West Science Information System and Technology
Vol. 3, No. 02, August 2025, pp. 151~158

Big Data Analytics in Decision Making: A Bibliometric Mapping of Scientific Contributions

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Article Info

Article history:

Received August, 2025
Revised August, 2025
Accepted August, 2025

Keywords:

Big Data Analytics,
Decision Making,
Bibliometric Analysis,
VOSviewer

ABSTRACT

This study aims to map the intellectual, conceptual, and collaborative landscape of scientific research on Big Data Analytics (BDA) in the context of decision-making using a bibliometric approach. Drawing data from the Scopus database and analyzing it through VOSviewer, the study identifies publication trends, influential authors, high-impact journals, keyword co-occurrence patterns, and international collaboration networks. The results reveal that "big data" serves as the dominant thematic core, often interconnected with concepts such as data analytics, data mining, information management, and artificial intelligence. Temporal and density visualizations indicate a shift in research focus from traditional data management toward intelligent decision support systems and real-time analytics. Additionally, countries such as China, the United States, and the United Kingdom emerge as central actors in shaping global collaboration. The study contributes to the theoretical understanding of the field by highlighting its interdisciplinary nature and provides practical insights for policymakers, academics, and practitioners seeking to leverage BDA for more effective, data-driven decision-making. Limitations and directions for future research are also discussed.

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1. INTRODUCTION

The exponential growth of data in the digital age has fundamentally transformed how individuals, organizations, and governments perceive and engage in decision-making processes. As data becomes increasingly ubiquitous—originating from sensors, social media, enterprise systems, and mobile applications—traditional analytical approaches struggle to cope with the volume, variety, and velocity of information. This explosion of data has given rise to the domain of Big Data, which refers to datasets so large and complex that conventional data processing methods are inadequate [1], [2]. Big Data is typically characterized by the "5 Vs": Volume, Velocity, Variety, Veracity, and Value [3]. These attributes encapsulate the challenges and opportunities inherent in modern data management, laying the foundation for a new paradigm of data-driven decision-making.

In response to these developments, Big Data Analytics (BDA) has emerged as a crucial capability for harnessing the full potential of complex datasets. BDA combines advanced techniques such as machine

learning, data mining, predictive analytics, and natural language processing to extract actionable insights from massive data streams [4]. The integration of BDA into decision-making has allowed organizations to move from reactive approaches to proactive and even prescriptive strategies. Across industries, BDA has been credited with enabling smarter business decisions, optimizing operational efficiency, predicting market behavior, and improving customer experiences [5], [6]. In public sectors, it has been employed to improve policy-making, crisis response, and resource allocation. The influence of BDA in shaping both strategic and operational decisions has made it a critical area of academic and practical inquiry.

Given its transformative power, scholarly attention toward BDA has grown significantly over the past decade. The academic discourse spans multiple domains, including business, healthcare, finance, education, logistics, and government administration. Studies have explored technical, organizational, and human aspects of BDA implementation, ranging from data governance to ethical implications [7]. However, the literature remains fragmented, with diverse approaches, contexts, and terminologies creating silos within the knowledge base. To navigate this complexity, bibliometric analysis has become an increasingly popular method for mapping scientific landscapes. By using tools such as VOSviewer and Bibliometrix, researchers can identify trends, influential contributors, collaborative networks, and thematic clusters across a body of literature [8].

Several studies have attempted to examine the bibliometric structure of research on Big Data and analytics. For instance, [9] conducted a bibliometric review of over 600 publications related to BDA and information management, identifying key trends and scholarly collaborations. Similarly, Di [10] performed a structured literature review to assess the link between BDA and decision-making, emphasizing gaps in research within nonprofit organizations, public institutions, and small-to-medium enterprises. These studies underscore the growing academic interest in the intersection between analytics and decision processes. However, many focus on broader applications of BDA or narrow technological themes rather than providing a focused bibliometric mapping specifically tied to the concept of decision making as an intellectual and practical domain.

Despite the relevance and momentum of research in this area, several critical gaps remain. Current literature lacks a comprehensive bibliometric mapping that centers exclusively on the scientific contributions of BDA in decision-making processes. The field still requires systematic insights into who the most influential authors, institutions, and journals are, which countries are leading in global collaborations, and what thematic areas dominate the research. Additionally, while previous reviews have acknowledged the importance of analytics in driving decisions, few have offered a conceptual visualization of how these contributions are structured over time or across disciplines. As a result, scholars and practitioners alike lack a coherent overview of the intellectual architecture that underpins this evolving field. The objective of this study is to fill that gap by conducting a bibliometric mapping of scientific contributions related to Big Data Analytics in decision-making.

2. METHODS

This study adopts a bibliometric analysis approach to systematically examine the structure and evolution of scholarly contributions related to Big Data Analytics in decision-making. Bibliometric methods are widely used to quantitatively assess scientific literature by analyzing patterns in publications, citations, authorship, and co-occurrence of terms. The approach enables the identification of influential journals, authors, institutions, countries, and research themes. This study focuses particularly on mapping the intellectual, social, and conceptual structures of the field to understand how the intersection between big data and decision-making has developed over time. The

bibliometric analysis serves not only to provide a snapshot of the current research landscape but also to uncover hidden trends and suggest future research directions.

To conduct the analysis, data were retrieved from the Scopus database, one of the largest and most reliable sources for peer-reviewed scientific literature. The search query was carefully designed to capture relevant documents by using a combination of keywords such as "big data analytics," "decision making," and their variants (e.g., "data-driven decision," "BDA," "data-based decisions"). The search was limited to journal articles, conference papers, and reviews published between 2012 and 2024, reflecting the period of exponential growth in Big Data literature. Only English-language documents were included. After refining and deduplicating the dataset, the final sample comprised a total of 587 documents. The metadata, including author names, titles, abstracts, keywords, publication sources, citations, and affiliations, were exported in RIS and CSV formats for analysis.

The data were then analyzed using VOSviewer, a widely used bibliometric mapping software that allows for the construction and visualization of bibliometric networks. Specifically, the analysis included: (1) co-authorship analysis to reveal collaboration networks among authors, (2) co-occurrence analysis of keywords to identify dominant research themes and topical clusters, (3) citation analysis to detect influential publications and intellectual foundations, and (4) country-level analysis to assess global distribution and research productivity.

3. RESULTS AND DISCUSSION

Co Authorship Analysis

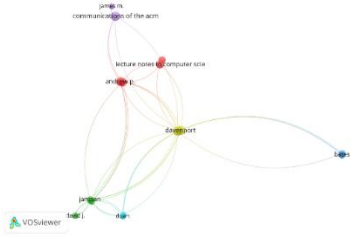

Figure 1. Author Visualization
Source: Data Analysis

Figure 1 reveals a co-authorship and co-citation network among prominent scholars and publication sources in the domain of Big Data Analytics and decision-making. At the center of the map is Davenport, a key figure in the field, who is strongly linked with multiple authors and sources, including Andrew P., Janssen, Duan, and Lecture Notes in Computer Science, indicating a central intellectual influence. The proximity and thickness of the lines suggest frequent co-citation or collaboration, particularly between Davenport and authors like Andrew P. and Janssen, reflecting their shared thematic contributions. Meanwhile, Communications of the ACM and James M. form another distinct node cluster, suggesting a separate but connected stream of literature. The presence of Bates at the periphery, yet still connected to Davenport, suggests a more specialized or emerging perspective within the broader field.

Co-Occurrence Analysis

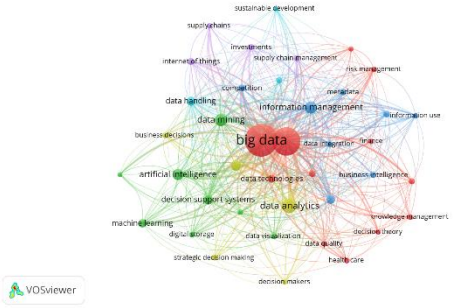

Figure 2. Network Visualization
Source: Data Analysis

Figure 2 illustrates the conceptual structure of the research landscape surrounding Big Data and decision-making through a keyword co-occurrence analysis. At the core of the map is the term "big data", represented as the largest and most interconnected node, indicating its centrality and high frequency in the literature. Closely surrounding it are key technical and analytical concepts such as "data analytics," "data mining," "data technologies," and "information management." These concepts represent the foundational components and methodologies employed in extracting value

from big data, highlighting that scholarly discussions heavily emphasize both the technological infrastructure and the processing capabilities necessary for data-driven decision-making. One of the prominent clusters (colored green) includes terms like "artificial intelligence," "machine learning," "decision support systems," and "strategic decision making." This grouping suggests a strong thematic alignment between intelligent technologies and their applications in supporting and automating decision processes. The presence of "digital storage" and "data visualization" within the same cluster indicates that not only the analysis but also the management and presentation of data are considered integral to effective decision-making. These themes reinforce the idea that the application of AI and machine learning in Big Data is not just for prediction, but also for enhancing strategic decisions across sectors.

Another significant thematic area (red cluster) emphasizes "business intelligence," "knowledge management," "decision theory," "finance," and "risk management." This cluster reflects the managerial and organizational lens through which big data is interpreted, particularly in enterprise contexts. The inclusion of "health care" and "data quality" suggests interdisciplinary extensions, showing that data analytics is increasingly being applied in sensitive and high-stakes domains. Moreover, terms like "information use" and "metadata" highlight the importance of not just data availability but also data governance and structuring, which are critical for deriving meaningful insights. The blue and purple clusters point toward broader systemic and operational themes. For instance, the blue cluster includes terms like "information management," "data integration," and "supply chain management," indicating the relevance of Big Data in organizational logistics and operational optimization. Meanwhile, the purple cluster groups terms such as "sustainable development," "supply chains," "internet of things," and "investments," highlighting the emerging relevance of Big Data in global development goals and interconnected digital ecosystems. These terms reflect the growing scholarly attention toward macro-level implications of data analytics, especially in sustainability, smart technologies, and economic forecasting.

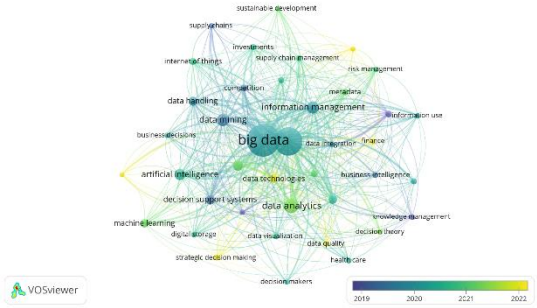

Figure 3. Overlay Visualization
Source: Data Analysis

Figure 3 offers insights into the temporal evolution of keywords in the domain of Big Data and decision-making between 2019 and 2022. At the center of the map is the keyword "big data," depicted in a medium-to-dark green shade, indicating that it has been a consistent and dominant topic throughout the observed years—primarily peaking around 2020–2021. Closely connected terms such as "data mining," "data analytics," "data technologies," and "information management" share similar colors, suggesting these foundational concepts have maintained central importance across time without significant decline or recent spikes in novelty. This central cluster reflects a stable core of methodological and technological focus in the literature.

Interestingly, terms such as "machine learning," "artificial intelligence," "strategic decision making," and "risk management" appear in brighter yellow tones, denoting more recent emphasis or growing scholarly interest, particularly around 2022. Their peripheral positions, yet strong connections to the central cluster, signal an expanding research frontier where Big Data is being integrated with intelligent decision systems and emerging business challenges. These newer terms may represent the frontier of innovation, reflecting the shift from descriptive analytics toward more prescriptive and AI-driven decision-making frameworks. Their appearance highlights the

ongoing transformation in how decision-making processes are supported by advanced analytics tools. Conversely, some nodes such as "information use," "finance," and "business intelligence" are shaded in darker blues and purples, indicating that they were more prominent in earlier years (circa 2019). Their lower frequency or diminishing color intensity suggests that while these areas were foundational in the early phase of Big Data integration into decision-making, they may now be considered mature or have been superseded by newer trends such as AI applications, IoT, and decision support systems.

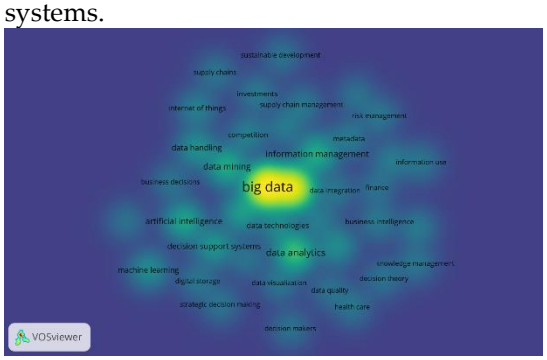

Figure 4. Density Visualization
Source: Data Analysis

Figure 4 presents a heatmap that reflects the intensity and frequency of keyword occurrences in the scholarly literature on Big Data and decision-making. At the center, the term "big data" glows bright yellow, indicating it is the most frequently occurring and central concept across the dataset. Surrounding this core are highly active but slightly less frequent terms such as "data mining," "data analytics," "data technologies," "information management," and "data integration." These appear in lighter shades of green, signaling their strong but secondary importance in shaping the discourse. This suggests that most of the academic focus in this domain remains grounded in the technological and analytical foundations of how big data is managed and utilized in decision-making contexts. As we move outward from the central cluster, the intensity diminishes into softer greens and blues, representing keywords with relatively lower frequencies. Terms such as "artificial intelligence," "machine learning," "decision support systems," and "business intelligence" still exhibit moderate density, indicating their growing relevance, though they remain less central than core infrastructural concepts. Peripheral topics such as "supply chain management," "sustainable development," "healthcare," and "knowledge management" are present but lightly illuminated, suggesting emerging or niche areas of research.

Citation Analysis

Table 1. Top Cited Literature

Citation	Author	Title
1797	[11]	Artificial intelligence for decision making in the era of Big Data – evolution, challenges and research agenda
1164	[12]	Data Science and its Relationship to Big Data and Data-Driven Decision Making
574	[13]	Factors influencing big data decision-making quality
369	[14]	Big data analytics capability and decision-making: The role of data-driven insight on circular economy performance
287	[15]	Role of big data management in enhancing big data decision-making capability and quality among Chinese firms: A dynamic capabilities view
263	[16]	Behavioral implications of big data's impact on audit judgment and decision making and future research directions
262	[17]	A review of industrial big data for decision making in intelligent manufacturing
260	[18]	Big data in the policy cycle: Policy decision making in the digital era

233	[19]	From conventional group decision making to large-scale group decision making: What are the challenges and how to meet them in big data era? A state-of-the-art survey
223	[10]	Towards felicitous decision making: An overview on challenges and trends of Big Data

Source: Data Analysis

Figure 5 visualizes international research partnerships in the domain of Big Data Analytics and decision-making. The map highlights China, the United States, and the United Kingdom as the dominant and most interconnected countries, indicating their central role in producing and co-authoring scientific literature in this field. These three nations act as global hubs, with extensive collaborative ties spanning across Europe, Asia, and the Middle East. China shows strong linkages with countries such as South Korea, Pakistan, and New Zealand, while the United States is well connected with Italy, Canada, and Saudi Arabia. The United Kingdom, on the other hand, forms a central European cluster alongside France, the Netherlands, and Portugal. Regional clusters such as Malaysia, Iraq, and Oman suggest emerging research activity and collaborations within Southeast Asia and the MENA region.

Practical Implications

The findings of this bibliometric study offer significant practical insights for policymakers, data strategists, business leaders, and public sector decision-makers. By identifying the most influential authors, countries, institutions, and thematic trends in the field of Big Data Analytics (BDA) applied to decision-making, this research provides a strategic knowledge map for professionals seeking to benchmark best practices or initiate cross-national collaborations. The visualization of co-authorship networks and keyword clusters enables practitioners to understand which areas of BDA are maturing—such as information management and data mining—and which are emerging, such as AI-driven decision support and strategic decision-making systems. Organizations can use this information to align their data initiatives with proven academic insights and emerging global trends, thereby enhancing their evidence-based decision-making capabilities.

Theoretical Contributions

This study contributes to the theoretical development of the BDA domain by systematically mapping the intellectual, social, and conceptual structures that underpin research on data-driven decision-making. It advances the literature by uncovering how traditional themes such as information systems and business intelligence have evolved into more integrated domains that now include artificial intelligence, data visualization, and digital governance. Furthermore, the co-occurrence and temporal analysis of keywords reveal how the field is shifting toward more prescriptive and real-time decision models. The research also confirms the centrality of interdisciplinary integration—linking information technology, operations management, and behavioral decision theory—which reinforces the need for more hybrid theoretical frameworks to address the complexity of decision-making in the digital era.

Limitations and Future Research

While this study provides a comprehensive overview of the bibliometric landscape, it is not without limitations. First, the analysis is restricted to documents indexed in the Scopus database, potentially excluding relevant contributions from other repositories such as Web of Science or IEEE Xplore. Second, the reliance on keyword co-occurrence may not capture nuanced methodological or contextual differences in the studies. Third, the bibliometric tools used (e.g., VOSviewer) are based on frequency and co-linkage logic, which may overlook the qualitative depth or citation motivations behind scholarly connections. Future research can address these limitations by integrating systematic literature reviews (SLR) or meta-

analyses to explore conceptual frameworks in more detail, expanding datasets to include grey literature, and applying altmetric or sentiment analysis to examine the societal impact of BDA in decision-making.

4. CONCLUSION

This bibliometric study has provided a comprehensive overview of the scientific landscape surrounding Big Data Analytics (BDA) in the context of decision-making. By analyzing publication trends, influential authors, collaborative networks, and thematic keyword clusters, the study reveals that BDA has evolved into a dynamic, interdisciplinary field that integrates information management, data mining, artificial intelligence, and decision support systems. The centrality of terms like "big data," "data analytics," and "information management" underscores the foundational role of technological infrastructure, while emerging interests in AI, strategic decision-making, and sustainable development reflect a shift toward more intelligent and forward-looking applications. International collaboration is strong, with countries like China, the United States, and the United Kingdom leading scholarly output and cross-border partnerships. Overall, the findings not only map the current intellectual and conceptual contours of the field but also highlight opportunities for future research and innovation in enhancing decision-making through advanced data-driven approaches.

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