



MAPPING THE LANDSCAPE OF ARTIFICIAL INTELLIGENCE IN BANKING: A BIBLIOMETRIC PERSPECTIVE

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Abstract:

Artificial intelligence (AI) technologies are transforming the banking sector, creating radical changes in operational efficiency, customer experience, and risk management. For an institution that thoroughly analyzes its own and its customers' needs and desires, this requires continuous transformation and adaptation to market conditions. Furthermore, the use of AI is undeniable in this process, which has evolved since the beginning of the 21st century and requires the analysis of big data. Machine learning and natural language processing (NLP)-based chatbots offer speed and personalization in customer service, while fraud detection systems increase the security of financial transactions with their anomaly detection capabilities. Furthermore, automating repetitive tasks through robotic process automation provides significant reductions in operational costs. Data privacy and security concerns are further complicated by legal regulations such as GDPR. Consequently, while AI plays an indispensable role in the banking sector, ethical, regulatory, and technological infrastructure issues also need to be addressed. This study analyzes the existing scientific literature on the role of artificial intelligence in the banking sector using bibliometric methods and evaluates the studies in this field. The dataset for the study was taken from the Web of Science (WoS) database, and a bibliometric analysis was conducted using Vosviewer. The analysis identified studies covering the period 1992-2025, totaling 247 publications. It concluded that scientific productivity was low between 1992-2018, but has accelerated and increased since 2018, with a significant increase in studies in this field in recent years. Furthermore, the importance of the concepts of "fintech," "credit risk," and "machine learning" for researchers was emphasized.

Keywords:

Artificial Intelligence, banking, fintech, machine learning, bibliometric analysis

JEL Classification:

M10, M15, O33

1. Introduction

The banking sector has always been a pioneer in using the outputs of technology in its products and services. From mechanical calculators to telegraph-based money transfers, from access to banking services via telephone, internet, and mobile devices to plastic credit cards and mobile payment solutions, many uses in the sector have been made possible thanks to developments in information and communication technologies. All these developments have not only benefited banks and their customers but have also made significant contributions to institutions in terms of improving their processes and adapting to competition.

Since the early 2000s, the internet infrastructure covering the whole world, along with the emergence of the concept of big data, has pushed all institutions to take strategic steps in data analysis and service delivery. At this point, artificial intelligence technologies have become the focus of institutions' work.

When artificial intelligence is combined with big data analytics, it enables the development of machines that can perform human-like functions by processing information obtained from various sources such as GPS signals, emails, sensor data, videos, blogs, and social media posts, and significantly increase efficiency in production and services

(Yılmaz, 2018). In this context, artificial intelligence stands out as a technology with the potential to revolutionize the banking sector.

AI technologies offer a wide range of opportunities in the banking sector, from customer service and risk management to fraud detection and the provision of personalized financial products. Implementing the right solutions for critical banking processes such as real-time monitoring of abnormal monetary transactions, credit rating and risk management, reaching customers through chatbots, and fraud detection for bank and customer security has become crucial.

On the other hand, the rise of AI in the banking sector also brings with it a number of challenges. Issues such as data privacy, algorithmic bias, impacts on the labor market, and regulatory compliance require careful consideration of AI applications.

The banking sector is a cornerstone of the global economy due to its critical role in the collection and distribution of financial resources, and constitutes 83% of the financial system in Türkiye (COŞKUN et al., 2021). The sector continues to operate under market conditions sometimes filled with financial crises and uncertainties. Therefore, a comprehensive understanding and strategic approach are needed to fully realize the potential of artificial intelligence in the banking sector and minimize potential risks. The aim of this study is to conduct a bibliometric analysis of the level of artificial intelligence's presence in the banking sector and to guide researchers on opportunities, challenges, and future predictions. The first section provides information on what artificial intelligence is and its historical background. The following section outlines the place, importance, and application areas of AI in the banking sector. The next section, under the heading of the study's methodology and findings, discusses the bibliometric analysis data and interprets the obtained data. The final section, the conclusion and evaluation, focuses on recommendations for the sector and academia, research topics open to further study, and future predictions.

2. Conceptual Framework

2.1. Definition of Artificial Intelligence (AI)

Artificial intelligence (AI) refers to the ability of machines to perform tasks typically requiring human intelligence, such as reasoning, learning, problem-solving, and perception (Ding et al., 2023; Khalid et al., 2024). AI involves creating computer systems that can analyze data, identify patterns, and make data-driven decisions (Ferrer, 2023). Some definitions emphasize AI's role in enabling machines to "think" or mimic intelligent human behavior (Mariani et al., 2023; Varshaa et al., 2020).

McCarthy, considered the father of AI, defined artificial intelligence as the science and engineering of making intelligent machines (McCarthy et al.; 1955). According to Russell Norvig; AI is defined as "the design of systems that perceive their environment and take actions to achieve their goals." This definition highlights the autonomous and adaptive characteristics of AI.

Microsoft founder Bill Gates describes artificial intelligence as a model created to solve a specific problem or provide a specific service. Stanford University professor Andrew NG states that artificial intelligence is the new electricity. This is an analogy expressing that AI will revolutionize every major industry, just as electricity did 100 years ago. It also emphasizes the transformative power of AI.

In the EU Artificial Intelligence Act published on June 13, 2024, an Artificial Intelligence System is defined as follows: 'An artificial intelligence system' is a machine-based system designed to operate with varying levels of autonomy, capable of exhibiting adaptability once deployed, and deriving from inputs received for explicit or implicit goals how to produce outputs such as predictions, content, recommendations or decisions that can affect physical or virtual environments.' Also, under the EU AI Act, minimal risk, limited risk, high risk and A risk-based approach has been developed that identifies four risk levels, including unacceptable risk (Camilleri, 2023).

According to these definitions and statements, it is possible to say that the most important characteristics of AI are:

- Ability to Learn
- Behavior in an Autonomous Manner
- Ability to Adapt

The sub-disciplines of AI can be listed as follows:

- Machine Learning: A fundamental discipline that enables algorithms to learn from data and includes methods such as decision trees and support vector machines.

- Deep Learning: A sub-branch of machine learning based on artificial neural networks, especially working with big data.
- Natural Language Processing: Covers areas such as text and speech analysis and language models.
- Robotics: Encompasses autonomous systems that interact with the physical world. (Russell, Norvig: 2020), (Goodfellow, et al., 2016), (Jurafsky, Martin, 2021)

2.2. The History of Artificial Intelligence

Artificial intelligence has gained increasing popularity and recognition in recent years. A review of the academic literature indicates that academic studies on artificial intelligence began in the mid-20th century. However, humankind's efforts to automate processes and discover jobs capable of performing human-like tasks date back centuries. Traces of these efforts can be seen in ancient Greece (Buchanan, 2005). Indeed, sacred mechanical statues built in Egypt and Greece were believed to possess wisdom and emotion (Antiquity, 2019). One of the most important indicators of early precursors to AI, according to historical records, is Hero's Automata from the 1st century AD. In the 4th century AD, Architas, who lived in ancient Greece, designed a device called a mechanical pigeon, powered by steam or compressed air. These can be considered examples of today's autonomously operating systems. The efforts of ancient Greek scientists to track lunar and solar eclipses are noteworthy, exemplified by the Antikythera mechanism, known as the "world's first computer," which is over 2000 years old (Gupta et al., 2021). In the 8th century AD, the concept of algorithms developed by al-Khwarizmi, a prominent scientist of the Abbasid period, serves as an example for modern AI modeling. These models, adopted by Western civilization, have inspired scientists (Elamin, 2024). In the modern era, research and studies in the field of artificial intelligence have accelerated after Turing's article "Can Machines Think?". The concept of AI was first defined by John McCarthy at the Dartmouth Conference in 1956.

Chronologically, significant developments and milestones in the field of artificial intelligence in the modern era can be listed as follows:

Table 1. Chronology of AI in the Modern Era

Name of the Period	Key Developments
Birth Period (1950's)	The concept of artificial intelligence was first introduced during this period. Pioneering figures like Alan Turing conducted studies on the ability of machines to think. The Dartmouth Conference in 1956 is considered the official birth of the field of artificial intelligence.
Early Period (Late 1950s - 1960s)	The first AI programs were developed and generated great excitement. During this period, there was a strong belief that AI could solve complex problems.
AI Winter (1970's)	Interest in AI research has decreased due to unmet expectations and insufficient resources. Governments and investors have reduced their investments in AI projects.
Expert Systems (1980's)	Expert systems have emerged as computer programs equipped with specialized knowledge in a particular field. These systems have been used in fields such as medicine, engineering, and finance. Interest in AI has revived, and investments have increased.
AI Winter (1990's)	Interest in AI has decreased again due to the limitations of expert systems and the high cost of hardware.
The Machine Learning and Deep Learning Era (2000s - present)	With the increase in the amount of data, more powerful computers, and the development of new algorithms, machine learning and deep learning techniques have made great strides. During this period, significant achievements have been made in many fields such as image recognition, natural language processing, robotics, and gaming. Artificial intelligence is widely used in many sectors today and is expected to have an even greater impact in the future.

OpenAI's ChatGPT generative AI chatbot, launched on November 30, 2022, has garnered significant worldwide attention, revolutionizing the reach of AI from corporate users to end-users. In fact, it reached 1 million registered users in just 5 days (EuroNews; 2022). This level of user acquisition demonstrates the rapid adoption of innovative technology by end-users, particularly in comparison to social media platforms. Furthermore, this indicates that human-machine interaction has reached a new dimension.

3. The Spread of Artificial Intelligence Technologies in the Banking Sector

The adoption of artificial intelligence applications in the banking sector, as in other sectors, has paralleled advancements in computing power and advanced analytical methods. In this context, banks have turned to AI-based solutions to better analyze customer behavior, offer personalized services, and optimize transaction processes.

The level of adoption of AI technologies by banks can be examined within the framework of Everett Rogers' Diffusion of Innovation Theory. The theory explains the adoption of an innovation through (a) the characteristics of the innovation, (b) the adoption process, (c) the categories of adopters, (d) communication channels, and (e) the social system elements. (Rogers; 2003)

The adoption of AI by banks can be evaluated within the scope of these elements under the following headings:

- Features of innovation; cost savings and transaction speed will play a role in institutions' preference for innovative technologies such as AI. For example, analyzing real-time transactions with AI-supported fraud detection systems reduces losses. Thanks to robot advisors, portfolio management can be performed for individual and institutional investors. (Bharadwaj, 2013), (Fethi & Pasiouras, 2010).
- Adoption Process; Banks acquire knowledge about the use of AI, test it with pilot projects to achieve full integration, implement it in business processes (chatbots, fraud detection, etc.), and if successful results are obtained, AI becomes a part of the institution. However, the difficulty of adapting to old systems, the need for technical expertise, and high costs can slow down the adoption process of AI. (Deloitte, 2020), (Flavian et al., 2022)
- Adopting Categories; Technology-focused banks have been innovative, while smaller banks have been late adopters (McKinsey; 2021). This situation will give banks that adopt innovative technologies early a competitive advantage.
- Communication Channels; Technology giants, fintech startups, technology fairs, and academic publications have primarily triggered the spread of AI in the banking sector (Deloitte, 2020), (McKinsey; 2021). Thus, integrating innovative technologies like AI into business processes will pave the way for new collaborations.
- Social System; This consists of elements such as regulations, customer expectations, and competition. Institutions that are slow to meet customer expectations may lose their competitive advantage. In addition, the existence of internal resistance, especially the strict regulations and compliance requirements applied to AI in the EU region, are some of the factors that challenge banks. (Deloitte, 2020), (Fountain et al., 2019; Makhija & Chacko, 2021).

The use of AI in the banking sector began in the 1980s with the development of structures known as expert systems. These systems were primarily used in accounting and financial services (Wagner, 2017). Early systems were designed to automate specific financial processes and provide decision support mechanisms using rule-based algorithms and databases equipped with expert knowledge (Buchanan, 1984). For example, they were used to perform risk analysis in credit evaluation processes or to support basic fraud detection systems.

1990s: The evolution of AI in the banking sector continued with the first steps of machine learning techniques. During this period, statistical models and simple classification algorithms began to be applied in areas such as credit risk assessment and customer segmentation. Advances in database technologies enabled banks to analyze larger datasets and increased the accuracy of AI systems. (Trippi, 1992), (Tam, 1992), (Zopounidis et al., 1997)

2000s: With the widespread adoption of internet banking, AI systems began to be used more in fraud detection and customer identity verification processes in online transactions. Algorithms such as simple neural networks and decision trees were adopted for real-time transaction monitoring and anomaly detection. (Fethi, 2010), (Bahrammirzaee, 2010) In addition, early chatbots began to be used to answer basic queries in customer service. (Lester, 2004), (Boden, 2006)

2010s: The rise of big data analytics and cloud computing accelerated the transformation of AI in the banking sector. Deep learning models provided higher accuracy in fraud detection and credit risk analysis; natural language processing (NLP) technologies enabled the development of advanced chatbots (e.g., HDFC Bank's EVA, Bank of America's Erica) and automated customer support systems. During this period, AI-based financial advisory services,

such as robo-advisors, became widespread in portfolio management and investment strategies. (Weizenbaum, 2010), (Rychtyckyj, 2012), (Cao, L., 2017), (Davenport, 2018) 2020s and Present (2025): Generative AI and big language models redefined customer interactions, enabling innovative applications such as personalized financial advice and dynamic reporting. Federative learning supports the training of AI models while protecting data privacy and facilitates compliance with regulations such as GDPR. Furthermore, edge AI and blockchain integration are used to improve transaction security and speed. Quantum computing holds promise for the future in areas such as complex risk modeling and portfolio optimization. (Noor, 2023), (Goodell et al., 2024), (Özkan, 2022), (Li, 2024) This evolution demonstrates that AI in the banking sector not only increases operational efficiency but also transforms customer experience and strengthens regulatory compliance. In the future, the impact of AI in the banking sector will deepen further as challenges such as ethical AI applications, reducing algorithmic bias, and integration with legacy systems are overcome. The main areas of application for AI in banking can be listed as follows:

Table 2: Examples of AI Use Cases Around the World (Source: Davenport; 2018)

Purpose of Use	Company Name	Benefit
Operational Efficiency and Automation	Deutsche Bank	Deutsche Bank has automated 500,000+ hours of human labor with RPA.
	Citibank	Citibank has reduced errors by 70% in document processing using OCR + AI.
Credit Scoring and Risk Management	Goldman Sachs	Goldman Sachs uses Python-based AI algorithms in credit risk models.
	BBVA	BBVA is testing OpenAI's models for credit forecasting for startups.
Chatbots and Virtual Assistants	Bank of America	Bank of America's chatbot Erica has reached 40 million users.
	HSBC	HSBC can answer customer queries 30% faster with Google Cloud's NLP technology.
	JPMorgan Chase	JPMorgan Chase automates customer behavior analysis with Amazon Web Services (AWS).
Fraud Detection and Anomaly Analysis	Mastercard	Mastercard has reduced fraud by 50% with its AI-based "Decision Intelligence" system.
	Danske Bank	Danske Bank detects anomalous transactions in real time with deep learning models.

3.1. Opportunities and Challenges in the Field of Artificial Intelligence

Banks are vital for both the stability of the financial system and the growth of the national economy due to their role in collecting and utilizing financial resources. As they constitute 83% of the financial system, they are the first institutions that come to mind in Türkiye's financial sector (COŞKUN et al., 2021). Studies on artificial intelligence applications in the Turkish banking sector are attracting increasing attention due to their potential to increase efficiency, reduce costs, and improve customer experience in financial services (Gümüş et al., 2020). Understanding the potential of artificial intelligence technologies in the banking sector requires examining when these technologies began to be implemented, what opportunities they offer, and what challenges they bring. In this context, a detailed examination of the development of artificial intelligence applications in the Turkish banking sector, the opportunities encountered, and the challenges faced will play a significant role in shaping the sector's future strategies. The beginning of artificial intelligence use in the Turkish banking sector, as in other sectors, occurred in parallel with the increase in data processing and analysis capacities. Particularly since the early 2000s, rapid advancements in computer technologies and the widespread adoption of the internet have led banks to collect large amounts of data and create a

need to analyze this data. During this period, data mining techniques and basic artificial intelligence algorithms began to be used in areas such as credit risk assessment, fraud detection, and customer segmentation (Ata & Erbudak, 2022). However, the widespread adoption and deepening of artificial intelligence applications has accelerated in the last decade, especially with advancements in machine learning and deep learning. In this context, banks have turned to AI-powered solutions to better understand customer behavior, offer personalized services, and optimize operational processes (Yılmaz, 2018). These developments have enabled banks to gain a competitive advantage and provide a better customer experience. The opportunities offered by the use of artificial intelligence in the banking sector are quite diverse. Firstly, artificial intelligence can improve credit risk assessment processes, helping to make more accurate and faster decisions. Unlike traditional credit assessment methods, artificial intelligence algorithms can analyze customers' financial history, credit score, income status, and other relevant data to make a more objective assessment of whether a credit application should be approved. This allows banks to reduce their risks and offer credit to more customers. Secondly, artificial intelligence can play a significant role in fraud detection. Continuous monitoring activities combined with data mining applications can enable the effective management of fraud risks in high-transaction-intensity sectors such as banking (Kaban, 2020). By detecting abnormal transaction patterns and suspicious activities, artificial intelligence algorithms can prevent fraud attempts and minimize financial losses for banks. Thirdly, artificial intelligence can improve customer service. In this context, chatbots and virtual assistants can answer customer questions, solve problems, and offer personalized suggestions. In this way, banks can increase customer satisfaction and reduce customer service costs.

However, AI applications also face some challenges in the banking sector. Firstly, data privacy and security concerns may hinder the widespread adoption of AI applications. The collection, storage, and use of customer data must comply with legal regulations and ethical principles. Regulations such as the Personal Data Protection Law, in particular, mandate that banks make their data processing processes more transparent and secure. Secondly, the complexity and comprehensibility of AI algorithms may make the use of these technologies difficult. This is because the transparency and explainability of the decision-making processes of algorithms (explainable AI) are of great importance to both regulatory bodies and customers. Thirdly, the development and implementation of AI applications can be costly. This may make it difficult for small and medium-sized banks, in particular, to invest in AI technologies.

While the future of artificial intelligence applications in the banking sector looks bright, it is necessary to consider the potential risks and ethical issues associated with these technologies. In particular, issues such as their impact on the labor market and algorithmic discrimination are important matters that need to be carefully managed. Strictly supervised and regulated banks, technology providers, and regulators must work together to address ethical, operational, and regulatory issues (Patil, 2025). In this context, it is important to adopt a human-centered approach in the development and implementation of artificial intelligence technologies and to ensure that the technology is used in a way that maximizes societal benefit (Akkoyun, 2021).

In conclusion, the banking sector needs to make strategic decisions regarding the design of business and IT processes, taking into account both the opportunities and challenges presented by AI. While AI offers significant benefits in terms of cost savings, increased customer satisfaction, and improved efficiency in business processes, the challenges banks may face include employee adaptation to AI technology, regulations, ethical risks, data privacy, cybersecurity, and technological infrastructure costs.

4. Methodology and Findings

This study employs bibliometric analysis to examine academic publications on the role of artificial intelligence in the banking sector. This method analyzes the research areas, publication and citation numbers, publication patterns by country, author analysis, and keyword analysis to determine where research on the subject and concept has been conducted from the past to the present. This allows researchers to identify areas of concentration and areas requiring further study. This type of analysis also serves as a guide for researchers.

The Web of Science article database was used as the dataset source for the analysis. The keywords used were Artificial Intelligence and Banking, and Banks. The widest possible time range was chosen to understand the depth of academic research, specifically targeting studies from 1975 to 2025.

The research questions in this study were formulated as follows:

- What is the development of academic studies on AI and Banking over the years?

- Which authors stand out in the studies conducted on this subject?
- What is the distribution of the studies by country?
- What is the distribution of co-authorship in the studies conducted?
- Which keywords stand out in academic studies on AI and Banking?
- Which keywords are used the least in academic studies?

The Web of Science academic article database is one of the most reputable and comprehensive databases in the world. The main reasons for choosing this database as a dataset include the meticulous publication process of the articles and its pioneering role in academic publishing. A search query using the English words “Artificial Intelligence,” “Banking,” and “Banks” in the subject, abstract, and keywords of the articles yielded 1462 articles. Only articles in English and categorized as “Business,” “Business Finance,” “Management,” and “Operations Research Management Science” were selected. This selection resulted in 247 academic publications. Abstracts of the examined articles are shown in Table 3.

Table 3. Descriptive Table for the Articles Reviewed

Total Number of Articles:	247
Time Range	1992-2025
Total Number of Citations:	5.692
Average Citations Per Article:	23,04
h-index	35 (Indicates that each of the 35 articles received at least 35 citations.)
Publication Type:	Journal Article
Top 3 Journals by Number of Articles:	International Journal of Bank Marketing (15 makale) Expert Systems with Applications (13 makale) Cogents Business (6 makale)
Main Article Topics:	AI Applications in Banking, Credit Risk Assessment, Customer Services, Predictive Modeling, FinTechs, Behavioral Finance

4.1. Academic Publication and Citation Analysis by Year

According to the query results, the first article was published in 1992. The number of article publications and citations between 1992 and 2025 is shown in Figure 1. While the number of articles followed a horizontal trend between 1992 and 2017, a significant increase in the number of publications is observed from 2018 onwards. According to the relationship between the number of publications and the number of citations, an increase in the number of citations was recorded along with the increase in the number of publications after 2018. The number of articles reached its highest point in 2024. Based on the increase in the number of articles, it is predicted that the number of articles will increase in the coming years.

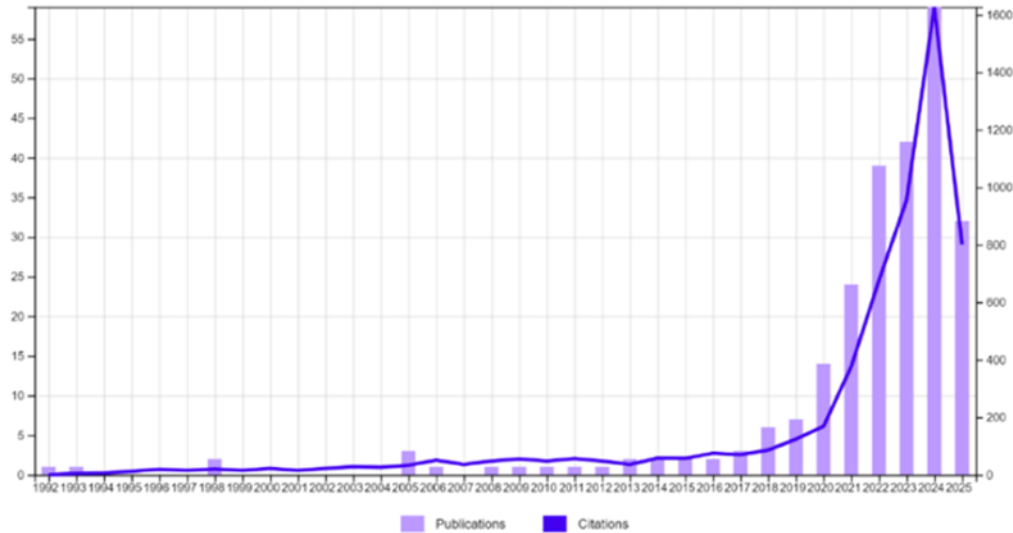


Figure 1. Publication and Citation Count Between 1992-2025 (Right Axis).

When examining the most cited publications, the top three authors are, respectively: Tam and Kiang with 638 citations, Oreski, S. and Oreski G. with 299 citations each, and Cheng, My and Qu, Y. with 228 citations each. The authors with the strongest linking power are Cintamur, Payne, and Lee, respectively.

Table 4: Most cited publications in the fields of AI and Banking.

Rank	Authors	Publication Name	Journal	Citation #	Publ. Year
1	Tam, ky; Kiang, my	Managerial Applications Of Neural Networks - The Case Of Bank Failure Predictions	Management Science	638	1992
2	Oreski, S; Oreski, G	Genetic algorithm-based heuristic for feature selection in credit risk assessment	Expert Systems With Applications	299	2014
3	Cheng, MY; Qu, Y	Does bank FinTech reduce credit risk? Evidence from China	Pacific-Basin Finance Journal	228	2020
4	Fountain, T; McCarthy, B; Saleh, T	Building the AI-Powered Organization Technology isn't the biggest challenge, Culture is	Harvard Business Review	223	2019
5	Flavián, C; vd.	Intention to use analytical artificial intelligence (AI) in services - the effect of technology readiness and awareness	Journal Of Service Management	205	2022
6	Ben Jabeur, S; vd.	CatBoost model and artificial intelligence techniques for corporate failure prediction	Technological Forecasting And Social Change	203	2021
7	Boot, A; vd.	Fintech: what's old, what's new?	Journal of Financial Stability	148	2021
8	Trivedi, J	Examining the Customer Experience of Using Banking Chatbots and Its	Journal Of Internet	147	2019

		Impact on Brand Love: The Moderating Role of Perceived Risk	Commerce		
9	Abelián, J; Castellano, JG	A comparative study on base classifiers in ensemble methods for credit scoring	Expert Systems With Applications	147	2017
10	Varetto, F	Genetic algorithms applications in the analysis of insolvency risk	Journal Of Banking & Finance	143	1998

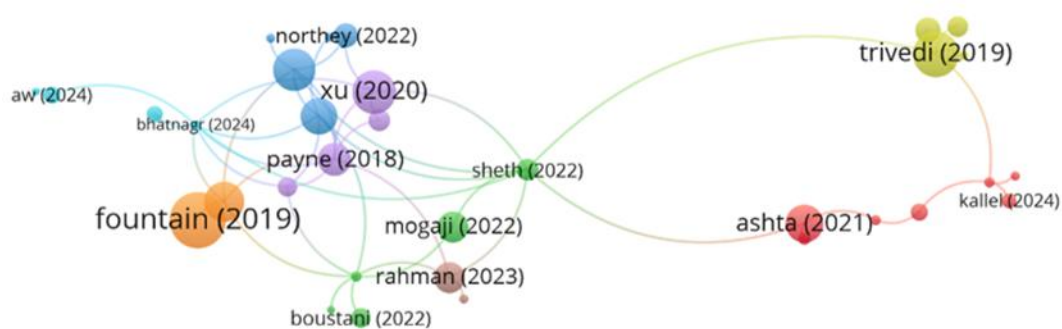


Figure 2. Relationship map of authors publishing in the fields of AI and Banking.

4.2. Co-authorship Analysis

Co-authorship analysis revealed 16 clusters with 28 authors. Michael Nwogugu was identified as the most prolific author with 3 publications. Four authors formed a single cluster, and the total link strength was found to be 32. The most cited co-authors were Payne, E., Peltier, J. with 239 citations, Cheng and Qu with 229 citations, and Barger, V. with 204 citations.

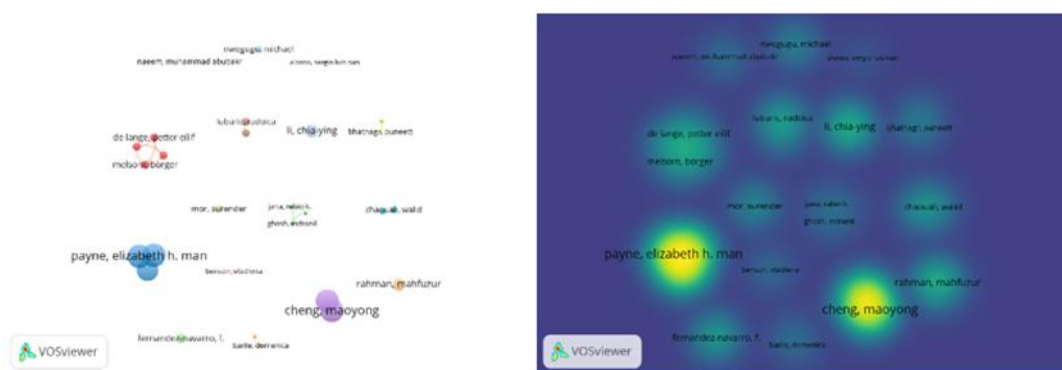


Figure 3. Co-authorship relationship and intensity map (by citation count)

the USA (65), the People's Republic of China (43), Malaysia (35), France (31) and Turkey (28). Figure 4 shows a map of the countries' article citation numbers and cooperation between countries.

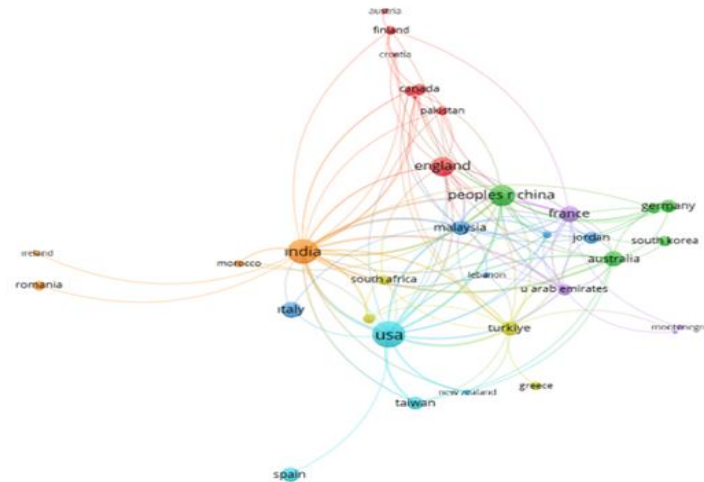


Figure 5: Prominent countries and network of relationships in article publication.

4.5. Academic Journal – Publication Analysis

The journals in which the articles examined in the analysis were published are ranked as follows: The International Journal of Bank Marketing leads with 15 articles reflecting its focus on customer-centric AI applications (e.g., chatbots, robo-advisors). This journal also has the highest meeting connectivity strength. Expert Systems with Applications follows with 13 articles highlighting technical AI methodologies such as neural networks and community methods. This journal also has the highest total number of citations. Cogent Business and Management is third with 6 publications. The Journal of Research in Interactive Marketing and the Journal of Behavioral and Experimental Finance each contain 3 articles focusing on customer experience and behavioral finance, respectively.

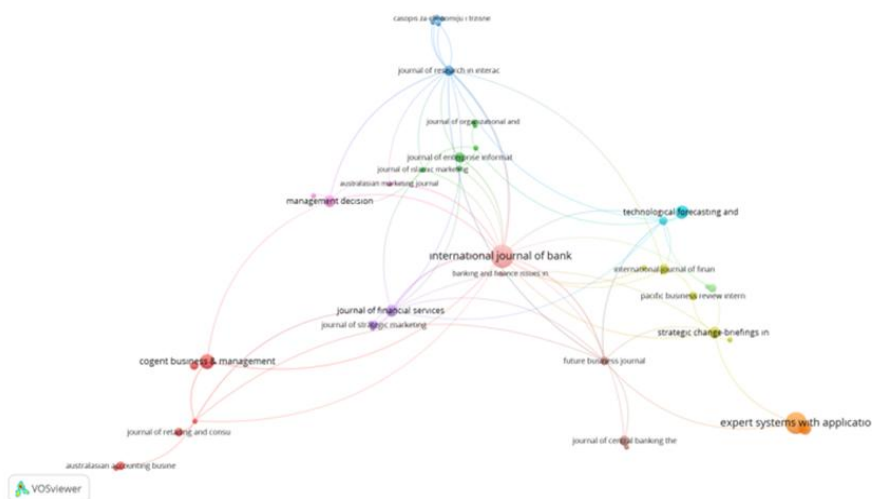


Figure 6: Top-grossing academic journals and their networks.

4.6. Academic Institution – Publication Analysis

The minimum number of publications and citations per academic institution was set at 1. Accordingly, the institutions with the highest number of citations were identified as Arizona State University with 638, Bank Karlovac with 299, and the University of South Dakota with 239. The institutions with the highest number of publications were ranked as follows: Islamic Azad University with 5, Aston University with 4, and Monash University with 3.

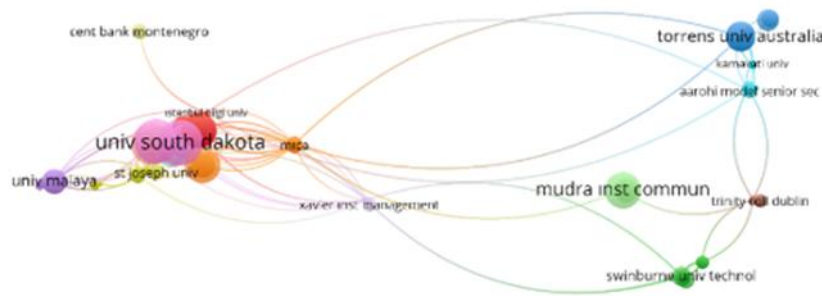


Figure 7: Academic Institution – Publication Relationship Network by Citation Count

5. Conclusion and Discussion

AI technology has the power to transform all business processes. To use this power effectively and correctly, it is important to know what AI is, to learn in which areas it is used, and to identify its strengths and weaknesses. Scientific research on AI shows that it began in the mid-20th century. However, precursor studies on AI extend back to ancient times. This has provided the basis for today's scientific studies due to humankind's desire to automate processes, increase efficiency in their work, etc.

The banking sector has always been a pioneer in using innovative technologies. In the sector, the use of expert systems, especially in accounting and risk assessment, began in the 1980s. These systems are among the early AI technologies. Since the 2000s, with the increase in speed of CPU (central processing unit) hardware in the field of Information Technologies, the growth of Internet infrastructure, and the emergence of the big data concept, it has become impossible to manage and analyze data manually. Therefore, with the integration of innovative technologies into the banking sector, data analysis and generating meaningful results from data have become increasingly easier.

Today, AI technologies provide speed in transactions in many areas such as customer service, credit risk assessment, and fraud detection, while contributing to the profitability of banks through cost savings. They also provide a competitive advantage in customer acquisition.,

In this study, articles on the use of AI in the banking sector between 1992 and 2025 were examined in the academic literature using bibliometric analysis. According to the analysis results, studies on AI in the banking sector globally followed a horizontal trend between 1992 and 2017, and an upward trend in the number of academic studies was observed after 2018. According to the query results, the article with the highest number of citations on the use of AI in the banking sector dates back to 1992. This article shows that research on AI in the banking sector did not begin recently.

The countries with the most published articles are the USA, India, and China. The countries with the most article citations were identified as the USA, China, and France. Looking at the geographical distribution of publications, the majority are from North America, Europe, and Asia. The low number of publications from African and South American countries is noteworthy.

The most prominent keywords were determined to be “artificial intelligence,” “banking,” “credit risk,” “fintech,” and “machine learning.” The least frequent keywords were found to be “organizational innovation,” “legal requirements,” and “employment.” The most cited article is “Managerial Applications Of Neural Networks - The Case Of Bank Failure Predictions” by Tam and Kiang, published in 1992.

Comments and suggestions for the academic field: While showing increasing adoption of AI-related academic studies in the banking sector, it highlights the need for more research on ethics, transparency, and regulations. It is recommended that the number of publications on these topics increase to raise awareness. The creation of country-specific language models can be focused on blockchain-AI related concepts. The application of academic studies in the banking sector and the establishment of collaborative contacts with the public and private sectors are important steps towards the future. Furthermore, establishing AI engineering departments within universities, increasing the number of entrepreneurs working in the AI field in technoparks, keeping interest in AI alive, and providing incentives are among the recommendations.

Comments and suggestions for the banking sector: The rise of Generative AI (GenAI) can be highlighted, especially its use in internal business processes (report generation, search engines, etc.). Additionally, the creation of a unique AI language model for each institution may be considered. In the near future, we may witness a high-level transformation involving Artificial General Intelligence, which thinks and behaves like humans, including physically conducted banking transactions in branches. In this case, it is recommended that steps be taken to ensure job security for bank employees. The transformation of the workforce will be possible by equipping employees with new competencies and ensuring their adaptation to AI technologies. Strictly enforced regulations in the sector will be a key determinant in the development of AI. In particular, the AI Act approved by the EU Parliament in March 2023 is expected to introduce certain measures regarding the use and development of AI technology. This law is likely to affect the banking sector as well.

Comments and Recommendations for Regulatory Bodies: Regulatory bodies in the banking sector (e.g., the Central Bank of Turkey and the Banking Regulation and Supervision Agency) should establish a regulatory framework for overseeing AI-based products. This framework will guide banks in creating a secure service network using innovative technologies. Reporting the success rates of AI-powered applications to regulatory bodies could be mandatory. AI training programs could be organized in collaboration with regulatory bodies. Banks could be required to provide commitments regarding the ethical use of AI algorithms. Furthermore, collaboration with international organizations (e.g., BIS, ECB) and the establishment of AI working groups are recommended.

Banking Sector and Artificial Intelligence from the Perspective of Technology Manufacturers: IBM's Watson and Microsoft's Azure cloud platforms offer IT infrastructure for AI investments. On the other hand, storing banking data on a platform located abroad, outside of bank data center environments, may not be appropriate due to regulations. For example, in Turkey, there is legislation preventing the transfer of banking data abroad. (Official Gazette, Issue 31069) This points to data leakage and data security concerns. While the use and development of AI technologies in domestic data centers or on-premises private cloud platforms is appropriate, it is recommended that global technology manufacturers (such as Microsoft and IBM) invest domestically and present AI-related success stories and business scenarios to institutions. Furthermore, collaboration between FinTech firms and banks in developing AI-supported applications (e.g., chatbots, fraud detection) to bridge the know-how gap would be beneficial for healthy growth. Such collaboration would contribute to the development of both the banking and FinTech ecosystems. Topics open to research include articles and theses on the transformation of the workforce in the banking sector through the use of artificial intelligence technologies, AI ethics, and the application of AI in sub-service areas of banking (e.g., SME Banking and AI).

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