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Deciphering Decision Intelligence at the Nexus of Big Data Analytics and Artificial Intelligence - A Bibliometric Study

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Abstract

In today's rapidly evolving business environment, the ability to make quality decisions is crucial for organizational growth and competitiveness. Consequently, organizations are increasingly turning to information technologies like big data and artificial intelligence. However, despite significant technological advancements and access to vast amounts of data, these initiatives frequently fall short in improving decision-making processes and thus failing to deliver tangible business value. This in effect calls for deeper investigation of the field of decision intelligence which looks decision making phenomena from both technological and organizational perspective. However, as the literature is highly fragmented, therefore the current study presents a bibliometric analysis of 997 journal articles published between 2014 and 2023, extracted from the Scopus database, with the purpose of mapping the field's knowledge production, key contributors as well as identification of research hotspots in this interdisciplinary field of decision intelligence by using VOSViewer and Bibliometrix tools. Findings show over 40% annual growth in DI publications. Key identified clusters are technology utilization, decision-making frameworks, and AI integration, with major themes including data-driven decision-making, predictive analytics, and organizational performance. Despite some limitations, such as using a single database, this study has significant implications for understanding the field's development and identification of potential for future research directions.

Keywords: Decision Making, Big Data, Artificial Intelligence, Decision Intelligence, Bibliometric Analysis

Introduction

Decision-making is widely acknowledged as vital capability pivotal for organizational performance and competitiveness (Elgendy et al., 2022). Extant research has found strong correlation between decision making and business performance (Sahoo, 2021) as Bain & Company in their research reported that there is a 95% correlation between companies that

excel at making and executing key decisions and those with top-tier financial results (Hill et al., 2021). Conversely a McKinsey survey found that ineffective decision-making costs the average S&P 500 company $250 million per year (Aminov et al., 2019). However, considering rapidly evolving market dynamics along with exponential growth of data, decision-making processes are becoming increasingly complex (Duan et al., 2019; Elgendy et al., 2022). The research shows that businesses make billion decisions on an annual basis, and most of these gets more complex as time goes on including involvement of more stakeholders and expanded options. As a result, organizations more and more are incorporating the evidence-based reasoning and the data-driven approach in order to enhance their capability for strategic decision making and for improving the financial results of the company (Johnson et al., 2021).

In the quest of making better decisions, advent of big data and artificial intelligent (AI) has generated both opportunities and challenges. Big data, characterized by its high volume, variety, and velocity, offers a wealth of insights and decision support capabilities to organizations (Rialti et al., 2019). In parallel, AI technologies, e.g., machine learning, natural language processing, and deep learning, have demonstrated significant potential in automating decision-making process, and augmenting human judgement (Duan et al., 2019). Despite the fact that the possibilities of BDA and AI in decision-making are very promising, this achievement is not completely free of difficulties. Several studies have identified remarkable challenges such as data integrity issues, lack of skilled employees, inadequate technology infrastructure, and the reluctance to accept the change (Ashaari et al., 2021; Rialti et al., 2019). Janssen et al. (2017) have argued against the widely held belief that process automation always directly leads to better decision-making, analysing this perspective as an overly simplified one. Hence, despite the technology sophistication, methodologies or frameworks of how data informs decisions and impacts business outcomes remain insufficiently proven.

This evolution from sheer technological focus to more business value and objective oriented emphasis has resulted in emergence of new research avenue which is broadly called decision intelligence (DI) (Pratt et al., 2023). It augments data science with social science and managerial science and thus contextualizes data insights with social behaviour in an organizational context to enable decision making (Pratt et al., 2023). DI emphasizes starting with the decisions that need to be made before seeking out relevant data and other supporting factors. However, despite the growing significance of this area of research as well as burgeoning corpse of research work on and around decision intelligence, the literature is highly fragmented and dispersed across multiple disciplines and domains. As such, the existing literature reviews missed the opportunity to offer insights into the nexus of digital technologies and organizational decision quality for understanding the intricacies of decision intelligence research field (Di Vaio et al., 2022). To address these gaps, a systematic bibliometric mapping and analysis at the intersection of decision making, big data, AI, and organizational dynamics is essential.

Therefore, in this study, we aim: i) to analyse temporal distribution patterns and citation trends of decision intelligence related literature; ii) to show contributions of prolific authors, leading countries and the most productive academic institutions; (iii) to investigate the intellectual structure through cited journals and references in DI research domain (iv) to

highlight the research hotspots (keywords, topics, themes etc.) of DI research. This paper will be beneficial for researchers, policy makers, and individuals to identify the key contributors and understand the research trends in and around the field of decision intelligence and thus discover the potential and opportunities for future research.

Methodology

To construct a literature review, compile the bibliography, and produce reliable findings, it is crucial to follow an iterative process of identifying appropriate search terms, conducting literature searches, and completing the analysis (Öztürk et al., 2024). Five-step approach is adapted in this study for gathering data and conducting a comprehensive evaluation and bibliometric analysis of the selected research area (Fahimnia et al., 2015). The process can be broken down into five steps: (i) selecting the database that will be searched and determine which search terms to use, (ii) screening the initial search results, (iii) refining the search outcomes, (iv) generating descriptive statistics and v) conducting in-depth bibliometric analysis.

Information Sources, Search Strategy and Data Collection

Figure 1 demonstrates the steps of identifying, screening and inclusion of documents based on the PRISMA standards (Page et al., 2021). The Scopus database was chosen for this bibliometric analysis as it covers 39,000+ journals, published articles, book and conference materials that are peer-reviewed. Following the selection of the database, in order to search for relevant scholarly literature, determining the right keywords and formulation of comprehensive search string holds significance in bibliometric analysis. Search for relevant literature was carried out using the keywords: ("big data" or "artificial intelligence" or "machine learning" or "deep learning" or "decision intelligence" or "business intelligence" or "data intelligence" or "data analytics" or "business analytics" or "data science" or "analytics" or "data mining" or "data warehouse" or "bi&a" or "digital technolog*" or "digitalization" or "digital transformation" or "industry 4.0" or "di&a") and ("decision making" or "decision intelligence" or "decision quality" or "decision-making" or "decision performance" or "decision effectiveness" or "decision efficiency" or "decision speed").

With data obtained on Mar 31, 2024, search string was searched only from the title of the documents as titles typically encapsulate the essence and primary focus of a research paper and thus help in identifying the most relevant documents for a given research question (Hyland & Zou, 2022). This initial search led to creation of a list of 2399 documents. Afterwards, some helpful filters such as time period, document type and language were applied for the sake of finding high quality and reliable content for further analyses (Page et al., 2021) . Hence, after paying attention to peer reviewed journal articles that were published between 2014 and 2023 and written in English language, and removing duplicate and incomplete outputs, final number of resulting articles considered for the bibliometric analysis was 997 as shown in Figure 1.

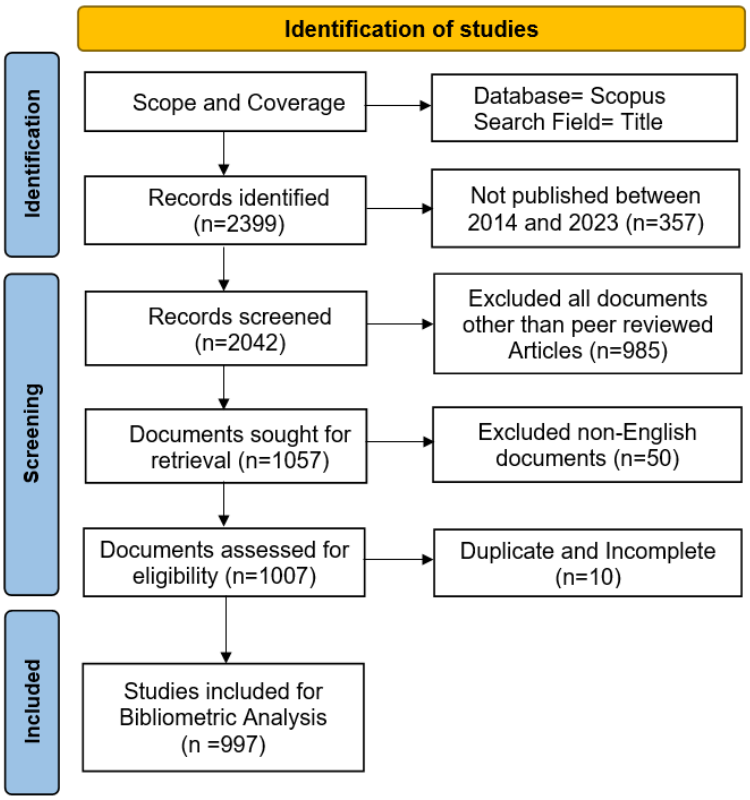

Figure 1. PRISMA Flow Diagram for Data Collection

Data Analysis Procedure

This bibliometric study uses a two-pronged approach for the analysis of collected data, which include both performance analysis and science mapping. While performance analysis quantitatively clarifies contributions of the agents and components within the research area, science mapping unravels intellectual relations and structural connections among them (Donthu et al., 2021). In the first stage, we used OpenRefine software to harmonize and pre-process the gathered data. For analysis, two powerful bibliometric tools were used - the R package Bibliometrix and the VOSviewer software. Bibliometrix simplified data collection, processing, and quantitative bibliometric analysis, whereas VOSviewer enabled to map knowledge systematically and hence we were able to reveal the key trends, influential publications, authors, and the intellectual structure that gives the research domain under investigation its shape.

Findings and Results

Table 1 presents certain statistics of the final set of data, which shows an impressive annual growth rate of over 40% and a high academic interest in the theme of the study. It also shows that 4,136 authors contributed in the development of literature with most articles being produced through collaborative efforts (average co-authorship of 4.65). Furthermore, around one-third of the authors included in this research are international.

Table 1
Demographic Profile of Respondents

Timespan	2014:2023	Authors	4136
Documents	997	International co-authorships %	32.53
Annual Growth Rate %	42.59	Co-Authors per Doc	4.65

Yearly Research Production and Citation Trend
Figure 2 presents a positive trajectory in annual publication production and the document citations by the literature from 2014 to 2023. There is a fast spike in both metrics since 2017. Firstly, the big data is the reason; next, the AI technologies. Despite some fluctuations, the trend indicates a positive correlation between the volume of research production and citations, which in turn depicts the overwhelming interest in and around the research area of decision intelligence among researchers. Considering advancements in technologies like BDA and AI as well as their widespread acceptance coupled with increasing awareness and competence, the growth in research production is likely to further increase.

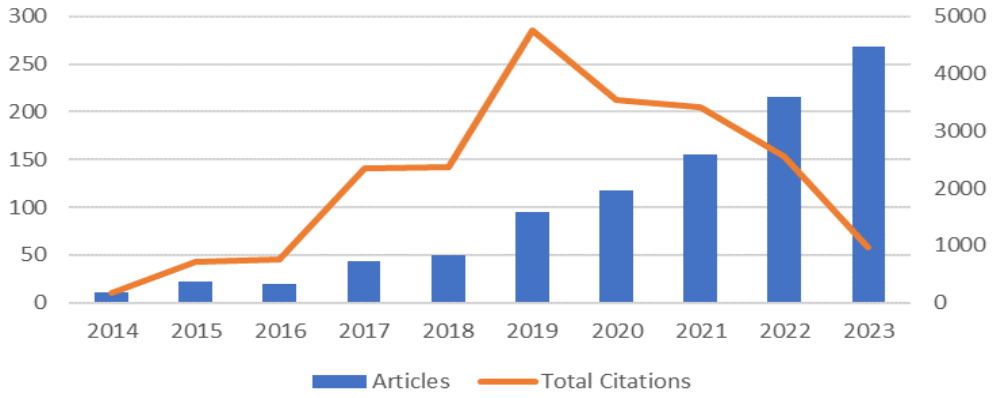

Figure 2. Annual Scientific Production

Most Influential Journals
Understanding research progress of decision intelligence through publication patterns in different source journals enables identifying the most influential sources as well as enabling to get knowledge about research scope and breadth. Technological Forecasting and Social Change (17 Documents & 901 Citations), IEEE Access (16 Documents & 416 Citations), and Sustainability (16 Documents & 318 Citations) represent the trio of the most productive journals who have produced altogether 49 papers on the research field of decision intelligence. Interdisciplinary nature of these journals further underscores an impressive cover for the field of interdisciplinary studies and the need to conduct research from different perspectives.

Scientific Community and Most Influential Agents: Authors, Institutions and Countries
Table 2 provides an overview of the authors, institutions, and source countries of the most frequently cited works in the decision intelligence field. Boudewijn Aasman and Ahmad Termimi Ab Ghani stands out among other authors regarding their contribution to the subject matter. Furthermore, despite Sun Yat-sen University being the first instance of superior institutions, the appearance of Central South University in the middle of South and Niigata University to the north of Japan nations indicate the diversity in the combination of research

hubs driving decision intelligence innovations. The geographical distribution of contributions also speaks volumes about the teamwork and collective research efforts that have been behind development work in this area.

Table 2
Most Influential Authors, Institutions and Countries

Author	TD	TC	Affiliation	TD	Country	TD	TC
Aasman, Boudewijn	6	494	Sun Yat-Sen University	35	USA	192	5385
Ab Ghani, Ahmad Termimi	5	451	University Of Granada	33	China	187	3153
Abakouy, Redouan	5	415	Central South University	26	UK	90	4151
Abba, S.I.	5	353	University Of Zilina	20	India	87	2067
Abbady, Majdi Al Saaideh	5	113	Mayo Clinic	19	Canada	58	1500

*TD= Total Documents, TC= Total Citations

Most Cited Documents

The record of the most cited documents is presented in Table 3. Duan et al. (2019) study garnered the highest number of citations, with 1043 citations recorded in the Scopus database. From these seminal works, one can gain a clear insight into the mutual impact and development of these fields. Shrestha et al. (2019) discussed changing role of the AI in organizational decision-making. While Araujo et al. (2020) offered a whole systematic review of the consequences of data analytics in the decision-making process on different organisational tiers. They distinguish the role and impact of data analytics as strategic, tactical and operational by using the Data-Driven Decision-Making (DDDM) Framework. This framework also prescribes data quality and data governance as a central element of a solid analysis environment, affirming the need for proper data management. Jarrahi (2018), on the other hand studied the idea of human-AI hybrid system, which posits that AI acts as enhancement of human cognition, whereby while it processes large amounts of data, human beings provide the essence of the context and decision making.

Table 3
Highly Cited Articles

Paper	Author	Citations
Artificial intelligence for decision making in the era of Big Data – evolution, challenges and research agenda	(Duan et al., 2019)	1043
Artificial intelligence and the future of work: Human-AI symbiosis in organizational decision making	(Jarrahi, 2018)	728
Factors influencing big data decision-making quality	(Janssen et al., 2017)	456
In AI we trust? Perceptions about automated decision-making by artificial intelligence	(Araujo et al., 2020)	290
Organizational Decision-Making Structures in the Age of Artificial Intelligence	(Shrestha et al., 2019)	242

Co-occurrence Analysis of Keywords

To determine dominant research trends and identify research hot spots, VOSviewer software was used to conduct visual content analysis, concentrating on relationships among most frequently used keywords in decision intelligence literature. Among those keywords, artificial

intelligence (138 occurrences, total link strength 95) and machine learning (170 occurrences, total link strength 110) were found to be the two most decisive themes with high occurrences and strong link strengths, reflecting their highly influential role in decision intelligence investigation.

Analysing the resulting graph, several clusters of closely connected keywords can be pinpointed as the important areas and topics studied in the decision intelligence field. The first cluster is focused on data analytics and AI, that can be found by such keywords as 'artificial intelligence,' 'machine learning,' 'deep learning,' 'data mining,' 'big data analytics.' The second cluster contains the following keywords: "decision making", "decision support", "decision quality", and "organizational decision making", underlining the fact that the general focus is made at improving the decision-making processes and decision quality in organisations. Another cluster contains works that contain keywords such as industry 4.0, internet of things, smart cities, and digital transformation that indicate the interest of the authors in applying decision intelligence in developing technologies and digital transformations. A fourth cluster relates to the application areas of decision intelligence; the keywords include 'healthcare' 'social media' and 'trust' which point to research focus on the use of decision intelligence in healthcare and social factors as well as users' trust in the decision support systems. Also, the appearance of other related terms such as 'sustainability,' 'supply chain,' and 'supply chain management' suggests that there is an emphasis on using decision intelligence in sustainable supply chain management. The analysis also reveals specific and separated terms such as 'ethics,' 'autonomy,' and 'group decision-making,' that may denote new or lesser-known subfields within the decision intelligence spectrum. In sum, the author keyword co-occurrence matrix offers a glimpse into the spectrum of a multifaceted discipline that binds together decision intelligence from different scientific disciplines, industries, and applications.

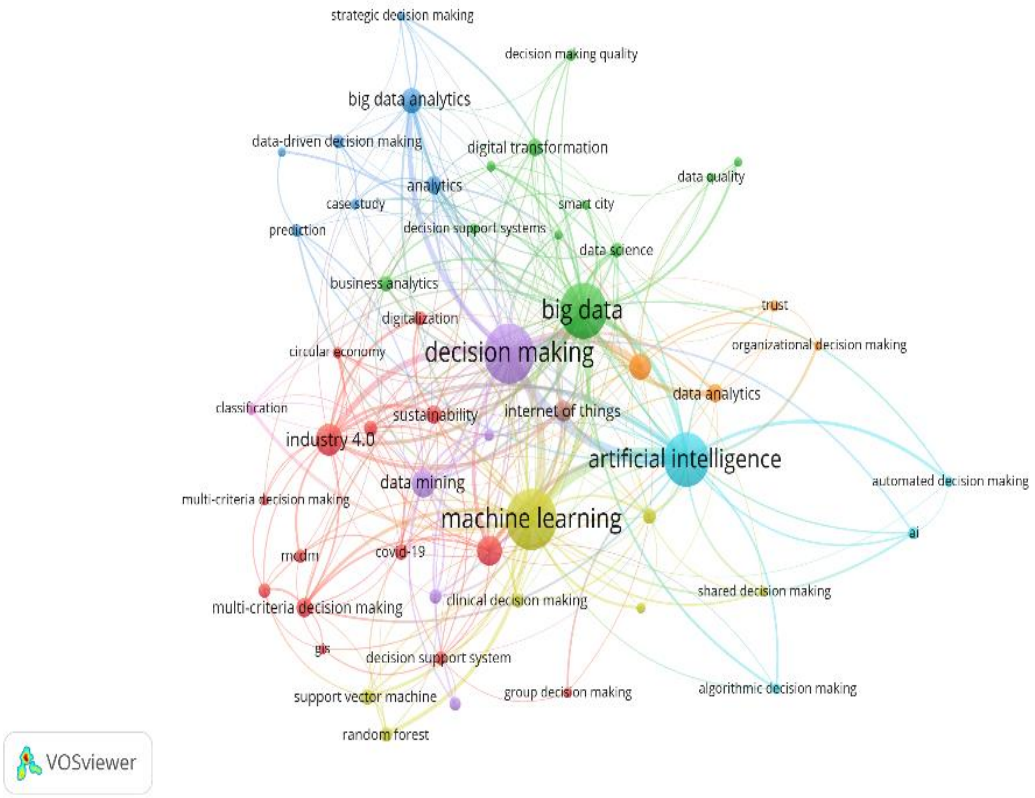

Figure 3. Co-occurrence Analysis of Author Keywords

Discussion of Results

The findings from this bibliometric analysis provide several key insights into the field's development, thematic focus, and influential contributors. These insights provide deeper understanding of how this field of research is integrated into different domains and how its application is becoming prevalent in various fields.

i) Temporal Distribution and Citation Trends: As it has been identified that for the past decade, the R&D activity has been growing significantly, however, it is quite astonishing to find out how the number of citations of the papers fluctuates year by year which implies that there is shift in focus or emerging trends mainly due to the introduction of big data and AI technologies, however, these aspects need more sophisticated analysis.

ii) Key Contributors- Authors, institutions and countries: Involvement of diverse geographical regions of authors and institutions of majority of DI literature contributions and interest witnessed in different subject areas like computer science, business and management, operations research, decision science and other disciplines shows the diversity and complexity of every aspect of decision intelligence.

iii) Key Journals: – evolving on theme of decision intelligence, emphasizes the use of big data and artificial intelligence techniques in its studies. Some of these journals contain articles that dedicate themselves to the features of AI and machine learning that contribute to the improvement of decision-making systems, including the frameworks and models that could be implemented by organizations.

iv) Key Studies: Highly cited papers in decision intelligence, data analytics, and AI provide a comprehensive understanding of how these fields intersect and evolve. Shrestha et al. (2019) has discussed the possibility of integrating human and Artificial Intelligence as

synergistic factors that improve efficiency and efficacy of actions. This framework puts a lot of emphasis on human supervision in combination with the intelligence provided by the AI analytics, which gives reasonable blueprints for decision intelligence. The Data-Driven Decision-Making (DDDM) Framework by Araujo et al. (2020) divides the use of data analytics into organisational levels that are strategic, tactical, and operational. This framework supports the importance of data quality and guidance where proper data management procedures should support both the quality and accuracy of delivered information. On a different note, Human-AI Symbiosis Model proposed by Jarrahi (2018) indicated that while AI comprehensively manipulates extensive data, extant human higher-order cognitive functions may complement by providing richness and imposing decisions. This model offers a theoretical framework, which can be applied in planning the development of intelligent systems that would complement human endeavours.

These works illustrate a shift in the role and scope of decision intelligence (DI). DI extends beyond business intelligence (BI) by emphasizing collaboration between human and artificial intelligence in decision-making. Unlike BI, which focuses on historical data and descriptive analytics, DI is forward-looking and prescriptive, offering recommendations to optimize outcomes. It uniquely combines human expertise with AI to enhance decision-making processes, creating advanced frameworks and methodologies for improved decision-making. This integration of artificial and human intelligence underscores DI's significant contributions to both society and business efficiency, highlighting its critical role in navigating dynamic business environments.

v) Research hot spots: The co-occurrence analysis of author keywords for decision intelligence provides identification of thematic dimensions in the decision intelligence and new trends which may not have been observed when the analysis is done generally. The themes that set the scene, such as AI, or; ML stand out as belonging to a new realm that considers more sophisticated methods based on AI. In addition, while changes toward the specific domains such as the “organizational decision making,” and the appearance of keywords like “ethics” and “autonomy” marks the richer picture of the socio-technical issues. DI research further emphasizes the integration of artificial and human intelligence for improved decision-making, aiming to democratize AI within businesses and society. The interdependency between technology acceptance, consumer trust relations, and advancements in uses in various domains like healthcare reflects on the multifaceted field of decision intelligence as a field of study, as well as enhancements that existed and are continuing to occur within the discourse hence promoting a better understanding of the subject.

Research Gaps and Future Directions

However, there is still a void in the literature regarding the accelerated advancement of decision intelligence, data analytics, and AI. There seems to be strong theoretical backgrounds now in the form of the Hybrid Intelligence Framework and the Human-AI Symbiosis Model; nonetheless, empirical validation of these frameworks in multiple different organizational scenarios is rather lacking. Further, it is acknowledged that data quality and data governance are essential factors to consider but, deficient of standard methodologies and substantial extant research examining these facets. Also ambiguous is the nature of human and AI control, with limited research covering how the tasks are divided between humans and computers as well as the effects on human decision-makers. In addition, the so-called ‘soft

factors' including the critical concerns as to ethical issues as well as all social implications of artificial intelligence's incorporation into decision-making are still understudied.

Future research agenda, therefore, should involve establishing the validity of the theories by means of employing historical surveys and case studies as well as comprehensive cross-sectional studies. Another important task is to define clear guidelines for data management and explore promising tools such as blockchain to improve the data quality. To optimise interactions between humans and AI we need to look into how best to divide responsibilities, as well as into the effects that AI usage has on the cognition of human actors. It is necessary to create an extensive work of ethical standards and protocols by using members and scholars from different fields in order to reform the use of AI in decision making processes. New research questions as he asked like what the long-term effects of AI on human cognition or how ethical and moral principles are integrated into the design of AI and others. Methodological approaches, such as mixed method research, design science framework, and comparative, will add to that information. Cooperative efforts with faculty from other colleges and schools will be crucial for creating solutions that are innovative and applicable to assist in the advancement of decision intelligence as a field.

Conclusion

With a robust dataset of 997 journal articles published over the period of 2014 to 2023, our bibliometric study reveals the most salient trends, contributors, and thematic clusters in the field. We found that scholarly interest in decision intelligence has been on the rise over the last decade. This fact indicates the expanding recognition of the importance of dealing with complex challenges in various fields of human activity. USA, China, and the UK appeared to be the most important contributors to the study of decision intelligence, thereby underlining its global nature. Our analysis revealed clusters in decision intelligence research in technology utilization, decision-making frameworks, and the integration of emerging technologies like AI and big data. Major themes of the papers dealt with data-driven decision-making, predictive analytics, and organizational performance. It can be seen that the organizations need to be strategic in the adoption of technology, conversant with the management of teams, and sensitive to behavioural and cultural factors. Like all studies, this paper also has some limitations. Some of the most prominent ones are related to selection of single database which might miss out another perspective. Even then, this bibliometric study provides some deeper insights for both academia and industry by highlighting some uncovered aspects of this field of research.

References

Aminov, I., De Smet, A., Jost, G., & Mendelsohn, D. (2019). Effective decision making in the age of urgency. *Mckinsey & Company*, *April*. Retrieved from https://www.mckinsey.com/business-functions/organization/our-insights/decision-making-in-the-age-of-urgency

Araujo, T., Helberger, N., Kruikemeier, S., & de Vreese, C. H. (2020). In AI we trust? Perceptions about automated decision-making by artificial intelligence. *AI and Society*, *35*(3), 611 – 623. https://doi.org/10.1007/s00146-019-00931-w

Ashaari, M. A., Singh, K. S. D., Abbasi, G. A., Amran, A., & Liebana-Cabanillas, F. J. (2021). Big data analytics capability for improved performance of higher education institutions in the Era of IR 4.0: A multi-analytical SEM & ANN perspective. *Technological Forecasting and Social Change*, *173*(August), 121119. https://doi.org/10.1016/j.techfore.2021.121119

Bousdekis, A., Lepenioti, K., Apostolou, D., & Mentzas, G. (2021). A review of data-driven decision-making methods for industry 4.0 maintenance applications. *Electronics (Switzerland)*, *10*(7). https://doi.org/10.3390/electronics10070828

Di Vaio, A., Hassan, R., & Alavoine, C. (2022). Data intelligence and analytics: A bibliometric analysis of human–Artificial intelligence in public sector decision-making effectiveness. *Technological Forecasting and Social Change*, *174*. https://doi.org/10.1016/j.techfore.2021.121201

Duan, Y., Edwards, J. S., & Dwivedi, Y. K. (2019). Artificial intelligence for decision making in the era of Big Data – evolution, challenges and research agenda. *International Journal of Information Management*, *48*, 63 – 71. https://doi.org/10.1016/j.ijinfomgt.2019.01.021

Elgendy, N., Elragal, A., & Päivärinta, T. (2022). DECAS: A modern data-driven decision theory for big data and analytics. *Journal of Decision Systems*, *31*(4), 337–373. https://doi.org/10.1080/12460125.2021.1894674

Fahimnia, B., Sarkis, J., & Davarzani, H. (2015). Green supply chain management: A review and bibliometric analysis. In *International Journal of Production Economics* (Vol. 162, pp. 101–114). Elsevier B.V. https://doi.org/10.1016/j.ijpe.2015.01.003

Hill, L. A., Tedards, E., & Swan, T. (2021). Drive Innovation with better decision-making. *Harvard Business Review*, *99*(6), 70–79.

Hyland, K., & Zou, H. (Joanna). (2022). Titles in research articles. *Journal of English for Academic Purposes*, *56*. https://doi.org/10.1016/j.jeap.2022.101094

Janssen, M., van der Voort, H., & Wahyudi, A. (2017). Factors influencing big data decision-making quality. *Journal of Business Research*, *70*, 338–345. https://doi.org/10.1016/j.jbusres.2016.08.007

Jarrahi, M. H. (2018). Artificial intelligence and the future of work: Human-AI symbiosis in organizational decision making. *Business Horizons*, *61*(4), 577 – 586. https://doi.org/10.1016/j.bushor.2018.03.007

Johnson, D. S., Sihi, D., & Muzellec, L. (2021). Implementing big data analytics in marketing departments: Mixing organic and administered approaches to increase data-driven decision making. *Informatics*, *8*(4). https://doi.org/10.3390/informatics8040066

Öztürk, O., Kocaman, R., & Kanbach, D. K. (2024). How to design bibliometric research: An overview and a framework proposal. *Review of Managerial Science*. https://doi.org/10.1007/s11846-024-00738-0

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D et al. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. In *The BMJ* (Vol. 372). BMJ Publishing Group. https://doi.org/10.1136/bmj.n71

Pratt, L., Bisson, C., & Warin, T. (2023). Bringing advanced technology to strategic decision-making: The decision intelligence/data science (DI/DS) integration framework. *Futures*, *152*. https://doi.org/10.1016/j.futures.2023.103217

Rialti, R., Zollo, L., Ferraris, A., & Alon, I. (2019). Big data analytics capabilities and performance: Evidence from a moderated multi-mediation model. *Technological Forecasting and Social Change*, *149*(June), 119781. https://doi.org/10.1016/j.techfore.2019.119781

Sahoo, S. (2021). Big data analytics in manufacturing: a bibliometric analysis of research in the field of business management. *International Journal of Production Research*, 1–29.

Shrestha, Y. R., Ben-Menahem, S. M., & von Krogh, G. (2019). Organizational decision-making structures in the age of artificial intelligence. *California Management Review*. https://doi.org/10.1177/0008125619862257