

SECTION FINANCE, BANKING, ACCOUNTING AND AUDIT

FROM INTUITION TO ALGORITHMS: THE TRANSFORMATION OF DECISION-MAKING THROUGH INTELLIGENT DATA TECHNOLOGIES – A BIBLIOMETRIC STUDY (2019-2024)

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Abstract: *This paper examines the relationship between decision-making in the financial sector and the role of intelligent data analysis technologies. The present study uses bibliometric methods on articles published between 2019 and 2024, sourced from Web of Science and Scopus, and processed with Bibliometrix (RStudio) and VOSviewer. After filtering and unifying the datasets, a final sample of 2,522 articles was analysed. The results identify clusters, highlighting the growing emphasis on artificial intelligence, big data, and machine learning as tools to support decision-making. In addition to the existing mapping trends, this study highlights the structural organization of the field by identifying motor themes, emerging themes, and conceptual clusters that shape the current scientific dialogue. The combination of the two bibliometric analysis tools, R Bibliometrix and VOSviewer, improves the robustness of the results by ensuring cross-validation between the analytical tools. The findings confirm a paradigm shift: traditional reliance on intuition is increasingly being replaced by evidence-based approaches driven by smart technologies. The article provides a strategic perspective on how intelligent data analysis technologies are reshaping the decision-making process in the financial field, going beyond a descriptive overview of the literature. This study contributes to the literature by providing an updated mapping of research trends and outlining the evolution and multidisciplinary nature of this emerging research area, offering valuable insights for scholars and practitioners in finance and management. The results of the study indicate that current research integrates several fields, making it multidisciplinary. In this case, the study encompasses technological, economic-financial, and managerial fields.*

Keywords: bibliometric analysis; decision-making; intelligent technologies; Artificial Intelligence (AI); data analysis; finance

JEL classification: G40, G17, G11

1. Literature review

The decision-making process, both at the individual level and within organizations, can be supported by newly emerging intelligent data analysis technologies. In recent years, the adoption of such intelligent technologies to simplify decision-making has gained significant attraction. The digital era is characterized by an unprecedented volume of available data; however, this abundance of information does not automatically simplify the financial decision-making process (Huang and You, 2023). For this reason, the

current research examines and highlights, within the literature, the relationship between these two concepts and the evolution observed during the analyzed period. Bibliometric analysis, according to Öztürk, Kocaman and Kanbach (2024) can be understood as a methodological approach that quantifies and evaluates patterns in scientific publishing and a very used - meticulous method for discovering and to analyze large volumes of scientific data (Donthu *et al.*, 2021). By relying on statistical techniques and numerical indicators, it allows researchers to capture the dynamics of a field or journal over time (Madsen, Berg and Di Nardo, 2023a). Bibliometrics is a dynamic field that requires both flexibility and advanced analytical capacity, which can be achieved through tools such as R (RStudio, R packages) and VOSviewer. According to Aria and Cuccurullo (2017), R is both a programming language and a computational environment designed for statistical analysis and data visualization. One of the packages available in R is Bibliometrix, which provides a set of quantitative tools for research in bibliometric and scientific analysis (Aria and Cuccurullo, 2017). Because of these features, R is particularly suitable for bibliometric analysis (Aria and Cuccurullo, 2017). Another application widely used by researchers for bibliometric analyses is VOSviewer. VOSviewer is a software tool designed to facilitate the creation and visualization of bibliometric maps (Van Eck and Waltman, 2010). **According to Aria and Cuccurullo (2017), VOSviewer is a freely available Java-based software developed by Van Eck and Waltman to support the analysis and visualization of citation networks within scientific literature. Any research paper or study can be approached first by performing a bibliometric analysis related to the subject of the specialized field. Bibliometric analysis can be at the foundation of any research that is started. The starting point of any bibliometric analysis is the creation of the database.** The research questions underlying this article are: (Q1) Is there a connection between the topics of decision-making and intelligent technologies? If so, (Q2) At what level does the convergence between the two concepts occur? Bibliometric analysis is the most effective method for obtaining answers to these questions based on the current specialized literature.

2. Methodology of conducted bibliometric analysis

The methodology for the bibliometric analysis in this article integrates datasets extracted and merged using two applications specifically designed for bibliometric research: VOSviewer and RStudio (Bibliometrix). Two separate datasets were obtained from well-established scientific platforms: Web of Science and Scopus. On both platforms, the process of defining the exported dataset began with an advanced search query using the following combined terms: “decision-making process,” “decision making,” “data analysis,” “intelligent data analysis technologies,” and “AI in finance.” A specific time interval was set for the inclusion of scientific works: 2019 to the end of 2024. The chosen timeframe (2019–2024) reflects the accelerated expansion of AI-driven decision-making research. Filters applied to both databases restricted the sample to open-access articles in English within Business and Finance. Four data exports were extracted: three from the WOS database in BibTeX format and one from Scopus in CSV format. To merge the exports into a single database, I used R tools to convert the exports to data frame format and combined them into a single file. After merging the datasets and removing

duplicates with the help of RStudio, a final set of 2,522 articles was obtained. Bibliometrix in RStudio was then used to generate word cloud, descriptive statistics, keyword co-occurrences, a thematic map, and a factorial map. To validate the network co-occurrence analysis, the database was also analyzed using VOSviewer.

3. Bibliometric analysis

As a first step in this study, I aimed to identify the ten most relevant sources – those that have contributed most significantly to the publication of articles on the topic addressed. These ten academic journals are listed in the table below, along with the number of articles published in each, as determined using R Bibliometrix.

Table 1: The 10 most relevant sources from the database extracted

Sources	Articles
TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE	105
JOURNAL OF BUSINESS RESEARCH	78
IEEE TRANSACTIONS ON ENGINEERING MANAGEMENT	51
MANAGEMENT DECISION	43
CONGENT BUSINESS & MANAGEMENT	39
FINANCIAL AND CREDIT ACTIVITY-PROBLEMS OF THEORY AND PRACTICE	39
JOURNAL OF BUSINESS ETHICS	39
ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES	35
JOURNAL OF RISK AND FINANCIAL MANAGEMENT	33
BUSINESS STRATEGY AND THE ENVIROMENT	32

Source: Processed by author in R Bibliometrix

Analysis of the main journals covering these topics – decision-making processes and intelligent technologies – shows that Technological Forecasting and Social Change, Journal of Business Research, and IEEE Transactions on Engineering Management are among the leading sources. This indicates that the topic is clearly multidisciplinary. After reviewing the ten most relevant sources, a word cloud analysis was conducted using the R tool in Biblioshiny (Bibliometrix) to provide a visual representation of the prominence of specific terms within the analyzed database.



Figure 1: Word cloud visualization of database
Source: Processed by author in R Bibliometrix

Based on the results from the word cloud analysis, the most frequently used terms at the core of the database are decision-making, artificial intelligence, performance, management, and impact. These terms are the most prominent in Figure 1. After identifying the most frequent words in the database, I aimed to determine the frequency of each of the top ten terms. A keyword frequency analysis was conducted and is presented in Table 2 to identify the most commonly used terms.

Table 2: Top 10 keywords from the database extracted

Keywords	Frequency
artificial intelligence	377
decision-making	310
performance	231
management	195
impact	191
innovation	166
model	165
decision making	156
machine learning	132
sustainability	103

Source: Processed by author in R Bibliometrix

According to the results generated with Bibliometrix, the top keywords were “artificial intelligence” (377 occurrences), “decision-making” (310 occurrences), and “performance” (231 occurrences). Using the keywords identified from the database, a co-occurrence network was analyzed, as illustrated in Figure 2 and Figure 3. First, I conducted the analysis using RStudio, and then I introduced the database into VOSviewer to validate the results obtained from Bibliometrix.

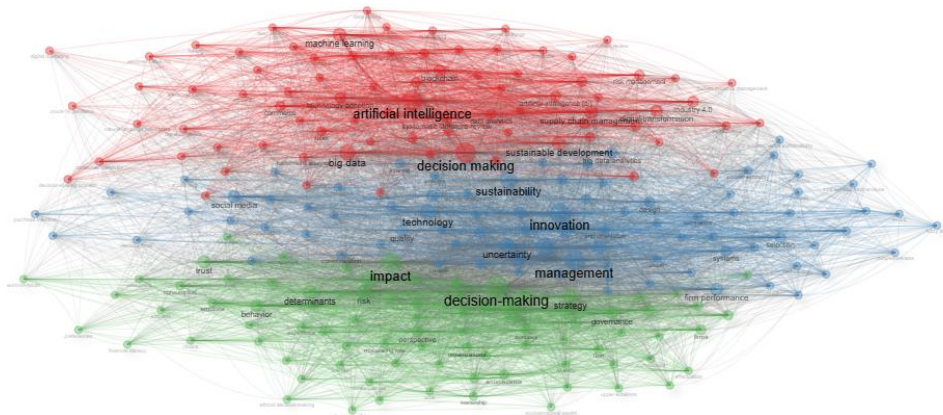


Figure 2: Network co-occurrences visualization of database

Source: Processed by author in R Bibliometrix

Based on the results obtained from Bibliometrix in the co-occurrence analysis, three clusters are illustrated, showing the internal links among the analyzed concepts. Cluster 1, shown in red, corresponds to concepts related to intelligent technologies based on the use of artificial intelligence. The red cluster represents the technological and digital area, focusing on the development and implementation of AI, digital transformation processes, algorithms, and new technologies applicable to industries and businesses. Cluster 2, represented in blue, includes the terms decision-making, innovation, and sustainability. Positioned between the other two clusters, it can be concluded that there are balanced connections between cluster 2 and both the technological cluster (cluster 1) and the managerial cluster (cluster 3). The blue cluster, as the central cluster, indicates that innovation and decision-making are key concepts linking technology to management. Cluster 3, shown in green, includes the terms management, impact, strategy, and organizational behavior. The analysis indicates that new technologies and AI impact innovation; innovation directly influences decision-making processes at all levels, and decision-making processes affect management and company-level results.

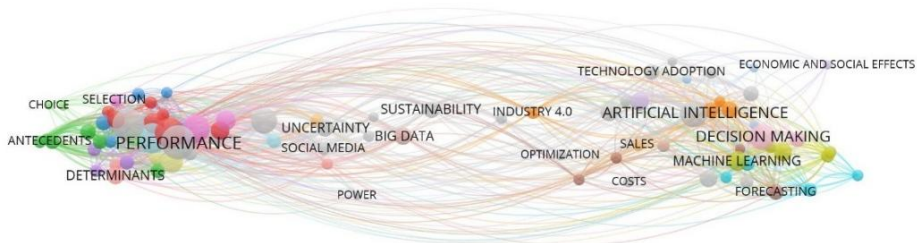


Figure 3: Network co-occurrences visualization of database

Source: Processed by author in VOSviewer

The map from Figure 3 highlights three major research clusters: (1) artificial intelligence and data-driven technologies supporting decision-making, (2) innovation and performance management, and (3) sustainability and managerial impact. The proximity between “artificial intelligence” and “decision-making” reflects the increasing integration of intelligent technologies within decision-making processes. While the co-occurrence network shows the conceptual connections that exists between keywords, the thematic map provides a broader view of their development and maturity. Based on the keywords extracted from my database, I analyzed the thematic map shown in Figure 4.

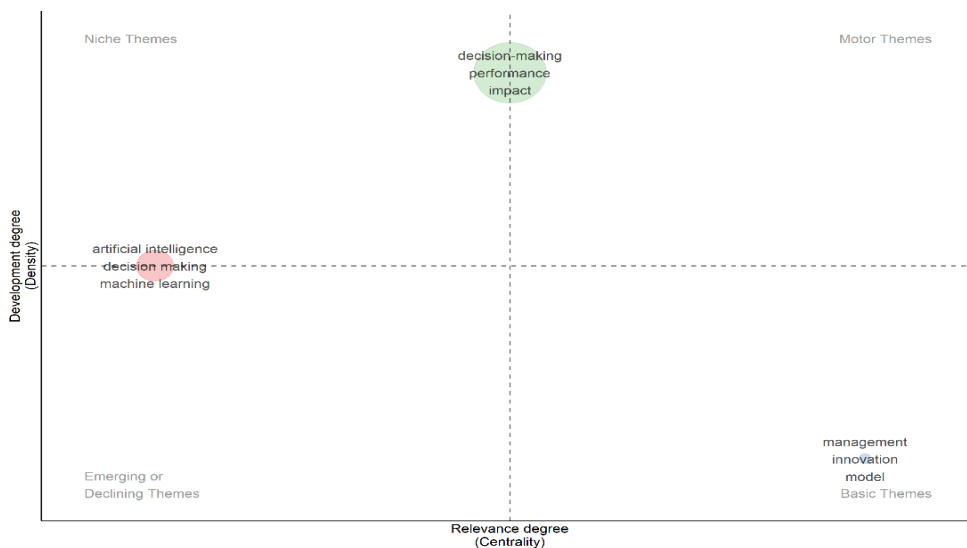


Figure 4: Thematic map of database extracted
Source: Processed by author in R Bibliometrix

The thematic map makes possible the visualization of important themes in the research field (Madsen, Berg and Di Nardo, 2023b). This map identifies the main, well-established themes (degree of relevance) and those that are still emerging but are increasingly explored by researchers (degree of development). From this analysis, I observed that “decision-making,” “performance,” and “impact” stand out as motor themes, demonstrating a high degree of centrality and development, while “artificial intelligence” and “machine learning” appear as emerging themes with growing relevance. These results suggest that the field is experiencing both technological and conceptual transitions. Meanwhile, “management,” “innovation,” and “model” are positioned as basic themes, providing theoretical and practical foundations for the domain’s evolution. I believe that interest in these topics will continue to grow, as they reflect current trends and offer many promising research opportunities that have not yet been explored in depth. Another bibliometric analysis performed to examine the trends and directions in the current literature among the analyzed concepts is the conceptual structure analysis, with the results shown in the next figure.

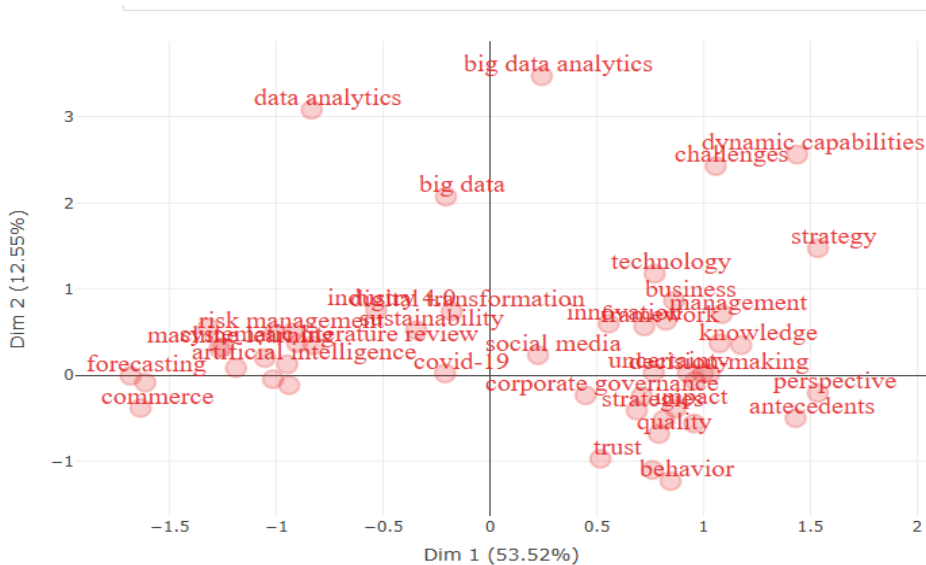


Figure 5: Conceptual structure map of database extracted

Source: Processed by author in R Bibliometrix

The conceptual structure map is created through factor analysis. The conceptual structure map visually displays how words that frequently appear in articles and research papers are organized and related. It highlights the connections between terms through a regional representation (Pai *et al.*, 2022). The factor analysis identifies two axes: the X-axis and the Y-axis.

- The X-axis (Dim 1 – 53.52%) represents the major directions in the literature. In this case, the axis separates two main directions in the literature: on the left are themes related to intelligent technologies (artificial intelligence, machine learning, big data, data analytics, industry 4.0), while on the right are themes related to decision, management, strategy, and performance (decision-making, innovation, governance, impact, trust).
- The Y-axis (Dim 2 – 12.55%) separates the internal subthemes into two groups: in the upper part are themes oriented toward analysis and managerial skills (big data, analytics, dynamic capabilities), while in the lower part are themes related to behavior and governance (behavior, trust, quality, governance).

Based on Figure 5, it is clear that the literature is organized around two main cores: on the left, smart technologies and data analysis; on the right, decision-making, management, and innovation. In the identified cores, there are also connecting themes that link the technological and managerial areas, such as sustainability, digital transformation, and social media.

4. Conclusions

The bibliometric analysis conducted using RStudio's Bibliometrix and VOSviewer applications reveals a substantial link between the concepts of “decision-making

process” and “intelligent analysis technologies.” The findings indicate a growing trend toward integrating intelligent technologies into decision-making processes, largely driven by significant advances in artificial intelligence in recent years. Additionally, the results indicate a growing number of studies and researchers concentrating on the convergence of these two fields, accompanied by an increase in their academic significance. This study contributes to a deeper understanding of interdisciplinary trends and provides a foundation for future research directions. Although the analysis covered publications from 2019 to 2024, future studies could expand this work by including additional databases or comparing developments across different economic sectors. Overall, the field appears to be in a phase of accelerated development, where artificial intelligence, data analytics, and decision-making processes are becoming increasingly interconnected. These dynamics highlight a clear shift from decision-making based solely on intuition to a digital transformation of management practices.

5. Limitations

The study also has limitations that must be considered. One limitation is that data from only WOS and Scopus were used for the analysis; therefore, the article does not cover the entire existing literature, and some relevant articles may be missing. Another limitation is that only open access articles were included, so high-impact articles published in closed journals may be absent from the database. Additionally, the selected time interval of 2019–2024 is a limitation.

6. Future directions

The study could be extended over a longer period by including more years, and the database could be analyzed using other tools for additional tests. For a more comprehensive extension, data exported from other sources, such as Google Scholar, IEEE Xplore, and SpringerLink, as well as the inclusion of articles beyond open access ones, could be considered.

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