Artificial Intelligence and its Impact on Management Research: A Large-Scale Bibliometric Topic Mapping Analysis of the Interval 2020-2023

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Abstract

The field of artificial intelligence is starting to permeate all aspects of society and management is no exception. From digital transformation, marketing and industry 4.0 to privacy and ethics, the significant growth of the number of papers being published each year makes it difficult to assess the state of research, the current topics that academia is focusing on and how these topics are evolving over the years.

This paper aims to highlight the main topics of this complex and central theme and showcase the evolution of the field through a structured bibliometric analysis of all business-relevant articles and conference paper published in this interval. Leveraging the SCOPUS database, a number of 4763 papers have been identified and analysed, revealing a number of new insights into how the study of artificial intelligence is evolving. Although we are looking at a global perspective, in subsidiary we also observe and compare how Romania is faring against the other global players.

Keywords: *artificial intelligence, bibliometric analysis, theme mapping, global, Romania.*

JEL classification: O32, O33, O39

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1. Introduction

Over the past years, the integration of artificial intelligence (AI) into multiple domains has raised significant interest from managers and organizations alike. Organizations are looking at the possible ways to integrate AI technologies in order to enhance their products, improve their decision-making process, optimize their supply chains and operations. Countries are looking at how to stay ahead in the AI race or catch-up and make sure that they are not left behind. As a consequence of this, the academia has also been investigating these topics and the research in these areas has increased drastically. Ensuring a good understanding of the artificial intelligence research status in the context of business and management is, in this case, essential for researchers, practitioners and policymakers alike.

This study aims to provide a comprehensive bibliometric analysis of the evolving trends, patterns and dynamics of artificial intelligence research in the field of business and management. Employing a rigorous bibliometric approach, we

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aimed to address a number of key questions on both the current state and expected future directions of AI scholarship research in this domain.

This study aims to answer the following research questions:

RQ1: What are the general and annual trends in publication for artificial intelligence the research area of business and management?

RQ2: What are the most relevant sources for research on artificial intelligence in the context of business and management research does the source distribution follow Bradford's law?

RQ3: What are the countries, as represented by the author's affiliation, producing the most research output on artificial intelligence in the context of business and management research?

RQ4: What are the most relevant authors and does the author productivity follow Lotka's Law?

RQ5: What are the key concepts researched, what are the encompassing themes and how do they evolve over the analysis period?

Research Question 1 (RQ1) examines the general and annual trends in publication within the realm of AI research in business and management. By analyzing publication outputs over time, we seek to discern patterns and fluctuations in the field.

Research Question 2 (RQ2) focuses on identifying the most relevant sources for AI research in the context of business and management. Furthermore, we investigate whether the distribution of these sources adheres to Bradford's law, which posits that literature in a particular field can be categorized into a core set of journals, supplemented by progressively larger numbers of peripheral journals.

Research Question 3 (RQ3) delves into the geographical distribution of AI research output in business and management. By examining the affiliations of authors, we aim to uncover which countries are at the forefront of AI scholarship in this domain.

Research Question 4 (RQ4) centers on author productivity and its adherence to Lotka's law, which describes the distribution of productivity among authors in a given field. Through this analysis, we seek to identify prolific authors and understand the dynamics of authorship within the AI research landscape.

Finally, Research Question 5 (RQ5) explores the key concepts researched, overarching themes, and their evolution over the analysis period. By identifying prevalent topics and emerging trends, we provide insights into the trajectory of AI research in business and management.

By addressing these research questions, this article contributes to a deeper understanding of the multifaceted nature of AI research in the context of business and management. Moreover, it offers valuable insights for researchers, practitioners, and policymakers seeking to navigate and contribute to this rapidly evolving field.

2. Research methodology

In order to ensure the correct and transparent reporting of both the results and the methods employed to achieve those results, the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines have been used. While initially created for reporting medical studies (Page *et al.*, 2021), the PRISMA guidelines have been adopted by researchers in multiple other disciplines including business and management areas (Booth *et al.*, 2020; Senali *et al.*, 2022). The framework describes three major stages, consisting of identification – determining the databases and identifying all articles that are associated with topic under review (artificial intelligence); screening – determining the articles that are relevant for the research from the articles previously retrieved; and reporting – reporting the final number of articles that were analysed.

Four main database sources have been considered for the search, Web of Science, Scopus and Google Scholar and the following characteristics have been evaluated for each to determine which one should be employed: volume of data, scope, reliability and coverage of management areas.

Web of Science is one of the oldest databases (Schnell, 2017), developed initially by the Institute for Scientific Information, later acquired by Thomson/Reuters and eventually re-established within Clarivate, it provides a number of indexes (SCI – Science Citation Index, SSCI – Social Sciences Citation Index, AHCI – Arts & Humanities Citation Index)(Clarivate, 2022). However, "coverage mainly focuses on journals and less on other means of scientific knowledge diffusion (e.g., books, proceedings and reports)" (Mongeon and Paul-Hus, 2016). Due to this choice of coverage on WoS' part, it suggests that there might be a lower number of results and a bias towards publishing positive results. In addition, for the specific field of business and management, the number of articles might be lower due to a reduced coverage of this field, with research by Mingers & Lipitakis (2010) going as far as stating that "Web of Science is […] poor in the area of management".

Scopus, a newer entry launched in 2004 by Elsevier, is a comprehensive abstract and citation database with a broad interdisciplinary coverage. While generally comparable with Web of Science, it seems that for Social Sciences it has a higher coverage than Web of Science (Mongeon and Paul-Hus, 2016) which provides the potential for a more inclusive research.

Google Scholar, launched also in 2004, relies on the indexing service of Google's search engine to collect and catalogue scientific literature and provide a simple way to search. While very broad and covering high volumes of data, there is a question of reliability of this data and a lack of transparency about its sources (Hartman and Mullen, 2008; Mingers and Lipitakis, 2010; Mongeon and Paul-Hus, 2016) which can lead to potential unwanted biases in the research. Additionally,

Google Scholar was found to lack the capability to categorize the results of the search in order to be able to filter only the information related to management.

As a consequence, the Scopus database has been selected as a source for the research. The search term used was “TITLE-ABS ("artificial intelligence") AND LANGUAGE ("English") AND DOCTYPE ("ar")” to identify all published articles containing the words “artificial intelligence” in either the title or the abstract, in the subject area of Business, Management and Accounting (by adding the search keyword “SUBJAREA ("BUSI")”), and an additional limit has been imposed to find only articles published between 2020 and 2023 by adding the keywords “AND PUBYEAR > 2019 AND PUBYEAR < 2024”. This resulted in 3872 records retrieved.

However, as Kitchenham and Charters (2007) mention in the context of systematic literature reviews in software engineering, there can be a problem of publication bias. They posit that there is a higher likelihood of positive results to be published compared to negative results, and they propose, as one mitigation strategy, including conference proceedings in the scanned results. This is further corroborated by Rethlefsen *et al.* (2021) which mention that this strategy can help minimize bias. As a result, the search terms have been expanded to add conference papers to the records identified by changing the keyword “DOCTYPE ("ar")” to “(DOCTYPE ("ar") OR DOCTYPE ("cp"))”. The final query used was “TITLE-ABS ("artificial intelligence") AND PUBYEAR > 2019 AND PUBYEAR < 2024 AND LANGUAGE ("English") AND SUBJAREA ("BUSI") AND (DOCTYPE ("ar") OR DOCTYPE ("cp"))” resulting in 5267 records retrieved.

The preliminary analysis of these results showed that a number of these results are from research areas that are not relevant for the study, such as Medicine, Nursing, Chemical Engineering, etc and therefore were screened out. The exact search keywords used for exclusion have been “(EXCLUDE (SUBJAREA,"ENVI") OR EXCLUDE (SUBJAREA,"MEDI") OR EXCLUDE (SUBJAREA,"PHYS") OR EXCLUDE (SUBJAREA,"NURS") OR EXCLUDE (SUBJAREA,"AGRI") OR EXCLUDE (SUBJAREA,"MATE") OR EXCLUDE (SUBJAREA,"CENG") OR EXCLUDE (SUBJAREA,"EART") OR EXCLUDE (SUBJAREA,"BIOC") OR EXCLUDE (SUBJAREA,"PHAR") OR EXCLUDE (SUBJAREA,"MULT") OR EXCLUDE (SUBJAREA,"CHEM"))”.

Following the screening, a number of 4763 records have remained to be included in the review (see Figure 1).

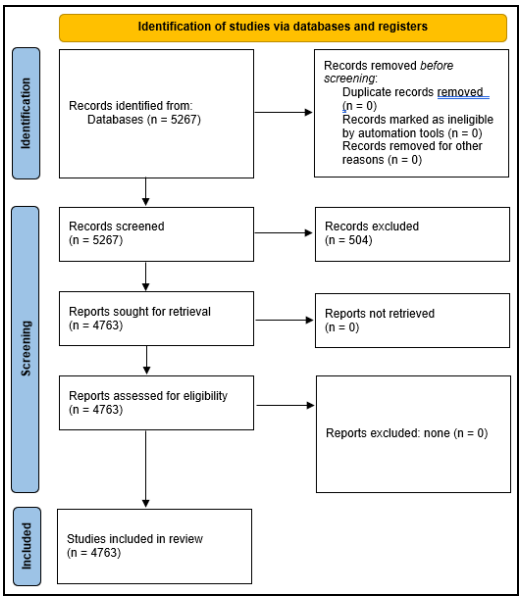

Figure 1. Summary of records included according to PRISMA framework

3. General Findings

The analysis has been performed using a combination of software packages, with R's Bibliometrix (Aria and Cuccurullo, 2017) package as the main tool, supported by Python's PyBibX package, VoSViewer (van Eck and Waltman, 2010) and Excel for postprocessing.

The 4763 results are constituted mainly from journal articles, 74% or 3529 results, with conference papers constituting the remaining 26% or 1234 results. The rate of annual growth is 31.9%, significantly higher compared to the general average compound annual growth rate of scientific publications as reported by Elango and Oh (2022), which, with the exception of one single country, was below 16% for all other countries.

Main information about the data

Table 1

Timespan	**2020 - 2023**
Sources (Journals, Books, etc)	997
Documents	4763
Annual Growth Rate %	31.9
Document Average Age	2.17
Average citations per doc	16.3
References	233403
Authors	11706
Authors of single-authored docs	623
Single-authored docs	671
Co-Authors per Doc	3.23

Timespan	2020 - 2023
International co-authorships %	28.09
DOCUMENT TYPES	
Article	3529
Conference paper	1234

Looking at the number of documents published per year, as seen in Figure 2, the high degree of interest in artificial intelligence is showcased by the constant evolution of the scientific literature output during the analysis period, which is driven by peer-reviewed articles rather than by conference papers.

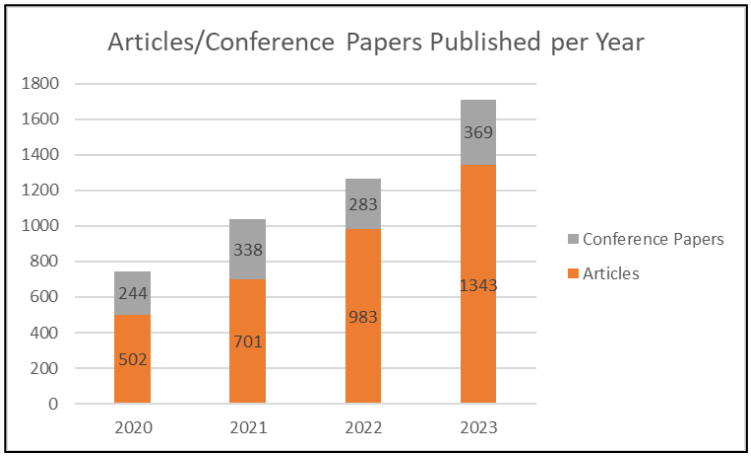

Figure 2. Number of documents published per year

4. Source Analysis

The total number of sources, as reflected in Table 1, is 997, and the research question posited was how relevant are these sources for the topic under study and whether Bradford's law fits the distribution of these sources.

When looking at the number of documents published in each journal, reflected in Table 2, it can be seen that the number of documents published decreases substantially even within the top 10 sources, with all ten sources accounting for under 15% of the total number of published documents. Another

Most relevant top 10 sources

Table 2

Rank	Journal	Documents Published	H-index[1]
1	Technological Forecasting and Social Change	126 (2.65%)	179
2	Lecture Notes in Business Information Processing	100 (2.1%)	63
3	Journal of Business Research	90 (1.89%)	265
4	Knowledge-Based Systems	78 (1.64%)	169
5	Technology in Society	70 (1.47%)	88
6	Advances in Transdisciplinary Engineering	55 (1.15%)	
7	International Journal of System Assurance Engineering and Management	53 (1.11%)	39
8	IEEE Transactions on Engineering Management	47 (0.99%)	112
9	International Journal of Production Research	47 (0.99%)	186
10	Big Data and Cognitive Computing	46 (0.97%)	33

While the total number of papers published by each journal is important, it is also interesting to look at the distribution of papers published per year. The distribution in Figure 3 illustrates that the top 2 sources, "Technological Forecasting and Social Change" and "Lecture Notes in Business Information Processing" have drastically increased the number of articles published on the topic of artificial intelligence in the past four years, while the source that has the highest H-index, the "Journal of Business Research", has been constantly publishing on this topic. This suggests that there is an increase in interest from journals to publish content regarding artificial intelligence.

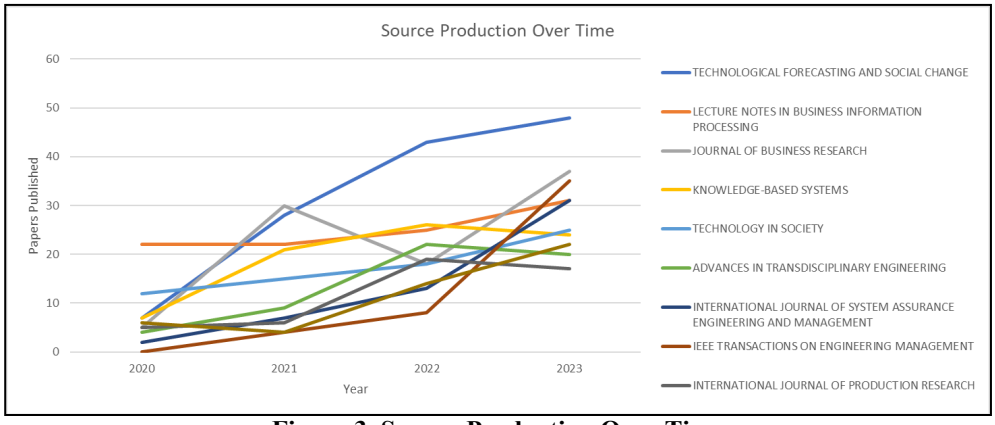

Figure 3. Source Production Over Time

[1] H-Index has been obtained by looking up the journal in the Scimago Journal and Country Rank (https://www.scimagojr.com/)

In order to analyse whether or not the distribution of papers published on the topic of artificial intelligence fits Bradford's Law, we must first define what it is. Bradford's law, as cited by Onyancha and Ocholla (2022), states that "if scientific journals are arranged in order of decreasing productivity of articles on a given subject, they may be divided into a nucleus of periodicals more particularly devoted to the subject and several groups or zones containing the same number of articles as the nucleus, when the numbers of periodicals in the nucleus and succeeding zones will be as $1:n:n^2:n^3$, where n is a multiplier". Simplified, the law says that a small number of journals will publish a high percentage of articles on that specific topic and a high number of journals will publish only small number of articles. However, there are also some arguments that Bradford's law is not adequate for determining the core sources as the Bradford distribution can potentially favour dominant theories and stifle alternative views, thus introducing bias (Nicolaisen and Hjørland, 2007).

The distribution of articles per journal and per Bradford's Law zones can be seen in Table 3. The number of zones has been chosen as three, and the ratio between the number of sources in each zone is 43:179:775. Rounded, this ratio can be expressed as ~1:4:18. This is very close to what was expected from Bradford's Law, which was expected to have a ratio of 1:4:16, therefore we can safely affirm that the distribution fits Bradford's law very closely.

Bradford's Law – Article Distribution per Zone

Table 3

	Number of Sources (Journals)	**Number of Articles**
Zone 1 (Core)	43	1587
Zone 2 (Intermediate)	179	1607
Zone 3 (Outer)	775	1569

The same information can be graphically observed from Figure 4 where the graphical visualization better expresses the diminishing returns of analysing the data beyond the core Zone 1 (in this case represented by the first 43 journals).

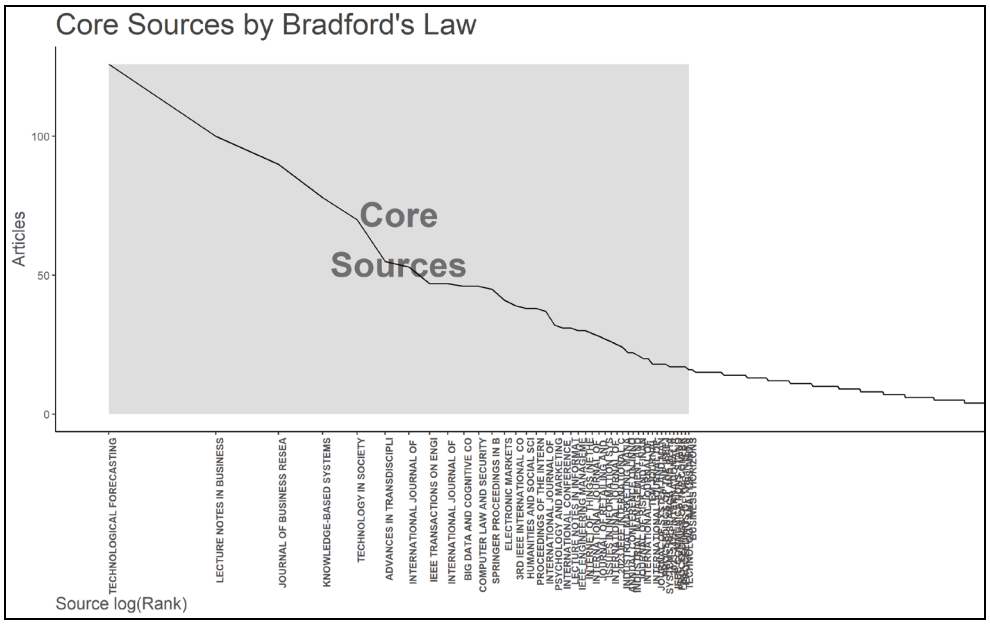

Figure 4. Core Sources Distribution by Bradford's Law

5. Author and Document Analysis

Author analysis allows us to determine how influential are specific authors in the designated research area and how concentrated is the creation of scientific articles (only few authors are producing the majority of the scientific output or a large number of authors are responsible for most of the works published). In addition, data about the authors allows us to determine if the scientific production is concentrated in a few specific countries or it is globally distributed.

As can be observed from Table 1, the total number of authors is 11706. Out of these authors, more than 85% or 9992 have written only a single article on the topic of artificial intelligence in connection with business or management research areas. Over 99% of the authors have written less than 7 articles. At the same time, under 1% of the authors (98 authors) have written or contributed to more 7 articles with 3 authors contributing to more than 3 articles (see Table 4 for details).

Authorship Distribution by Number of Articles Written

Table 4

Documents written	Number of authors	Percentage
1	9992	85.4
2	1067	9.1
3	292	2.5
4	139	1.2
5	74	0.6
6	35	0.3

Documents written	Number of authors	Percentage
7	23	0.2
8	18	0.2
9	15	0.1
10	13	0.1
11	4	0
12	4	0
13	1	0
14	6	0.1
15-32	14	0.1

The same information can be visually observed from Figure 5 which reflects the degree to which the distribution follows Lotka's Law. Lotka's Law, as cited by Pao (1985) states that "the number of authors, y_x, each credited with x number of papers, is inversely proportional to x, which is the output of each individual author" in a relation expressed as $x^n \times y_x = c$. While Lotka's Law commonly used parameters predicted that contributions of authors making a single contribution account for approximately 60% of the entire publication output in a specific research area (Friedman, 2015), the numbers in Table 4 show that in the specific case of artificial intelligence research in the area of business and management, that number is over 85%, which points to a higher distribution of authors performing research compared to the expectations of Lotka's Law.

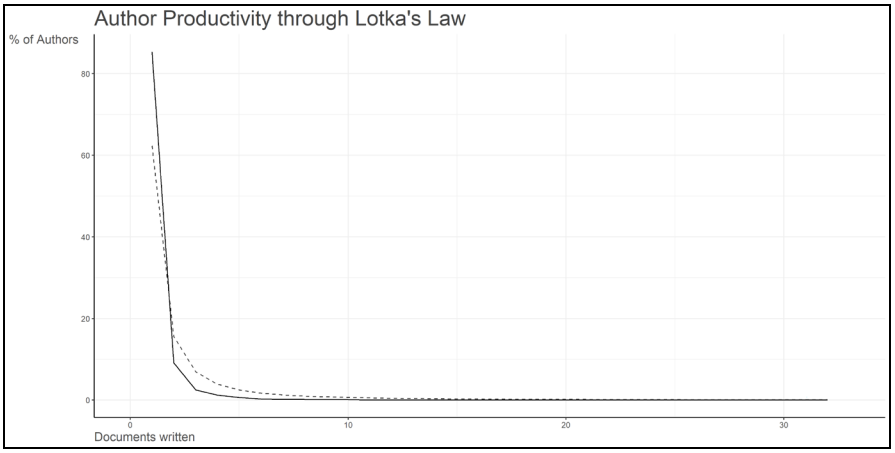

Figure 5: Lotka's Law for Author Productivity

The most prolific 10 authors, are presented in Table 5.

Most Prolific Authors

Table 5

Author	Articles	Articles Fractionalized
WANG Y	32	10.35
LI J	31	8.82
CHEN Y	30	8.41
GUPTA S	29	8.12
KUMAR A	28	6.27
WANG X	27	7.96
DWIVEDI YK	24	5.29
LI Y	24	6.41
ZHANG Y	24	7.73
KUMAR S	23	7.25

Looking at the distribution of the author's country in Table 6, out of the 108 total countries, we can see that the country with the highest number of papers is China, followed by USA and India. However, when analysing the distribution of the published articles per year, an interesting pattern can be observed, where the number of papers published by authors in USA has been following a linear increase, while China and India have accelerated their scientific production, and, based on this trend, are set to surpass USA in terms of research on artificial intelligence. While each European country has been taken separately, if they would have been analysed together as European Union, which, considering the tight integration of research objectives, EU funding provided and common policies on research, especially so on artificial intelligence research, would make it appropriate to bundle them under one single EU entity, the number of papers contributed to by authors inside EU countries would have been 3970, more than both China and USA together.

Romania, with 112 articles contributed by authors from Romanian research institutions, is placed on a reasonable 28th place globally and 11th place inside European Union.

One very notable absence is the lack of any articles from the Russian Federation. This might suggest that Russian researchers either choose to publish in different journals, not indexed by Scopus, might publish exclusively in Russian language, which, due to the filtering used for English articles only, would not have surfaced that research. Other hypotheses might also be plausible and this finding warrants further research.

Top 10 countries by author contributing to research

Table 6

	Total Articles	Total Citations	Average Article Citations
China	2176	7380	13.2
USA	1718	10099	26.1
India	1701	4030	12.7
Germany	1008	4490	21.9

	Total Articles	Total Citations	Average Article Citations
United Kingdom	860	7760	37.1
Italy	528	2745	20.8
Australia	432	3131	26.3
France	378	3272	31.2
Spain	365	1012	11.6
Indonesia	357	188	5.1

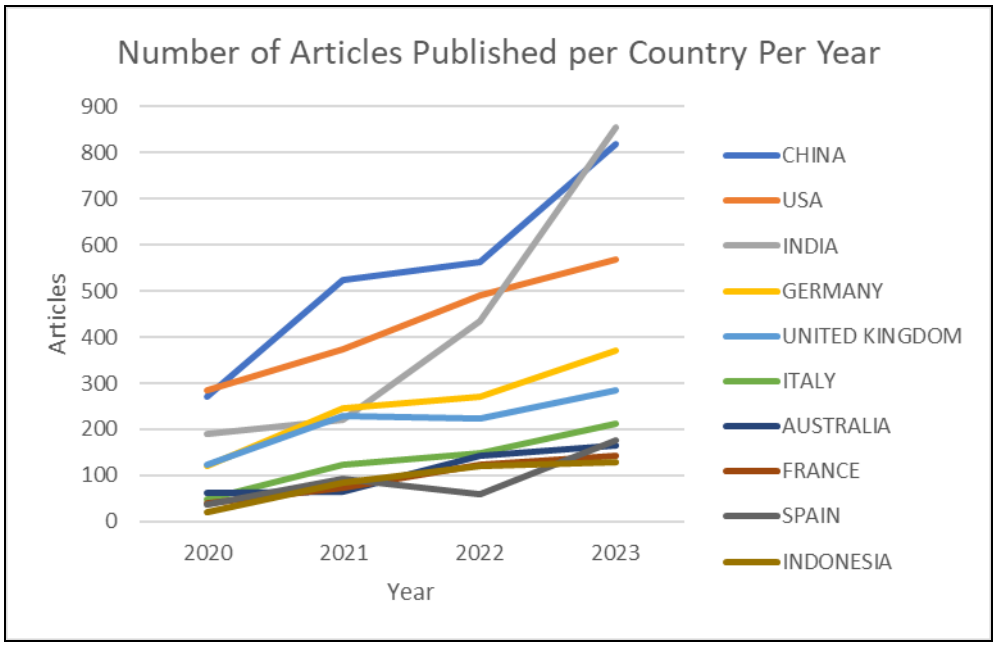

Figure 6. Distribution of Published Articles per Author Affiliation Country Per Year

Analysis of the most cited references inside the analysed papers allows us to determine what are the most influential papers in this field. A quick review of these references shows that most of the references are for relatively recent articles, written after 2018, one is for a very old article, from 1981, and three are for articles published between 2014 and 2017.

Top 10 Locally Cited References

Table 7

Cited References	Citations
HUANG M.H., RUST R.T., ARTIFICIAL INTELLIGENCE IN SERVICE, JOURNAL OF SERVICE RESEARCH, 21, 2, PP. 155-172, (2018)	134
DAVENPORT T., GUHA A., GREWAL D., BRESSGOTT T., HOW ARTIFICIAL INTELLIGENCE WILL CHANGE THE FUTURE OF MARKETING, JOURNAL OF THE ACADEMY OF MARKETING SCIENCE, 48, 1, PP. 24-42, (2020)	99
HAENLEIN M., KAPLAN A., A BRIEF HISTORY OF ARTIFICIAL	84

Cited References	Citations
INTELLIGENCE: ON THE PAST, PRESENT, AND FUTURE OF ARTIFICIAL INTELLIGENCE, CALIFORNIA MANAGEMENT REVIEW, 61, 4, PP. 5-14, (2019)	
WIRTZ J., PATTERSON P.G., KUNZ W.H., GRUBER T., LU V.N., PALUCH S., MARTINS A., BRAVE NEW WORLD: SERVICE ROBOTS IN THE FRONTLINE, JOURNAL OF SERVICE MANAGEMENT, 29, 5, PP. 907-931, (2018)	81
FORNELL C., LARCKER D.F., EVALUATING STRUCTURAL EQUATION MODELS WITH UNOBSERVABLE VARIABLES AND MEASUREMENT ERROR, JOURNAL OF MARKETING RESEARCH, 18, 1, PP. 39-50, (1981)	79
HUANG M.-H., RUST R.T., ARTIFICIAL INTELLIGENCE IN SERVICE, JOURNAL OF SERVICE RESEARCH, 21, 2, PP. 155-172, (2018)	78
BRYNJOLFSSON E., MCAFEE A., THE SECOND MACHINE AGE: WORK, PROGRESS, AND PROSPERITY IN A TIME OF BRILLIANT TECHNOLOGIES, (2014)	75
KAPLAN A., HAENLEIN M., SIRI, SIRI, IN MY HAND: WHO'S THE FAIREST IN THE LAND? ON THE INTERPRETATIONS, ILLUSTRATIONS, AND IMPLICATIONS OF ARTIFICIAL INTELLIGENCE, BUSINESS HORIZONS, 62, 1, PP. 15-25, (2019)	66
LECUN Y., BENGIO Y., HINTON G., DEEP LEARNING, NATURE, 521, 7553, PP. 436-444, (2015)	66
MAKRIDAKIS S., THE FORTHCOMING ARTIFICIAL INTELLIGENCE (AI) REVOLUTION: ITS IMPACT ON SOCIETY AND FIRMS, FUTURES, 90, PP. 46-60, (2017)	65

6. Theme analysis

In order to understand what are the main themes dominating the research landscape over the analysis interval, two main tools have been used: R's Bibliometrix Thematic Maps and VoSViewer's cluster analysis.

The thematic evolution Sankey diagram illustrates how the major themes have evolved between the intervals. The analysis has been performed in Bibliometrix using the author's keywords and leveraging InfoMap as the clustering algorithm. InfoMap has been chosen based on the work performed by Smith *et al.* (2020) who have listed it as better for the use-case of information spread as it focuses on the flow of information through the network.

Author keywords represent a deliberate decision by the author(s) on how to classify their work and can help identify the research topic (Song *et al.*, 2019) making it an significant tool in identifying the topic and focus of the publication (Agbo *et al.*, 2021) which lends them as a very good tool for analysing the thematic mapping and its evolution over the years.

Observing the diagram in Figure 7, it can be seen that while machine learning and industry 4.0 are present in all intervals, ethics, present in the interval

2020-2021 merges into trust in 2022 and decision making in 2023. ChatGPT, which appears in 2023 as a new concept, relies on the data analytics concept from the 2022 analysis interval.

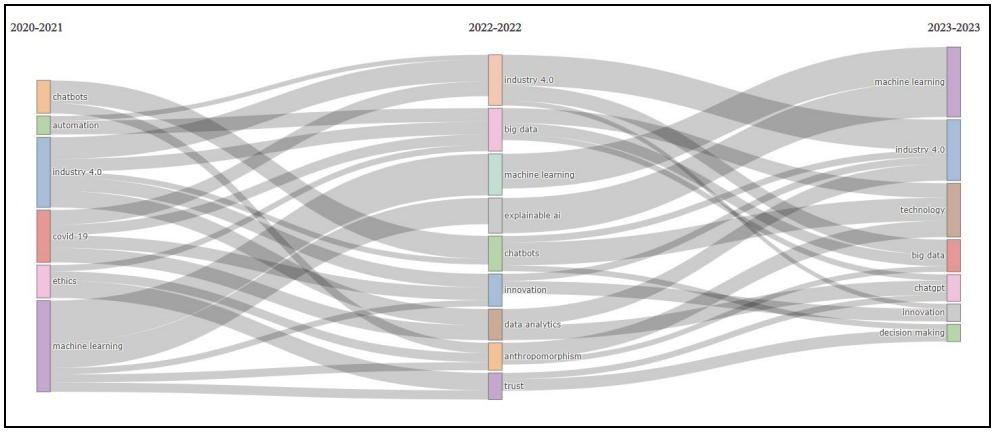

Figure 7. Theme evolution

The thematic map is created based on the co-occurrence network clusters of the author keywords. These clusters are depicted as circles in the graph, with the circle size determined by the number of occurrences for the specific author keywords present in that cluster. The thematic map is split into four zones, divided based on the degree of relevance (centrality) and degree of theme development (density). The centrality, depicted on the X-axis, represents the degree of interaction with the other graph clusters and measures the significance of the study theme. The density, depicted on the Y-axis, represents the cluster's internal strength and theme growth (Alkhammash, 2023).

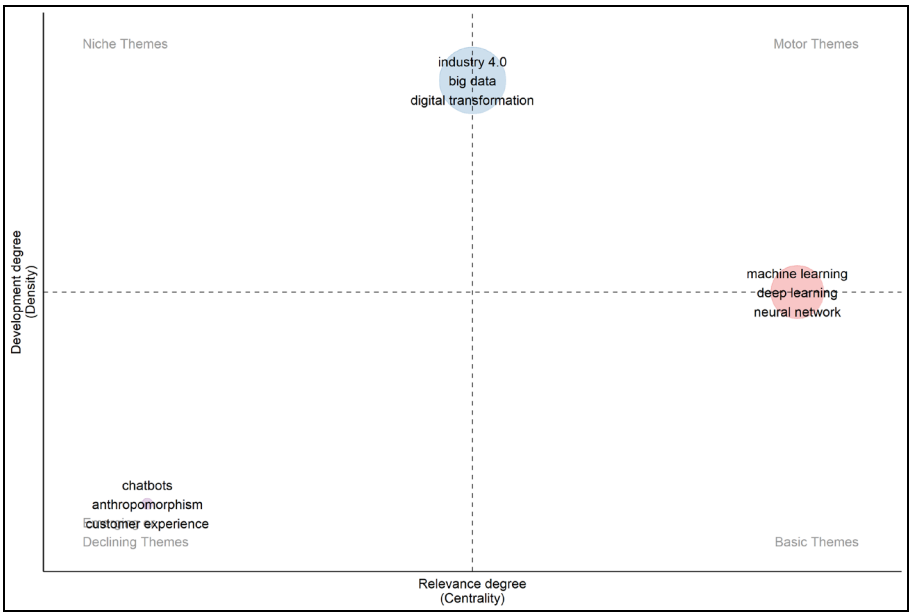

Figure 8. Theme mapping for the entire 2020-2023 interval

Three major theme groupings can be observed in the 2020-2023 interval: chatbots, digital transformation and machine learning.

Theme 1, with the main keywords chatbots, customer experience, anthropomorphism and customer journey, customer service, service robots, voice assistants is under the emerging/declining themes. The themes under this area have both low density and low centrality and are either not currently developed and have the potential to become more central or the interest in them is declining as the researchers are moving their attention to other themes. Figure 9 shows the network connections between the keywords which constitute this theme.

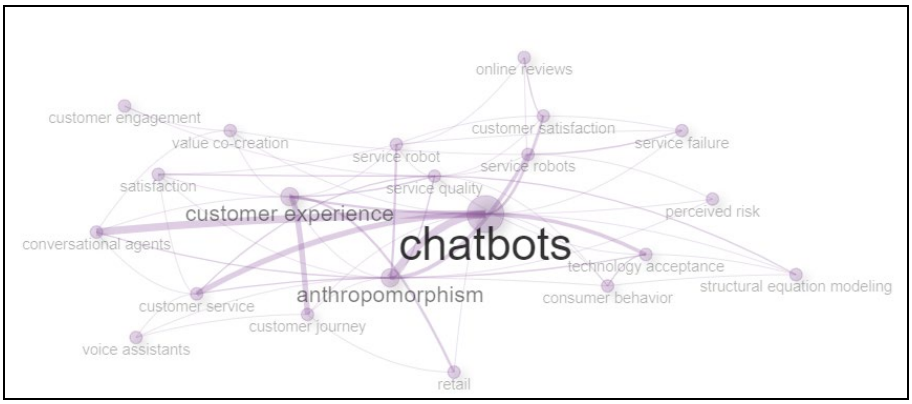

Figure 9. Network analysis of theme 1

Theme 2, a very dense theme oriented towards business concepts, consists of keywords such as industry 4.0, digital economy data analytics, decision making, knowledge management, big data, innovation, automation, etc. This theme has very high density, showcasing that this theme is currently undergoing expansion. The entire list of concepts, as depicted by the author keywords included in this theme, is depicted in Figure 10.

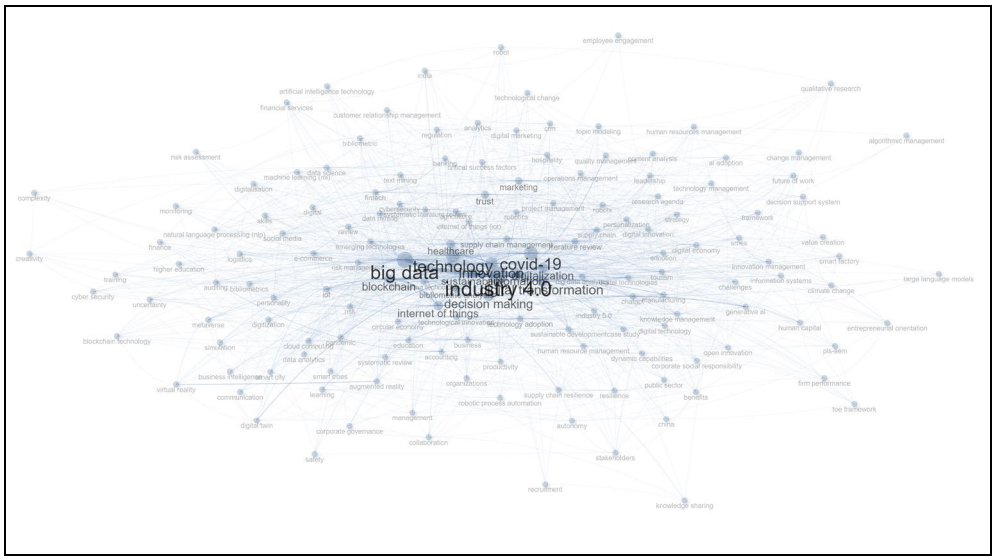

Figure 10. Network analysis of theme 2

Theme 3 is a more technical theme, consisting of keywords related more to the exact types of technical algorithms used for implementing artificial intelligence applications, such as machine learning, deep learning, neural networks, natural language processing, etc. At the same time, this theme is also concerned with the more nuanced concepts of data privacy, ethics, risks, bias and fairness, which are pointing towards stable concepts such as governance. This corresponds to the placement of this theme on the right-hand side of the X-axis, which corresponds with high centrality of this theme.

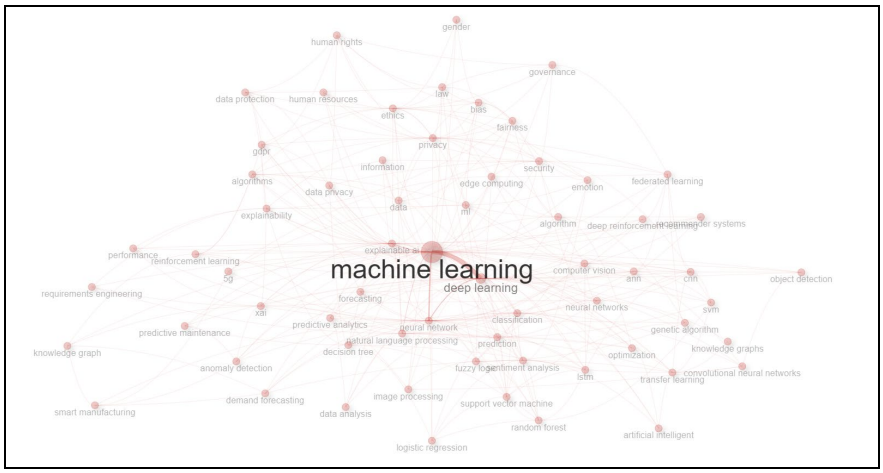

Figure 11. Network analysis of theme 3

7. Limitations

The study has been limited to the articles and conference proceedings indexed by the Scopus database and was exclusively focused on English-language documents. This limitation creates in inherent bias for all countries which do not have English as a first language as research written in any of their native languages would not be visible.

The most drastic example is represented by Russia, which does not show any research in the area of artificial intelligence in the context of business and management, and, one of the possible explanations can be that their research might not have been written in English.

The Scopus database, while very comprehensive, can also potentially introduce publication bias. While this has been discussed in the article and the Scopus database and the type of works searched for have been chosen to minimize this bias, it is important to mention it as it has not been eliminated. Generally, journals and conferences are more likely to report positive results and very new and innovative concepts might not be surfaced.

The analysis has been bound to a certain time period, 2020-2023, which does mean that the trends observed in this period will not reflect the long-term patterns in artificial intelligence research. This is proven by the fact that chatgpt, which was a term that never appeared in the interval 2020-2022, was among the top keywords in 2023. It is expected that LLMs will be probably highlighted in the following years as the more generic term AI migrates to the more specific term LLM.

8. Conclusions

The study has set out to analyse a large corpus of scientific literature with the aim to identify the general trends, authors and sources for artificial intelligence.

Our findings have revealed that the publication output over time is increasing at a very high 31.9% rate, higher than the compound annual growth rate for general publications in most countries, which is indicative of the increasing relevance and significance of AI in business and management research. The identification of the core sources and the source distribution pattern was shown to have followed Bradford's Law almost perfectly, which points to a small number of sources publishing a large part of the research. However, considering the fact that overall the number of sources is quite high, the research also highlights the diversity of the contributions to the field.

Furthermore, our study highlights the global nature of artificial intelligence research in business and management areas. The significant increase in the number of countries involved in AI research and the substantial increase in publication output from countries such as India, which has taken the lead in 2023 in publications on artificial intelligence, and China, which, even though it was in the first place from the perspective of publication output, it has still increased the number of publications, underscores the very high importance this field represents for them and its global importance. In addition, we also observed how Romania is positioned in this global research and recognized that while the 28th place globally and 11th place at EU level from the perspective of AI research output is not a bad position, it does allow room for improvement.

Moreover, our analysis of the key concepts and themes clarifies the evolving research landscape, from the emerging themes relevant for futures research, to motor and niche themes which are addressing established concepts, and contributes to a deeper understanding of the multidimensional nature of AI research in business and management while at the same time providing valuable insights for researchers, practitioners, and policymakers alike.

References

1. Agbo, F.J. *et al.* (2021) 'Scientific production and thematic breakthroughs in smart learning environments: a bibliometric analysis', *Smart Learning Environments*, 8(1), p. 1. Available at: https://doi.org/10.1186/s40561-020-00145-4.
2. Alkhammash, R. (2023) 'Bibliometric, network, and thematic mapping analyses of metaphor and discourse in COVID-19 publications from 2020 to 2022', *Frontiers in Psychology*, 13, p. 1062943. Available at: https://doi.org/10.3389/fpsyg.2022.1062943.
3. Aria, M. and Cuccurullo, C. (2017) '*bibliometrix*: An R-tool for comprehensive science mapping analysis', *Journal of Informetrics*, 11(4), pp. 959-975. Available at: https://doi.org/10.1016/j.joi.2017.08.007.
4. Booth, P. *et al.* (2020) 'Entrepreneurship in island contexts: A systematic review of the tourism and hospitality literature', *International Journal of Hospitality Management*, 85. Available at: https://doi.org/10.1016/j.ijhm.2019.102438.
5. Clarivate (2022) *The History of ISI and the work of Eugene Garfield*, *Clarivate*. Available at: https://clarivate.com/the-institute-for-scientific-information/history-of-isi/ (Accessed: 30 March 2023).

6. van Eck, N.J. and Waltman, L. (2010) 'Software survey: VOSviewer, a computer program for bibliometric mapping', *Scientometrics*, 84(2), pp. 523-538. Available at: https://doi.org/10.1007/s11192-009-0146-3.
7. Elango, B. and Oh, D.-G. (2022) 'Scientific Productivity of Leading Countries', *International Journal of Information Science and Management*, 20(2), pp. 127-143.
8. Friedman, A. (2015) 'The Power of Lotka's Law Through the Eyes of R', *Revista Română de Statistică*, 63(2), pp. 69-77.
9. Hartman, K.A. and Mullen, L.B. (2008) 'Google Scholar and academic libraries: an update', *New Library World*, 109(5/6), pp. 211-222. Available at: https://doi.org/10.1108/03074800810873560.
10. Kitchenham, B. and Charters, S. (2007) 'Guidelines for performing systematic literature reviews in software engineering'.
11. Mingers, J. and Lipitakis, E.A.E.C.G. (2010) 'Counting the citations: a comparison of Web of Science and Google Scholar in the field of business and management', *Scientometrics*, 85(2), pp. 613-625. Available at: https://doi.org/10.1007/s11192-010-0270-0.
12. Mongeon, P. and Paul-Hus, A. (2016) 'The journal coverage of Web of Science and Scopus: a comparative analysis', *Scientometrics*, 106(1), pp. 213-228. Available at: https://doi.org/10.1007/s11192-015-1765-5.
13. Nicolaisen, J. and Hjørland, B. (2007) 'Practical potentials of Bradford's law: a critical examination of the received view', *Journal of Documentation*, 63(3), pp. 359-377. Available at: https://doi.org/10.1108/00220410710743298.
14. Onyancha, O.B. and Ocholla, D.N. (2022) 'Dispersion of ICT-related subject terms in information and knowledge management publications: A Bradford analysis', *Humanities and Social Sciences Communications*, 9(1), pp. 1-8. Available at: https://doi.org/10.1057/s41599-022-01189-2.
15. Page, M.J. *et al.* (2021) 'PRISMA 2020 explanation and elaboration: Updated guidance and exemplars for reporting systematic reviews', *The BMJ*, 372. Available at: https://doi.org/10.1136/bmj.n160.
16. Pao, M.L. (1985) 'Lotka's law: A testing procedure', *Information Processing & Management*, 21(4), pp. 305–320. Available at: https://doi.org/10.1016/0306-4573(85)90055-X.
17. Rethlefsen, M.L. *et al.* (2021) 'PRISMA-S: an extension to the PRISMA statement for reporting literature searches in systematic reviews', *Journal of the Medical Library Association*, 109(2), pp. 174-200. Available at: https://doi.org/10.5195/jmla.2021.962.
18. Schnell, J.D. (2017) 'Web of Science: The First Citation Index for Data Analytics and Scientometrics', in *Research Analytics*. Auerbach Publications.
19. Senali, M.G. *et al.* (2022) 'Flipped classroom in business and entrepreneurship education: A systematic review and future research agenda', *International Journal of Management Education*, 20(1). Available at: https://doi.org/10.1016/j.ijme.2022.100614.
20. Smith, N.R. *et al.* (2020) 'A Guide for Choosing Community Detection Algorithms in Social Network Studies: The Question Alignment Approach', *American Journal of Preventive Medicine*, 59(4), pp. 597-605. Available at: https://doi.org/10.1016/j.amepre.2020.04.015.
21. Song, Y. *et al.* (2019) 'Exploring two decades of research on classroom dialogue by using bibliometric analysis', *Computers & Education*, 137, pp. 12-31. Available at: https://doi.org/10.1016/j.compedu.2019.04.002.