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Research Article

Scientometric Mapping of Research Trends and Impact of Artificial Intelligence Applications in Banking and Finance

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ABSTRACT

In recent times, the number of scholarly works contributed in the fields of Artificial Intelligence (AI), banking, and finance has increased significantly. This study aims to presents a qualitative approach to review, assess, and identify the remarkable developments of AI applications in banks based on the Scopus indexed database by deploying Vosviewer 1.6.19v and Biblioshiny software to analyze factors like Co-authorship, Co-occurrence, and Citations.

The number of documents retrieved from the Scopus indexed database is 368 from 2013 to 2023. The result shows that China (91 documents), India (86 documents), the US (59 documents), Turkey (32 documents), and Russia (31 documents) are the five most active countries in terms of publications. The top active institutions are Bucharest University of Economic Studies, University Bourgogne Franche Comté (France), and Gachon University (South Korea). At the same time, China emerged as a significant funding nation for AI-based research. Several significant study gaps are found by reviewing the prior literature and offering suggestions for additional research.

This review develops and categorizes previous research sub-themes, identifies research themes showing how AI is used in banking and uses thematic findings to suggest an AI banking service framework that closes the knowledge gap between academic research and industry practice. These results guide future research and the formulation of strategic decisions about applying and optimizing value from AI technologies in the banking industry for academics, marketers, and decision-makers.

Keywords: Banking, Artificial Intelligence, Scientometric, Bibliometrix, Scopus indexed database, VOSviewer, Biblioshiny

INTRODUCTION

The present era realizes that advanced technologies like Artificial Intelligence (AI), Robotics, and Smart electronic gadgets, to name a few, are no longer away from the reach of humankind (West, 2015). Concerning modern technologies, digital transformation has driven every aspect of our lives, involving enhancing individual skills and competencies, education, research, and businesses, leading to indications and practical expertise (Laura et al., 2023).

AI is embodied through machines, computers, or robots to help people and organizations virtually to facilitate their specific tasks (Lu et al., 2019). Rapid technological advancements and digitization have recently generated the penetration of AI in various comprehensive networks, especially in the banking sector, to improve business performance and customer experience.

The banking environment has been more competitive and volatile due to globalization and transparency in the modern economy (Chen et al., 2018). Modern-day banks' introduction of

digital banking services is helping them grow and expand. The banking industry has become a prominent endorser of AI technology for various applications. AI has extended a cutting-edge solution that could improve problem-solving, automated data operations, improve credit rating, and identify potentially fraudulent transactions by providing reliable customer services in banking services (Duan Y. et al., 2019). . AI technologies render customization of services to customers and employees and automation of internal processes, boosting efficiency and revenues. Banks could deploy AI to increase performance in terms of customer experience by empowering frictionless, 24/7 client association.

Assistance offered virtually through Chatbots is being utilized on various digital platforms to boost personalized banking activities effectively and answer customer queries related to banking transactions. AI analyzes customer behavior patterns solely based on transactional records digitally and recommends solutions according to customer necessities. Robotic automation through AI is pretending to be a more significant concern in banking to attain competitive advantage and profit maximization. AI adoption in corporate banking has benefitted routine processes to enhance efficiency and accuracy round-the-clock, besides cost reduction and indicative customer experiences.

A bibliometric study has been conducted to integrate AI's influence in banking. Of late, an acceptance of bibliometric evaluation in research has gained considerably due to the data access from Scopus, Web of Science, Dimensions scientific database sources, and the available bibliographic software (Donthu et al., 2021).

The research defines and visualizes the reviewed literature over a decade, with the research implications for the future scope, as numerous studies have referred to the bibliometric data analysis on "AI in banking." Therefore, it is vital to acknowledge the collaborative research and development of associations from various disciplines.

The paper aims to perform a systematic literature review to comprehend research and collaboration processes better. A thematic categorization of co-authorship, citations, keywords, and bibliographic coupling was analyzed. Also, the topology of the bibliographic analysis and the desired results were described using the model.

The study contributes to understanding the present status, the knowledge advancement and a thematic map drawing connected to the body of literature on AI in banking services.

A blended approach of bibliometric analysis and a literature review thematically of recently reported data give us a comprehensive view of the theme and generate future research directions.

DATA COLLECTION AND METHODOLOGY

Database

In general, 917 documents were identified from Scopus database, filtered to (n=570) records concerning the proposed topic, “AI in Banking.” Finally, the number of records was reduced from 570 to 368 based on a chosen study period (2013 – 2023), including titles, author names, keywords, categories, and publication types. In a broader comprehensive study to conduct bibliometric analysis, 368 documents were divided into full-text articles (n=197), proceeding papers (n=122), reviews (n=19), early access articles (n=17), book chapters (n=8) and only articles (n=5) for systematic review.

To simplify data analysis, the articles are processed using Mendeley Desktop software after being downloaded in *plaintext format. Moreover, the bibliometric map was created using VOSviewer (van Eck et al., 2013). Publication maps and network-based journal/co-citation maps can be produced with VOSviewer (Hudha et al., 2020). It is possible to remove the frequency of less relevant keywords. Data mining and mapping can also be done with VOSviewer software (Xie et al., 2020).

Figure 1 depicts the architecture of the VOSViewer application and data collection process, which reflects the choice of particular parameters made while using VOS Viewer.

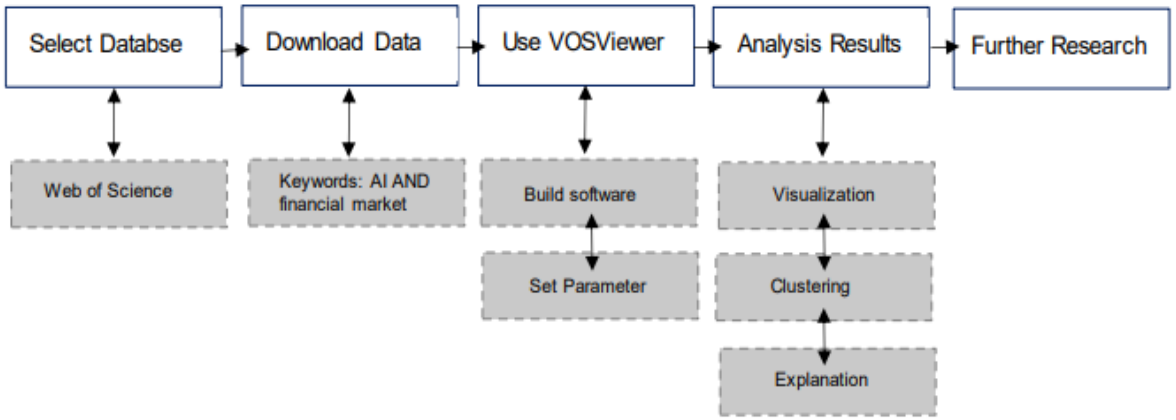

Figure 1: VOSViewer usage process diagram

Bibliometric Tools

Bibliometric analysis is one of the statistical tools used to discover emerging patterns in scientific research articles published and registered in Scopus and Scopus databases (Barbara et al., 2022).In addition, to recognize patterns, scientific mapping, and active research institutions of collaborative work in a particular field and to study the intellectual structure of a given field as presented in the relevant document, bibliometrics is used. Figure 2 represents the flow of the bibliometric analysis used in the study. The relevant data has been extracted from the predefined Scopus database, one of the most comprehensive databases covering various disciplines and peer-reviewed scientific information (Ramanita Pranckute, 2021).

The data obtained is exported as a plain text file extension and then uploaded to VOSviewer and Biblioshiny software for mapping and visualization. In this study, to evaluate the data, Biblioshiny, a web application, was used and enclosed in the Bibliometrix R-package. All the data analyses that different tools permit users to operate separately are constituted in Biblioshiny (Ariaa et al., 2017).. VOSviewer 1.6.19v is the software that analyses the database in this study for visualizing the data from Scopus (Eck et al., 2010). Hiscite (Garfield, 2004), CiteSpace and BibExcel (Jayantha et al., 2019) were used earlier for bibliometric analysis. Furthermore, the bibliometric techniques effectively handle large volumes of data to develop a scientific framework for the present study (Zupic et al., 2014).

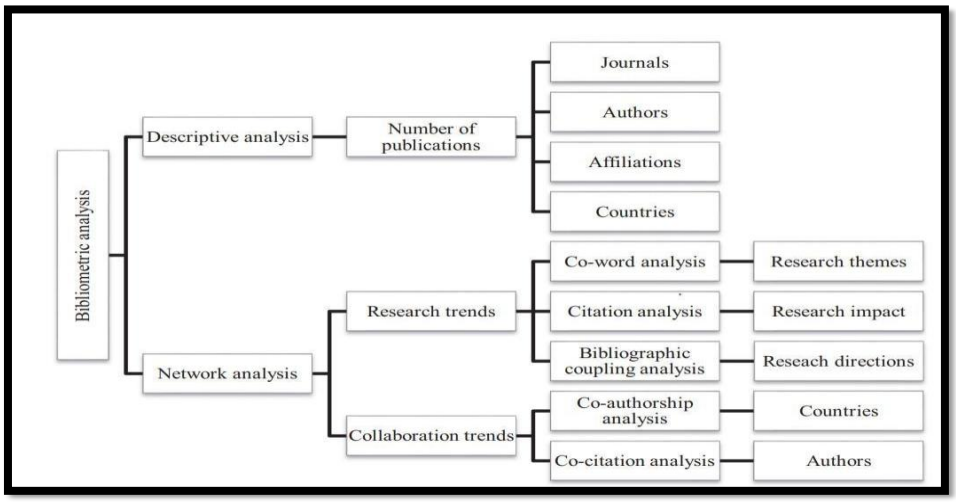

Figure 2: Bibliometric Analysis Topology

A bibliometrics methodology is an execution of quantitative techniques like citation analysis to access bibliometric data (Broadus, 1987).

The literature review intends to transform the academic content into a systematized form in identifying, mapping, and evaluating the facts using bibliometric analysis. It also specifies the relevant research gaps and provides the

future research scope.

RESULTS AND DISCUSSIONS

The present research makes use of Descriptive and Network analyses. The descriptive analysis includes background facts based on prevailing noticeable literature and its interpretation. In contrast, network analysis broadens the scope of the study through predictive correlation in the literature instead of just presenting events in the database. Further, its scientific mapping helps to detect literary targets and trends.

Descriptive Analysis

Banks use virtual assistant services to provide guidance and answer customer queries related to banking transactions. Dynamic analytics through AI for social enterprises can better understand customers' emotional states and perceptions. In addition, AI generates detailed records and the behavior of their customers, consequently allowing banks to build healthy relationships with customers by scaling their products and services with cost-effective and efficient features accordingly.

Extensive research on AI in the banking sector has enormously contributed to its potential growth, thus enforcing the banking industry's adoption of AI technology to enhance customer satisfaction and loyalty.

The variables such as publications, top journals, authors, and research organizations belonging to various countries for ten years were discussed based on descriptive analysis.

Table 1 shows the number of publications from 2013 - 2023. Usage of AI in banking has steadily increased from January 2013 to December 2023, with significant growth starting in 2018, where about 99 publications reported belonged to the year 2022.

Table 1: Information related to Documents, Authors, and Authors collaborations

DESCRIPTION	RESULTS
TIMESPAN	2013:2023
SOURCES (JOURNALS, BOOKS, ETC)	255
DOCUMENTS	368
ANNUAL GROWTH RATE %	16.23
DOCUMENT AVERAGE AGE	2.86
AVERAGE CITATIONS PER DOC	6.946
REFERENCES	14562
DOCUMENT CONTENTS	
KEYWORDS PLUS (ID)	477
AUTHOR'S KEYWORDS (DE)	1318
AUTHORS	
AUTHORS	1079
AUTHORS OF SINGLE-AUTHORED DOCS	52
AUTHORS COLLABORATION	
SINGLE-AUTHORED DOCS	55
CO-AUTHORS PER DOC	3.09
INTERNATIONAL CO-AUTHORSHIPS %	23.64
DOCUMENT TYPES	
ARTICLE	197
ARTICLE; BOOK CHAPTER	8
ARTICLE; EARLY ACCESS	17
ARTICLE; PROCEEDINGS PAPER	2
PROCEEDINGS PAPER	122
REVIEW	19
REVIEW; EARLY ACCESS	3

Source: Scopus database, Biblioshiny software

The 368 publications were classified as follows shown in Figure 3. 197 journal articles, 122 proceedings, 19 reviews, 17 early access articles, 8 book chapters, and to name a few. According to the results for the above-consolidated document types, the most frequently used document type as a research topic is a document in the form of a journal article, with 53 percent. Meanwhile, proceedings paper contributed 33 percent of the documents used from Figure 3.

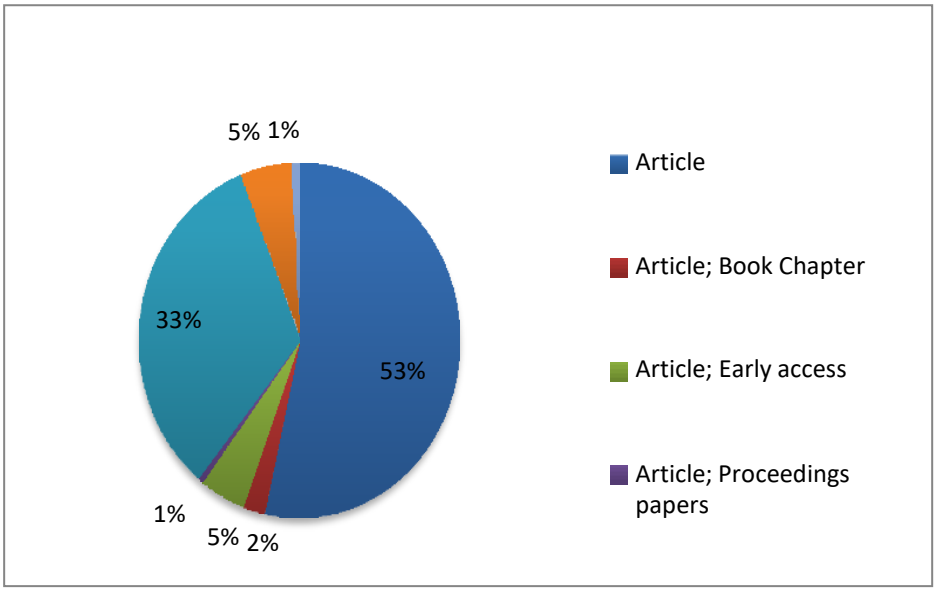

Figure 3: Publication Type

From January 2013 to December 2023, the use of AI in banking has steadily increased, with significant growth starting in 2018. 2022 saw a decade high, with 99 publications, as shown in Table 2 & Figure 4. This implies a bright scope for research in this area in the preceding years.

Table 2: Number of Publications (2013 -2023)

Year	Articles
2013	8
2014	9
2015	12
2016	9
2017	11
2018	25
2019	36
2020	52
2021	71
2022	99
2023	36

Source: Scopus database, Biblioshiny software

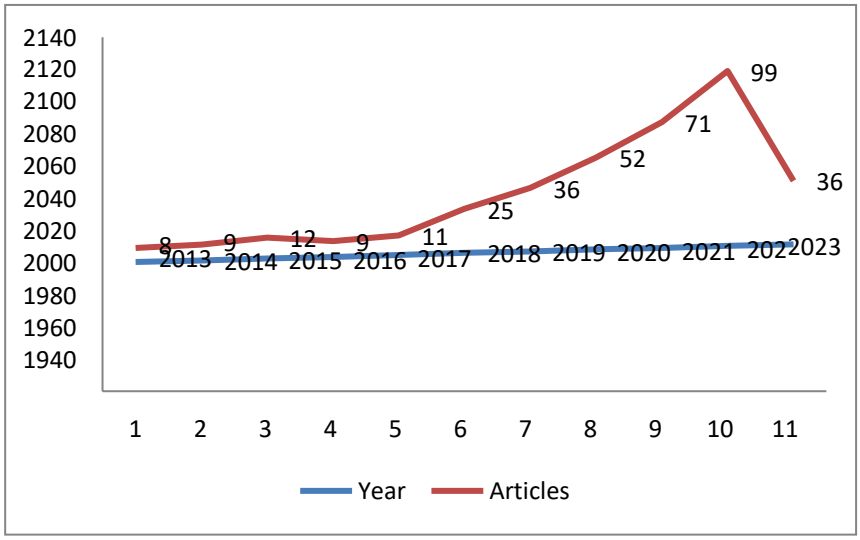

Figure 4: Articles Published (2013-2023) Source: Scopus database

Table 3 and Figure 4 reflect the export of data from various Scopus categories. Of 368 documents, the Computer Science Artificial Intelligence category has the highest number of 114 documents. According to the findings, there is a strong association between Artificial Intelligence adoption, Business, Management, Finance, and Computer Sciences.

Table 3: Number of publications Category Wise (2013-2023)

Categories	Number of Publications in each category
Ethics	2
Social Sciences Interdisciplinary	4
Robotics	5
Multidisciplinary Sciences	10
Economics	22
Management	28
Business	40
Business Finance	40
Computer Science Information Systems	103
Computer Science Artificial Intelligence	114

Source: Scopus database, Biblioshiny software

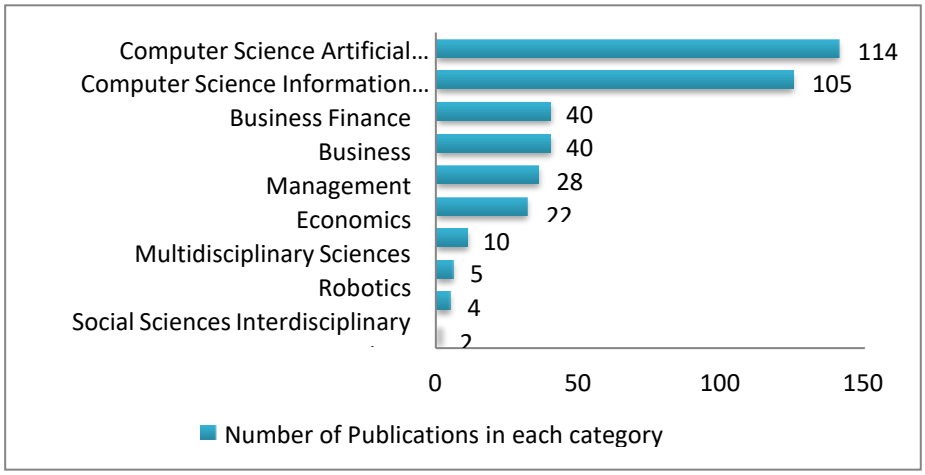

Figure 5: Publications Category Wise Source: Scopus database

Table 4 illustrates the top ten authors and their publications on AI in banking. With 4 articles, author KHAN S tops the list, whereas the remaining authors follow the publication list with 3 - 2 articles each and contribute 29 articles. Based on the results, authors with fewer publications are in the evolutionary stage and must be categorized as predominant (Feng et al., 2017).

Table 4: Authors Publications on AI in Banking

Author	Articles	Articles Fractionalized
KHAN S	4	1.23
DVORAK J	3	1
JANKOVA M	3	1
KUMAR A	3	1.17
LI B	3	1
PIOTROWSKI D	3	3
SHARMA S	3	0.92
URBADECSKY K	3	1
ALYAS T	2	0.31
ASHTA A	2	1

Source: Scopus database, Biblioshiny software

Table 5 elucidates the research institutes with the most paper publications on AI in banking. The top ten research organizations include IEEE ACCESS, with 12 recognized publications, while EXPERT SYSTEMS WITH APPLICATION has produced 11 publications and contributed 112 articles. The results suggest that most institutions involved in research based on AI concepts in banking are at their early stages, attributing to low publications, limiting around 3 to 4 articles.

Table 5: List of the Top Affiliations Based on Publications

Source	Articles
IEEE ACCESS	12
EXPERT SYSTEMS WITH APPLICATIONS	11
STRATEGIC CHANGE-BRIEFINGS IN ENTREPRENEURIAL FINANCE	9
WIRELESS COMMUNICATIONS & MOBILE COMPUTING	6
AI & SOCIETY	5
ELECTRONICS	5
JOURNAL OF FINANCIAL SERVICES MARKETING	5
JOURNAL OF INTELLIGENT & FUZZY SYSTEMS	5
PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON BUSINESS EXCELLENCE	5
COMPUTATIONAL ECONOMICS	4

Source: Scopus database, Biblioshiny software

The study reveals that most of the citations are from two countries, namely China and India, as highlighted in Table

6 and Figure 6. The number of citations made in China is 91, followed by India with 86 citations. The two countries cited 117 articles, representing about 80% of the top ten countries cited about AI in banking, indicating that the literature on the mentioned topic is produced in many countries but in a lesser amount.

Table 6: No of Publications - Country Wise

Country	Publications
CHINA	91
INDIA	86
USA	59
TURKEY	32
RUSSIA	31
SPAIN	30
FRANCE	25
UK	25
SAUDI ARABIA	23
ITALY	22

Source: Scopus database, Biblioshiny software

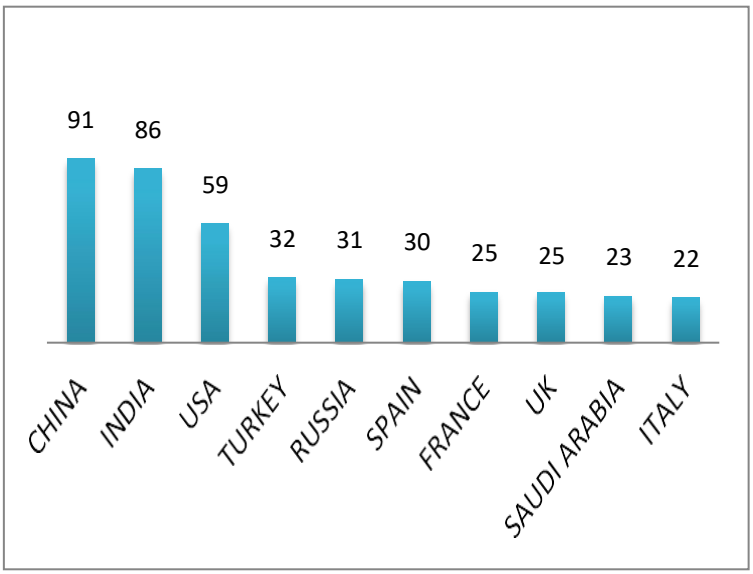

Figure 6: No of Publications-Country Wise Source: Scopus database

Table 7 shows the Co-occurrence analysis of top most keywords relying on total link strength.

Total link strength is the strength among similar elements (Eck et al., 2017). The keyword "Artificial Intelligence" possesses the highest total link strength, followed by other frequent keywords "model," "models," and "performance."

Table 7: Co-occurrence Analysis of Top Most Keywords

Word	Occurrence
Artificial-Intelligence	21
Model	18
Models	17
Performance	13
Bankruptcy Prediction	12
Impact	12

Banking	11
Management	11
Neural-Networks	11
Acceptance	10

Source: Scopus database, Biblioshiny software

Word Cloud identifies the authors' abstract words, which includes the most often-used authors' keywords (Secinaro et al., 2021). This shows the relationship between the authors' abstract words and other keywords: banking services, chatbots, technology acceptance, and satisfaction, which are built up around the most important keyword, "artificial intelligence" presented in Figure 7.The study specifies the research themes that include AI adoption in banking and provides a high-yielding ground for future research.

Figure 7: Word Cloud of AI in Banking Source: Scopus Database

Network Analysis

Network analysis is an advanced approach to representing social and intellectual constructs using available literature data. Network analysis uses comparative techniques to broadly classify the bibliographic data into Co-authorship, Co-occurrence, Citations, Co-citations, and bibliographic coupling analyses.

Co-Authorship Analysis

This analysis deals with three different units: Authors, Organizations, and Countries. A document involving many authors has been ignored, and the maximum number considered was 25. A minimum of 2 documents as threshold value has been considered for any author. Out of 1095 in total, 37 authors satisfied the threshold criteria. Further, total link strength of Co-authorship were calculated and compared. With 4 total citations for 3 documents, DVORAK JIRI constitutes the highest total link strength of about 6 from Figure 8.

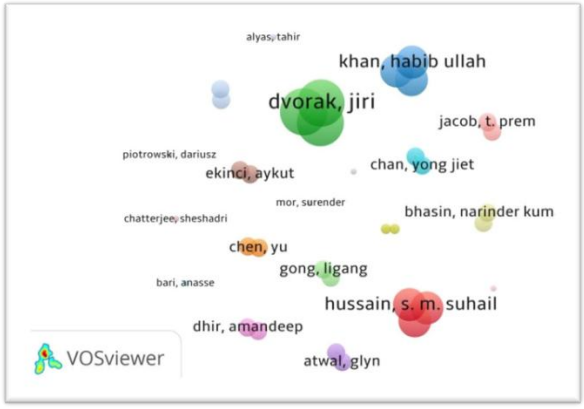

Figure 8: Co-Authorship Analysis of Authors. *Source: Scopus, exported on 30th Dec 2023*

Co-Occurrence Analysis

The Co-occurrence of Keywords or Co-words is often termed as a group of keywords simultaneously extracted from a collection of research publications of particular investigations (Lu et al., 2012). Evaluation of co-words is an attempt to extract technological themes that directly explore the correlation between the frequent occurrence of the pair of sentences from the reference subject (Ding et al., 2001) and trends of related subfields (He, 1999).

Below are top ten keywords obtained from co-occurrence analysis according to their total link strength, "artificial intelligence, model, models, performance, bankruptcy prediction, impact, banking, management, neural networks, and acceptance." Figures 9 and 10 depict the network mapping and Tree Map of frequently occurring keywords. Table 7 shows that artificial intelligence, model, and models hold 5%, 5%, and 4% of keyword occurrence percentages, respectively, attributing to a large cluster's association. Out of 1703 keywords, a minimum of 3 occurrences were anticipated, and 169 fulfilled the threshold limit.

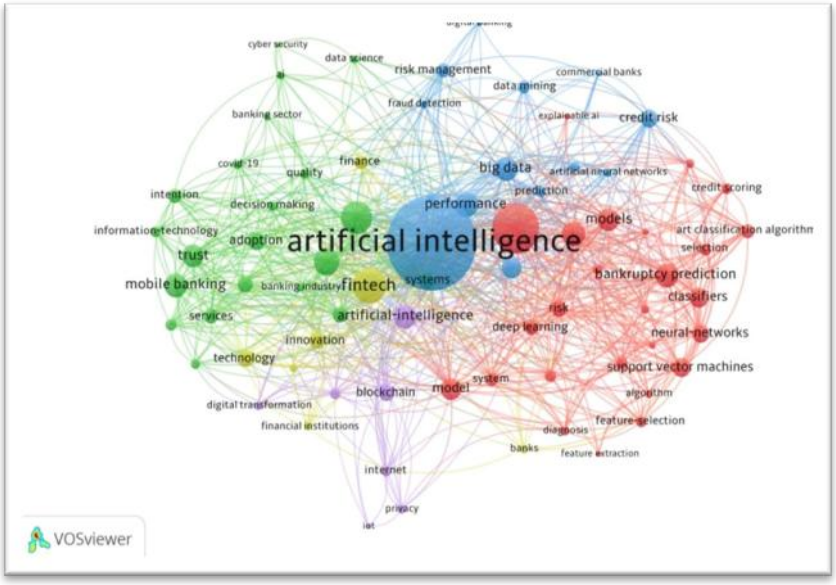

Figure 9: Co-Occurrence Analysis of All Keywords. *Source: Scopus, exported on 30th Dec 2023*

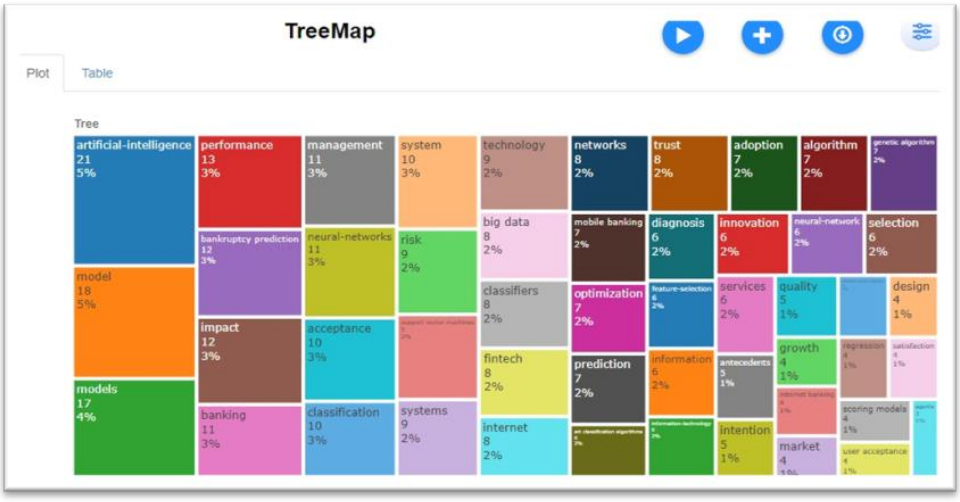

Figure 10: Tree Map of Co-Occurrence Analysis. *Source: Biblioshiny Software*

Citation Analysis

In academics, citation measures influence (Feng et al., 2017). In research, a significantly impacted study possesses a high value of citation index. Moreover, publication citation patterns might consider the kind of influence on research community (De Bakker et al., 2005). It can be notice from Table 8 & Figure 11, that 30 authors out of 1095

reached the threshold value of 2 citations per document. GONG, LIGANG (2014) tops the list with 71 citations, followed by ASHTA, ARVIND; EKINCI, AYKUT; JACOB, T. PREM, and CHEN, YU with 52, 31, 30, and 29 citations, respectively. While the highest total link strength of about 7 has been observed for ASHTA, ARVIND (2021).

Table 8: List of Top Cited Articles

Article	No. of Citations
GONG, LIGANG; 2014; An Improved Artificial Bee Colony Algorithm on Balance-Evolution Strategy	71
ASHTA, ARVIND; 2021; Artificial Intelligence and Fintech	52
EKINCI, AYKUT; 2013; A Comparison of various AI Methods in thePrediction of Bank Failures	31
JACOB, T PREM; 2019; AI--based Network Intrusion Detection with hyper parameter optimization tuning on the realistic cyber dataset using cloud computing	30
CHEN, YU; 2021; Implications of the use of artificial intelligence in public governance	29

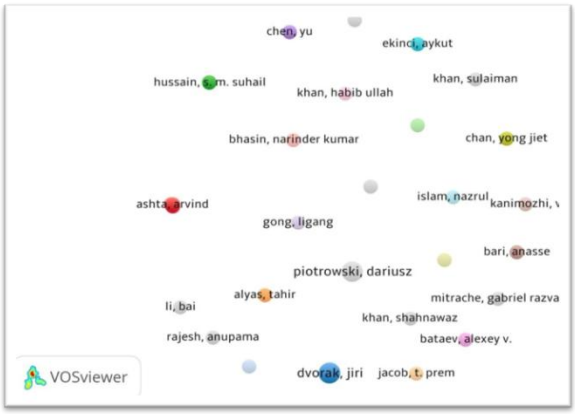

Figure 11: Citation Analyses Of Documents. *Source: Scopus, exported on 30th Dec 2023*

Bibliographic Coupling Analysis

Using the same reference by two or more articles can be termed bibliographic coupling (Kessler, 1963).It helps to identify what is being investigated in particular research (Zhao et al., 2008). Bibliographic coupling imparts an intense process for inspecting an intellectual design of a specific field (Koseoglu, 2016). A threshold value of a minimum of 2 per document has been taken into account. 174 authors met the criteria out of 368 documents. It was noticed that ORESKI S (2014) dominates the list with 263 citations, whereas CHI (2019) possesses higher total link strength about 146 citations, as shown in Table 9 and Figure 12.

Table 9: List of Top Five Cited Articles from Bibliographic Coupling

Paper	DOI	Total Citations	TC per Year	Normalized TC
ORESKI S, 2014, EXPERT SYST APPL	10.1016/j.eswa.2013.09.004	263	26.3	6.3
ALA'RAJ M,				

2016, KNOWL-BASED SYST	10.1016/j.knosys.2016.04.013	119	14.88	5.64
ABELIAN J, 2017, EXPERT SYST APPL	10.1016/j.eswa.2016.12.020	118	16.86	4.59
DIRICAN C, 2015, WORLD CONFERENCE ON TECHNOLOGY, INNO VATION AND ENTRE PRENEURSHIP	10.1016 / j.sbspro.2015.06.134	87	9.67	7.35
YANG XH, 2017, INFORM SCIENCES	10.1016/j.ins.2017.01.011	87	12.43	3.38

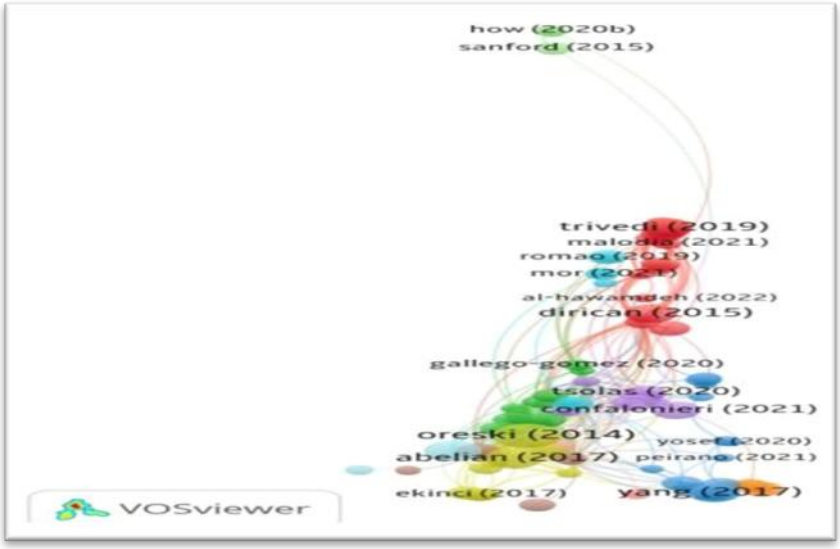

Figure 12: Bibliographic Coupling Analysis of Documents.

Source: Scopus, exported on 30th Dec 2023

Co-Citation Analysis

The citation of similar references by distinct articles is called co-citation. Co-citation analysis is the most effective technique to obtain the degree of relatedness among various citations (Small, 1973). Unlike the bibliographic coupling analysis, Co-citation determines the vital link among citing articles (Lu et al., 2012). Further, this analysis uncovers a hidden relationship pattern between authors and co-authors, who do not collaborate actively for their publications (Feng et al., 2017). Figure 13 shows the Co-citation network analysis of authors with the help of different colors that contain three prominent clusters**.** Out of the 11471 authors, a minimum of 5 citations were considered a threshold per author. Upon analysis, 238 authors were found to meet the threshold. With the highest number of citations at 26, VENKATESH, V (2018) tops the list, and his highest total link strength was 414. VENKATESH, V, and other authors are put down in the blue cluster since they shared common knowledge in Information technology. The green cluster represents authors such as WANG, G, and others from the Business Information Science and Technology field. ASHTA, ARVIND, and other authors are grouped in the red cluster belonging to Microfinance.

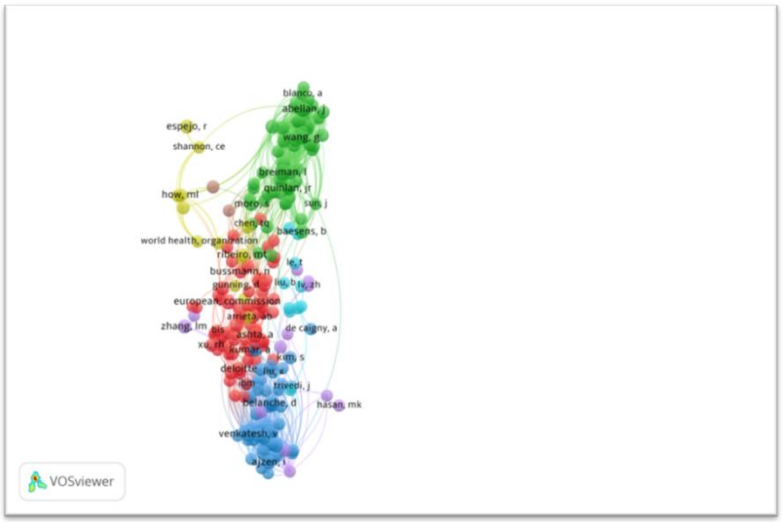

Figure 13: Co-Citations Analysis of Authors. *Source: Scopus, exported on 30th Dec 2023*

REVIEW OF MOST RECENT DOCUMENTS

It includes a study of the previously discussed most recent publications in Table 10, to discover which theories and models were most usually adopted in the literature on AI in banking, as well as the methods of conducting the empirical test (profile, methodology, sampling techniques, variables for data analysis, significant findings and recommendations).

Table 10: Review of the Recent Literature on AI in Banking

AUTHORS & YEAR	METHODOLOGY & TECHNIQUES	VARIABLES	FINDINGS	RECOMMENDATIONS
Noreen et al., (2023)	Questionnaire, convenient sampling	Awareness, Attitude, subjective norms, perceived risk, perceived usefulness, knowledge	Except perceived risk all other variables have positive relationship to adopt artificial intelligence.	This study would enable the banking administration to make strategic decisions so as to build the trust & confidence of consumers and overcome risks in using digital technology while doing transactions.
Ranpreet Kaur et al., (2023)	Secondary data	Bank enquiries, product applications, payment transfers, credit assessments, risk management, Chat bots and personalized	The essential application of AI tools is financial inclusion of the non-banking population that helps the banks achieve financial sustainability	Banks and financial services providers should tie up with fintech firms for technological indications and reach out to the unbanked population. This will offer a combination of trust and technological indication to Indian customers. Banks and financial services providers should tie up with fintech firms for

		offers		technological indications and reach out to the unbanked population. This will offer a combination of trust and technological indication to Indian customers. Banks and financial services providers should tie up with fintech firms for technological indications and reach out to the unbanked population. This will offer a combination of trust and technological indication to Indian customers. Banks and financial services providers should tie up with fintech firms for technological indications and reach out to the unbanked population. This will offer a combination of trust and technological indication to Indian customers. Banks should collaborate with financial firms to reach out to non-banking people and offer customers technological indication awareness and trust
Chaya et al., (2023)	Secondary data, case studies	Chat Bots, Report Generation Analytics, RPA, Biometrics and Loan Processing are some of the software applications that are used in banking and financial services.	Artificial intelligence is revolutionizing traditional banking services with modern banking applications as banking and financial services are changing rapidly with advanced technologies	Globally, governments should encourage the use of AI-embedded indications in financial and business operations to accelerate efficiency and retain better customer engagement
Shirie Pui Shan Ho et al., (2023)	Survey Questionnaire, Structure Equation Modeling	Brand Experience, Brand Preference and	Marketing through AI positively affects brand experience,	The research study would aid the banking sector to frame AI marketing and branding strategies for customer acquisition and retention

	(SEM)	Repurchase Intention Brand preference and experience, repurchase intention	brand preference, and repurchase intention. Whereas Brand experience intermediates brand preference and the efforts of AI marketing	
Domingos Mondego et al., (2022)	SEM model, regression analysis and multi-group analysis	CBPS adoption, perceived compatibility, Trust, perceived security levels, subjective norms and perceived risk	The finding of the study concludes the TAM application to examine the positive or negative factors that impact the implementation of Cloud Based Payment Systems	SEM would be the preferable research tool for examining the relationship between constructs, regression and multi-group analyses
Shirie Pui Shan Ho et al., (2022)	Structured Questionnaire, PLS-SEM 3.3.3	Customer personality and conscientiousness - dimensions, extroversion, agreeableness, trust, satisfaction, loyalty	The investigation clarifies the dimensions of conscientiousness and customer personality, extroversion, and agreeableness act upon Trust that consequently affects customer satisfaction and loyalty	The study recommends that managers of banks understand the dimensions of customer personality conscientiousness and develop pertinent management strategies to fulfill customer satisfaction and enhance loyalty
Reem Al-Araj et al., (2022)	Survey and random sampling	Customer Awareness	The significant contribution of the research focuses on AI technology for automated banking and financial services to	AI implementation assists banks in faster and effortless processing of enormous amounts of data

			simplify tedious manual tasks	
Cristi Spulbar et al., (2022)	Survey research	Comfort and Reliability	The research explores the future scope of banking with AI in front-office and back-office operations	AI technology offers new opportunities like consumer delight and indication; challenges such as cybercrime and macro-financial risks
Safeer et al., (2021)	Online Survey, PLS-SEM	Brand experience dimensions, word of mouth and willingness to pay more through the mediating role of perceived brand authenticity	The research proved that brand experience dimensions significantly influenced perceived brand authenticity, which affects loyalty	As a positioning tool brand authenticity aids bank managers globally in executing various experiential marketing strategies
Akash Yadav, (2021)	Survey and random sampling	Consumer's Perceptions	The study inferred utilization of AI services in private banks and financial institutions for the customers' benefit and satisfaction	According to the results inferred, the customers must get more commitment from the banking and financial representatives
Addanki Akhil et al., (2021)	Exploratory factor analysis	Artificial intelligence, service quality and customer satisfaction	The findings reveal that the need for AI in the banking sector is equally essential for customers	There should be an optimal balance between human and virtual agents based on customer preferences and requirements
Author's Proposed Future Research Work	***Survey Questionnaire and Purposive Sampling***	***Modified Service Quality Dimensions, Modified Technology Acceptance Factors,***	***Investigation includes the AI's Impact on Customer Loyalty in Digital Banking***	***Conceptual Model using SMARTPLS4_SEM***

		Customer Satisfaction and Customer Loyalty	***Services in India***	

Source: Author's self-made

DISCUSSION

As the present research aims to know the AI technology usage in banking worldwide, a qualitative approach helps to review, assess, and identify significant breakthroughs in AI applications in banks using the Scopus-indexed database, Vosviewer 1.6.19v, and Biblioshiny software to analyze factors such as co-authorship, co-occurrence, and citations. This study used considerable data analysis by bibliometric measurements on AI in banking based on articles exported from the Scopus database from 2013-2023. The AND and OR operators traced and assessed finally 368 articles related to the research topic. The evaluations of the reference database focused on specific parameters.

According to keyword search research, the term artificial intelligence correlates with the most publications, with 2022 seeing more publications than 2021. Computer Science Artificial Intelligence, which falls within the topic field, accounts for around 31% of articles.

Journal articles were the most common primary sources in the Document type, followed by proceeding papers. China has the most publications per country throughout the study period. Analysis of documents by diverse writers reveals a maximum contribution of 4-6 average articles. Most materials are from Bucharest University Economic Studies, and China looks to be the primary financing source for AI. The bibliographic coupling is done using Scopus Database and Vos viewer 1.6.19v and network analysis of co-authorship, co-occurrence, citations and co-citations. These network analyses provide helpful information on the many types of analysis discussed above. Furthermore, primary research on AI in banking was conducted between 2018 and 2023.

Analysis of documents belonging to various authors shows their maximum contribution of 4-6 average publications. Most documents are from Bucharest University Economic Studies, and China appears to be the most significant funding sponsor for AI. Using Scopus Database and Vos viewer 1.6.19v, Network analyses of Co-authorship, Co-occurrence, Citations, Co-citations, and bibliographic coupling were thus achieved. All these network analyses provide significant information about the various types of analysis mentioned above. Further, significant research on AI in banking occurred between 2018 and 2023.

CONCLUSION

With technological evolution, remarkable changes have happened in the banking sector. AI technology is a rapidly growing trend due to its influential role in this sector. It helps in managing a large amount of data in banks. With the help of a bibliographic review, essential themes under the scope of AI in banking have been analyzed, such as chatbots, robotic automation, risk assessment, personalized financial services, and competitions. The increased significance of AI and its benefits to bank services boosted countries' participation globally in investigating this study area further.

Further efforts to systematically review exclusive literature on AI were performed in banking through bibliometric analytical techniques using Biblioshiny and VOSviewer. This research found and sorted the documents according to link strength and citation rate. It was an effective method in this bibliometric analysis since the citation rate suggests that researchers are becoming more aware of this field, increasing the likelihood of extensive research highlighting the topic's importance.

Thus, the current study assists academicians, industrialists, and others in acquiring and applying the knowledge to benefit stakeholders. Banks could focus on increasing customer satisfaction and retention to maintain competitiveness and achieve profitability by adapting AI in services and allowing customers to use it easily.

RECOMMENDATIONS FOR FUTURE STUDIES

Network analysis consists of different types of analysis suggests provision for a future scope to contribute research related to AI applications in the banking sector. This article gives academia and area experts valuable insights into getting acquainted with AI applications since the research on AI-powered digital banking and financial inclusions is still in its infancy. Careful consideration is needed to determine whether artificial intelligence brings expertise to organizations or impedes intellectual capital growth and development. Policymakers need to examine each cluster to decide on its future scope. The implications of bibliographic analysis help scholars systematically review the literature and find research gaps for further studies.

The research and literature on artificial intelligence in the banking industry were assessed using a bibliometric approach in this study. Future research must broaden the scope of this bibliometric analysis by employing additional documentation, journal impact factors, and advanced citation techniques to provide greater clarity on this field of study. The research should serve as a foundation for identifying gaps and comprehensively investigating more critical areas of artificial intelligence in banking. Extensive research and theoretical understanding in this field will benefit customers more and result in more significant achievements in the banking industry.

MANAGERIAL IMPLICATIONS

Managers and policymakers may take considerable away from this article regarding artificial intelligence applications in their respective fields of expertise. Initially, increased use of technology in any form (chatbots, the Internet of Things, artificial intelligence) reduces people's manual skills, which affects the expansion of manual labor jobs. Next, managers must assess the themes discussed in this article, including what went wrong and what can be done to prevent similar incidents and create more favorable conditions that promote long-term growth. That different themes and clusters are interconnected is surprising to policymakers. The question is whether AI benefits all fields, businesses, and nations equally. To determine whether this technological advancement is feasible, managers should conduct surveys. Managers must conduct surveys to ascertain if technological advances are improving or degrading activities. Careful thought is needed to determine whether artificial intelligence adds value to organizations or if this idea is keeping intellectual capital from growing and developing. To determine each cluster's potential future reach, policymakers need to look at it independently.

For practitioners and marketers operating in the Indian banking industry, this research offers valuable insights. We encourage bankers to consider improving their application of AI to credit scoring, analysis, and granting procedures to lower risk, save expenses, and enhance customer satisfaction. This will help with the adoption of AI-based decision-making. But, in doing so, we advise utilizing AI to improve internal procedures and low-complexity tasks as a tool (chatbots) to enhance customer service, diverting employees' attention to other activities that have a more significant impact on the business. Furthermore, to target customers for the best solutions, we advise utilizing AI as a marketing segmentation tool.

LIMITATIONS

The reported investigation's shortcomings also need to be highlighted. Firstly the searches were conducted solely using the Scopus indexed database, which might result in the exclusion of critical informatory data from other significant databases. Secondly, bibliometric studies utilize quantitative data for analyses provided with the fewest documents on artificial intelligence in the banking sector throughout the ten-year analysis. As a result of which, the publication's content or quality cannot be interpreted. The researcher selects keywords randomly of their choice. However, special focus was exclusively on choosing keywords for the research theme. Besides using Plain text, RIS, and BibExcel for bibliographic analyses, future studies must use other tools that provide more clusters.

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Author contributions

MAH: Written the original draft, Scopus Database Collection, Data analysis, Visualization & Mapping, Design the methodology and revisions. SV: Conceptualization, Supervision, editing and proofreading. All authors read and approved the final manuscript.

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Availability of data and materials

The data used during the current study are of secondary nature obtained by exporting from Scopus indexed database. A total of 917 documents were identified from Scopus indexed database, filtered to (n=570) records concerning the proposed topic, "AI in Banking." Finally, the number of records was reduced from 570 to 368 based on a chosen study period 2013 – 2023.

The data that support the results have been included in the study and will be available on request from the corresponding author.

Declarations

Ethics approval and consent to participate

This material is the authors' original work, which has not been previously published elsewhere. The paper is not currently being considered for publication elsewhere.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing or conflict of interests

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