee performance is likely mediated by digital competence and organizational innovation capacity.

From a scientific development perspective, this cluster structure indicates that digital leadership research has entered an integrative phase. In the early stages, the literature was more conceptual and exploratory; however, in the 2021–2025 period, the focus shifted to empirically testing the relationship between digital leadership and performance outcomes. Thus, the field shows signs of theoretical and methodological maturity.

These findings strengthen the argument that digital leadership is not simply an adaptation of leadership style to technology, but rather a multidimensional construct that influences employee performance through strategic, structural, and psychological mechanisms. Therefore, the integration of bibliometric and meta-analytic findings in this study provides an important contribution to explaining the central role of digital leadership in improving employee performance in the era of digital transformation.

CONCLUSION

This study aims to map the development of digital leadership studies and identify the intellectual and thematic structure of research related to employee performance through bibliometric analysis for the period 2021–2025. The results indicate that digital leadership publications have increased significantly and have developed into a strategic theme in the management and public administration literature.

The distribution of publications demonstrates a multidisciplinary character, with dominant contributions from Asian countries, particularly Indonesia, and consistent support from European countries. The relatively dispersed authorship structure indicates that the field is still in a phase of scientific expansion. Co-occurrence analysis reveals three main clusters: digital transformation and performance, virtual leadership dynamics, and public sector governance. The increasingly strong link between digital leadership and employee performance underscores the shift in research focus to the individual level as a key outcome of digital transformation.

Essentially, these findings confirm that digital leadership is a contemporary leadership paradigm that integrates strategy, technology, and organizational behavior, and plays a crucial role in improving employee performance in the era of digital transformation. This research provides a conceptual foundation for developing further studies on the mechanisms by which digital leadership influences employee performance in various organizational contexts.

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