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ARAŞTIRMA MAKALESİ / RESEARCH ARTICLE

THE ECONOMIC DIMENSION OF ARTIFICIAL INTELLIGENCE USE IN HEALTHCARE: BIBLIOMETRIC MAPPING OF SCIENTIFIC PUBLICATIONS

SAĞLIK HİZMETLERİ ALANINDA YAPAY ZEKÂ KULLANIMININ EKONOMİK BOYUTU: BİLİMSEL YAYINLARIN BİBLİYOMETRİK HARİTALANDIRILMASI

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ABSTRACT

The aim of this study is to analyze trends in the literature regarding the economic aspects of artificial intelligence use in the healthcare sector through bibliometric mapping of scientific publications and to present a comprehensive overview of the field's current structure based on quantitative indicators. In this study, 1,326 studies obtained from a search conducted on February 15, 2026, in the Web of Science database using specified keywords were examined within the scope of bibliometric analysis using the VOSviewer program. The findings indicate that publications peaked in 2025, that the United States is the most productive country, and that artificial intelligence, machine learning, and deep learning are the most prominent research topics. Additionally, Olga Golubnitschaja, Wang Wei, and Carl Erb were identified as leading researchers in the field. Furthermore, the field was found to have a strong interdisciplinary structure, with research output being predominantly technology-focused and concentrated in high-impact-factor journals such as IEEE Access, Sensors, and Nature Communications; the most influential institutions were Stanford University, the National University of Singapore, and Harvard Medical School; and the most cited countries were the United States, India, and China. Furthermore, the United States, India, and China have stood out in terms of citation performance. Consequently, it is assessed that research on the economic impacts of AI in healthcare will continue to be important in the future.

Keywords: Artificial Intelligence, Healthcare Services, Health Economics, Bibliometric Analysis, VOSviewer

JEL Classification Codes: I10, I19, I11

ÖZ

Bu araştırmada, sağlık hizmetleri alanında yapay zekâ kullanımının ekonomik boyutuna ilişkin bilimsel yayınların bibliyometrik haritalandırılması yoluyla literatürdeki gelişim eğilimlerini analiz etmek ve alanın mevcut yapısını nicel göstergeler temelinde bütüncül bir bakış açısıyla ortaya koymak amaçlanmıştır. Bu araştırmada, 15.02.2026 tarihinde Web of Science veri tabanında belirlenen anahtar kelimelerle yapılan tarama sonucunda elde edilen 1.326 çalışma, VOSviewer programı kullanılarak bibliyometrik analiz kapsamında incelenmiştir. Bulgular, yayınların 2025 yılında yoğunlaştığını, ABD'nin en üretken ülke olduğunu ve yapay zekâ, makine öğrenimi ile derin öğrenmenin en öne çıkan araştırma konuları olduğunu göstermiştir. Ayrıca, Olga Golubnitschaja, Wang Wei ve Carl Erb konu alanında öne çıkan araştırmacılar olarak belirlenmiştir. Ayrıca, söz konusu alanın güçlü bir disiplinlerarası yapıya sahip olduğu ve araştırma üretiminin ağırlıklı olarak teknoloji odaklı olduğu ve IEEE Access, Sensors ve Nature Communications gibi yüksek etki faktörlü dergilerde yoğunlaştığı, en etkili kurumlar Stanford Üniversitesi, Singapur Ulusal Üniversitesi ve Harvard Tıp Fakültesi olmuştur; en çok atıf alan ülkeler ise ABD, Hindistan ve Çin'dir. Ayrıca, atıf performansı açısından ABD, Hindistan ve Çin'in öne çıkmıştır. Sonuçta, sağlık hizmetlerinde AI'ın ekonomik etkileri üzerine yapılan araştırmaların gelecekte de önemini koruyacağı değerlendirilmektedir.

Anahtar Kelimeler: Yapay Zekâ, Sağlık Hizmetleri, Sağlık Ekonomisi, Bibliyometrik Analiz, VOSviewer

JEL Sınıflandırma Kodları: I10, I19, I11

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GENİŞLETİLMİŞ ÖZET

Amaç ve Kapsam:

Sağlık alanında en yaygın olarak kullanılan teknolojilerden biri AI'dır. Sağlık sektöründe AI, kronik hastalıkların artışı, hastaların ihtiyaç ve beklentilerindeki değişiklikler, yaşam süresinin uzaması, Covid-19 salgını ve dijital dönüşümün hızlanması gibi faktörler nedeniyle daha da yaygın hale gelmiştir. AI, sağlık hizmetlerinde bulut bilişim, makine öğrenimi, giyilebilir tıp teknolojileri ve sinir ağları dahil olmak üzere çeşitli biçimlerde uygulanmaktadır. Sağlık hizmetlerinde AI, hastalıkların daha doğru ve hızlı bir şekilde teşhis edilmesini mümkün kılarak etkili tedavi sağlar ve maliyetleri düşürür. Ayrıca, sağlık hizmetlerinde AI kullanımı, bakım kalitesinin ve hasta memnuniyetinin artmasına, sağlık eşitsizliklerinin azalmasına, etkili kaynak planlamasına ve sürdürülebilirliğe katkıda bulunur. Öte yandan, AI daha doğru tanı ve tedavi yoluyla sağlık harcamalarını ve bakım maliyetlerini azaltırken, AI'nın sağlık hizmetlerine entegre edilmesinden kaynaklanan yatırım maliyetleri ile AI'ya ilişkin toplumsal ve ödeme kurumlarının endişeleri, AI'nın sağlık hizmetleri üzerinde yarattığı ekonomik baskıyı ortaya koymaktadır. Bu araştırmanın amacı, sağlık sektöründe yapay zekâ (AI) kullanımının ekonomik boyutuna ilişkin bilimsel yayınların bibliyometrik haritalandırması yoluyla literatürdeki eğilimleri analiz etmek ve nicel göstergelere dayalı olarak bu alanın mevcut yapısına dair kapsamlı bir genel bakış sunmaktır.

Yöntem:

Bu araştırma, sağlık hizmetleri alanında yapay zekâ kullanımının ekonomik boyutunu incelemek suretiyle gerçekleştirilen bibliyometrik analiz türünde bir çalışmadır. Çalışmada, belirlenen veri tabanından elde edilen bilimsel yayınlar bibliyometrik yöntemler kullanılarak analiz edilmiş ve alanın yayın eğilimleri, iş birlikleri ve araştırma odakları haritalandırılmıştır.Bu araştırmada veriler, 15 Şubat, 2026 tarihinde Web of Science veritabanından toplanmıştır. PubMed ve EMBASE gibi veritabanlarının aksine, Web of Science veritabanı tüm bilimsel disiplinleri kapsadığı ve yüksek kaliteli yayınlar için kanıtlanmış ve güvenilir bir kaynak olduğu için tercih edilmiştir. Arama stratejisi olarak, Web of Science veritabanında *"Konu"* kısmı seçilerek, ("yapay zeka") VE ("maliyet" VEYA "ekonomik" VEYA "maliyet-etkinlik" VEYA "ekonomik değerlendirme" VEYA "sağlık ekonomisi" VEYA "harcama" VEYA "mali") VE ("sağlık sektörü" VEYA "sağlık hizmetleri") anahtar kelimeleri kullanılarak arama yapılmış ve 2.378 yayın elde edilmiştir. Veri toplama sürecine yalnızca İngilizce makaleler dahil edildi; 2026 yılında yürütülen çalışmalar (N=30) hariç tutuldu. Sonuç olarak, 1.326 çalışma analiz edildi. Verilerin analizinde bibliyometrik analiz yöntemi kullanılmıştır. Verilerin görselleştirilmesi ve haritalandırılması için VOSviewer programı kullanılmıştır.

Bulgular:

Bu araştırmadan elde edilen sonuçlara göre, yayınların 2025 yılında yoğunlaştığını, ABD'nin en üretken ülke olduğunu ve yapay zekâ, makine öğrenimi ile derin öğrenmenin en öne çıkan araştırma konuları olduğunu göstermiştir. Ayrıca, Olga Golubnitschaja, Wang Wei ve Carl Erb konu alanında öne çıkan araştırmacılar olarak belirlenmiştir. Sonuçta, sağlık hizmetlerinde yapay zekânın ekonomik boyutuna yönelik bilimsel ilginin son yıllarda önemli ölçüde arttığı görülmektedir. Bulgular, araştırma alanının yapay zekâ, makine öğrenimi ve derin öğrenme ekseninde şekillendiğini ve Olga Golubnitschaja, Wang Wei ile Carl Erb'in alandaki etkili araştırmacılar arasında yer aldığını ortaya koymuştur. Ayrıca, söz konusu alanın güçlü bir disiplinler arası yapıya sahip olduğu ve araştırma üretiminin ağırlıklı olarak teknoloji odaklı olduğu ve IEEE Access, Sensors ve Nature Communications gibi yüksek etki faktörlü dergilerde yoğunlaştığı en etkili kurumlar Stanford Üniversitesi, Singapur Ulusal Üniversitesi ve Harvard Tıp Fakültesi olmuştur; en çok atıf alan ülkeler ise ABD, Hindistan ve Çin'dir. Ayrıca, atıf performansı açısından ABD, Hindistan ve Çin'in öne Buna göre, sağlık hizmetlerinde AI'ın ekonomik etkileri üzerine yapılan araştırmaların gelecekte de önemini koruyacağı değerlendirilmektedir.

Sonuç ve Tartışma:

In conclusion, this study, by reviewing the existing literature on the economic aspects of AI in the healthcare sector, has revealed that research in this field has increased rapidly in recent years. Overall, it was found that the studies were published between 1992 and 2025, and that there was a marked increase in the number of publications, particularly after 2020, due to the impact of the COVID-19 pandemic. Furthermore, it was observed that the majority of the studies were based in the United States. The prominence of keywords such as artificial intelligence, machine learning, and deep learning indicates that these technologies constitute the most important research areas in the healthcare sector. It was noted that the studies were generally conducted through interdisciplinary collaborations, with researchers such as Olga Golubnitschaja, Wang, Wei, Carl Erb, and Sudeep Tanwar standing out. Furthermore, the journals that ranked highest in bibliographic matching were IEEE Access, Sensors, and Nature Communications, while the most influential institutions were identified as Stanford University, the National University of Singapore, and Harvard Medical School; the countries receiving the most citations were the United States, India, and China. This study is expected to shed light on future research by providing a general overview of the economic dimension of AI in healthcare. Future research may address the economic dimension of AI in healthcare using applied and quantitative approaches, as well as different methods and databases.

1. INTRODUCTION

In today's globalized world, technology is advancing and evolving rapidly. This transformation has profoundly impacted the healthcare sector, just as it has all other sectors. Indeed, the integration of digital health technologies into healthcare services and adaptation to these technologies are of great importance for the sector's sustainability and efficiency (Schwalbe and Wahl, 2020). On the other hand, pandemics affecting global health, such as COVID-19, have underscored the importance of technology use in healthcare (Bachanova et al., 2020). Artificial intelligence (AI), a key technology in healthcare, generally helps save time by facilitating accurate diagnoses and strengthening clinical decision support systems (Jiang et al., 2017; Panch et al., 2018).

The use of AI in the healthcare sector dates back to the 2000s according to some authors, to the 1970s according to others, and to the 1950s according to still others (Çilhoroz and Işık, 2021; Uzun, 2020; Tran et al., 2019). Nevertheless, the year 1976 is generally accepted as the first use of AI in healthcare, when Gunn investigated the diagnostic probabilities of acute abdominal pain through computer analysis (Çetin, 2023). Over the following 30 years, applications and research on the use of AI in the healthcare sector increased, and today this technology has evolved to include advanced processes such as robotic surgery (Matheny et al., 2020). The growing popularity of AI in the healthcare sector stems both from the significant benefits it provides and from the complex and labor-intensive nature of healthcare services. Indeed, AI contributes to early diagnosis, treatment, cost savings, time savings, clinical decision-making, capacity planning and analysis, access to healthcare, patient data collection, health promotion, disease risk prediction and scoring, patient safety, quality of medical care, minimization of health disparities, personalized medicine, improved physician performance, pandemic management, reduced workload, adjustment of medication doses and prescriptions, forecasting patient demand, and calculating indicators such as morbidity (mortality) risks and length of hospital stay, among many other aspects (Akalın and Veranyurt, 2021; Gunasekeran et al., 2021; Guo et al., 2020; Isbanner et al., 2022; Jungwirth and Haluza, 2023; Matheny et al., 2020). By its very nature, the healthcare sector is labor-intensive and operates within a complex structure. Advances in science and technology, along with the increase in life expectancy at birth, have boosted demand for home care services, while the adverse conditions caused by industrialization and infectious diseases have also heightened the need for healthcare services. In meeting this growing demand, AI applications have become a crucial support mechanism for the labor-intensive healthcare sector (Akalın and Veranyurt, 2021). In the context of health services, AI is generally used frequently in many areas, such as diagnosis, treatment, risk assessment, population health management, health policy and planning, big data, education, and R&D (He et al., 2019; Schwalbe and Wahl, 2020). Some authors view AI as a powerful tool for achieving the goal of universal health coverage and, in this regard, suggest that the concepts of digital health, AI, and universal health coverage should be used in conjunction (Kickbusch et al., 2019; Panch et al., 2019).

However, the labor-intensive nature of the healthcare sector can increase error rates in tasks and procedures, leading to irreversible outcomes such as disability and death; nevertheless, studies show that the use of AI in healthcare reduces medical errors (malpractice) (Tarcan et al., 2024). Furthermore, thanks to its ability to make accurate diagnoses, AI also has the potential to reduce healthcare costs by preventing the repetition of unnecessary tests and procedures (cited in Uzun, 2020; Mesko, 2017). As one of the digital health technologies, AI not only improves patient outcomes and enhances quality in healthcare but also delivers cost savings (Jiao, Zhang & D'Souza, 2023; Wolff et al., 2020). AI technologies that predict hospital readmissions are an important tool from a health economics perspective (Rao et al., 2025). Furthermore, by providing personalized care tailored to each patient's profile, AI supports clinical decision-making regarding patients and reduces long-term costs for both patients and providers (Khanna et al., 2022). The beneficial economic impacts of AI in healthcare, particularly following the COVID-19 pandemic, include cost reductions achieved through reduced workload, efficient use of resources, and accelerated processes (Jiao et al., 2023). The use of AI in healthcare generates significant economic savings by improving operational efficiency for both healthcare providers and insurance companies (Al Meslamani, 2023). This positive economic impact is the most decisive factor in the decision to invest in AI within the healthcare sector (Khanna et al., 2022). On the other hand, the healthcare sector is among the most expenditure-intensive sectors. Indeed, in 2021, global healthcare expenditures exceeded 10% of global GDP (8.8 trillion U.S. dollars) (Pietris et al., 2022). Furthermore, AI has frequently been used as a solution to mitigate costs arising from limited resource utilization in healthcare, an aging population, and budget constraints (Voets et al., 2022). However, although AI reduces costs through diagnostic accuracy and operational efficiency, the methodological inconsistencies in studies on its economic impact make it difficult to determine the financial and economic value of AI in healthcare (El Arab, Al Moosa, & Sagbakken, 2025). On the other hand, analyzing the economic impacts of AI in healthcare is of great importance to all stakeholders in the healthcare sector (Wolff et al., 2020).

Although it is known that AI technology has the greatest potential in the field of healthcare where it is typically used by large hospitals (Mudgal et al., 2022) the role and impact of AI in the healthcare literature remain a subject of debate. Over the past year, more than 30,000 scientific studies on AI and related fields have been conducted, and research in this area continues to grow rapidly (Akalın and Veranyurt, 2021). However, it is necessary to determine how the concept of AI is addressed in healthcare-related studies, how it is approached in these studies, and what results are obtained in order to identify gaps. Bibliometric analysis is frequently used for this purpose. Bibliometric analysis is a method used to determine research productivity, strengths and weaknesses, gaps in the literature, and collaboration networks within a field, and it quantitatively reveals the impact of research outputs (Glanzel, 2003). Bibliometric analysis, which ensures the continuity of scientific knowledge, aims to systematically map the current state using numerical data by examining research on a specific topic in terms of criteria such as authors, countries, journals, organizations, citations, and collaboration; in this way, gaps and trends in the field's literature are identified (Cobo et al., 2011; Gün, 2024).

Although there are studies in the literature on the economic impacts of AI use in the field of health services, these are far from bibliographic approaches (Al Meslamani, 2023; Ceylan, 2025; Duran, 2024; El Arab et al., 2025; Jiao et al., 2023; Khanna et al., 2022; Pietris et al., 2022; Rao et al., 2025; Sahni et al., 2023; Voets et al., 2022; Wolff et al., 2020). On the other hand, the vast majority of bibliometric analysis studies on this topic address only the concepts of healthcare and AI together (Aldousari and Kithinji, 2024; Çetin, 2025; Guo et al., 2020; Hussain et al., 2024; Senthil et al., 2024; Tran et al., 2019). Therefore, using bibliometric methods to assess the current state of research on the economic impacts of AI in the healthcare sector represents an important area of study.

Furthermore, while a significant portion of bibliometric studies on AI in the healthcare sector focuses on technological developments, patient safety, communication, clinical applications, diagnosis and treatment processes, and ethical issues, there are only a limited number of bibliometric studies that comprehensively address the economic dimension of AI from the perspective of health economics. This study analyzes scientific publications focusing on the economic impacts of AI in the healthcare sector using bibliometric methods, thereby revealing the development of knowledge in the field, research trends, and emerging themes. In this regard, the study is expected to help fill a gap in the literature and guide future research.

2. LITERATURE REVIEW

In this section, the concept of AI and the economic impacts of AI use in the healthcare sector are presented based on the literature.

2.1. Artificial Intelligence (AI)

Although the idea of creating human-like, thinking machines dates back to the Industrial Revolution, the concept of AI was first systematically defined in 1950 by Alan Turing through the combination of the terms "intelligence" and "artificial" (Krittanawong et al., 2017). Although some authors trace the concept of AI back to Aristotle, it was technically established in 1950 with Alan Turing's "Turing Test." John McCarthy, on the other hand, defined AI as the science of developing intelligent machines and computer programs (Pai & Pai, 2021). As a branch of computer science, AI came to the forefront particularly in the 1950s with the rise of computerization, and researchers such as Allen Newell and John McCarthy conducted in-depth studies on this concept (Panch et al., 2018). AI refers to computer technologies capable of mimicking and applying abilities unique to human intelligence such as thinking, adaptation, and learning-through specific algorithms (Secinaro et al., 2021). In other words, AI is a field of computer science based on programs and algorithms developed to make devices intelligent (Manickam et al., 2022). AI refers to technologies that endow computers with human-like functional capabilities, enabling them to effectively process and analyze large and dispersed data (Chen et al., 2020). By mimicking cognitive processes such as logical reasoning, natural language processing, problem-solving, and visual perception, AI provides significant benefits in areas such as simplifying routine tasks in daily life, providing decision support systems, increasing efficiency in smart manufacturing processes, and optimizing costs. These capabilities enable AI to create value in industrial and commercial applications and facilitate effective communication and information sharing on a global scale (Bali et al., 2019; Manna et al., 2013).

2.2. AI in the Healthcare Sector

Today, the healthcare sector is at the forefront of the fields influenced by AI. In particular, the digital transformation in healthcare has increased the use of AI in healthcare applications, and healthcare professionals and governments have come to recognize the importance of AI (Jiang et al., 2017). These developments support the projection that AI revenue in the healthcare sector will reach $10 billion within five years (Çalışkan and

Çınaroğlu, 2023). On the other hand, factors such as the aging global population, the rise in chronic diseases, the spread of pandemics, and the demand for home care services are identified as the primary drivers increasing the importance of AI in healthcare (Vaishya et al., 2020). AI in healthcare was first used in clinical decision support systems and has since found applications in various areas such as cloud computing, machine learning, wearable medical technologies, and neural networks (Guo and Li, 2018). However, the diseases in which AI is most widely used in healthcare include neurology, cancer, and cardiology (Jiang et al., 2017). In the diagnosis of these diseases, AI-based applications can facilitate early diagnosis and cost-effective treatment processes. In particular, by enabling the diagnosis and treatment of high-cost diseases to be conducted in a virtual environment, AI facilitates access to healthcare services and thereby reduces health inequities (Koski and Murphy, 2021). The most significant reason for the widespread adoption of AI applications in healthcare is the benefits they provide to the healthcare system; AI offers significant contributions in many areas, including sustainability and cost savings in healthcare services, personalized medical care, patient and staff safety, and education (Akalın and Veranyurt, 2021). Furthermore, the use of AI in healthcare improves service quality and performance, leading to more efficient outcomes (Muafa and Al-Obadi, 2024). AI is generally used in the healthcare sector across many areas, including diagnosis and treatment, online healthcare services, pharmaceuticals, communication, medical decision support systems, medical and social rehabilitation, surgical interventions (such as robotic surgery), risk prediction, nursing care, imaging, epidemiology, home care, pathology, and more (Becker, 2019; Secinaro et al., 2021), it contributes to protecting patients' health, remote monitoring, virtual consultations, reducing the risk of adverse drug events, transparency, human resources management, measuring vital signs and values, pandemic management, complication management, outcome prediction, determining disease severity, reducing medical errors, virtual appointments, routine screenings, early diagnosis, and more (Amanat et al., 2022; Becker, 2019; Dave and Patel, 2023; Sunarti et al., 2021; Vaishya et al., 2020).

2.3. The Economic Impacts of AI Use in Healthcare

AI is impacting the healthcare sector not only in terms of clinical outcomes but also from administrative and financial perspectives (Rao et al., 2025). As in other sectors, the use of AI in healthcare leads to long-term cost savings (Pietris et al., 2022). It is emphasized that the use of AI in healthcare can yield annual savings of $2,000-3,000 (5%-10%) in healthcare expenditures without compromising quality or access (Sahni et al., 2023). The use of AI in healthcare reduces costs by facilitating the early and accurate diagnosis of diseases, thereby assisting physicians in clinical decision-making and enabling the delivery of more efficient and personalized healthcare (Duran, 2024, p. 3). AI-supported healthcare delivery not only prevents diseases and reduces medical expenditures but also decreases post-treatment hospitalizations and complications, thereby lowering the costs of post-treatment care (Al Meslamani, 2023; Khanna et al., 2022). However, the investment costs associated with integrating AI into healthcare services limit the decision to adopt AI in the healthcare sector (Al Meslamani, 2023; Jiao, Zhang & D'Souza, 2023). Furthermore, despite the benefits of AI for healthcare providers, certain concerns from the perspective of payers and the public create challenges in its implementation (Jiao et al., 2023). Nevertheless, due to rising global healthcare expenditures, providers should prioritize AI applications as a solution to optimize resource utilization, improve the quality of care, and enhance efficiency and cost-effectiveness (Jiao et al., 2023; Rao et al., 2025). This is because AI serves as a key tool for developing additional cost-effective healthcare strategies in response to rising healthcare expenditures (Pietris et al., 2022). AI generates cost savings in the healthcare sector not only for service providers but also for patients, pharmaceutical companies, and insurance companies (Khanna et al., 2023; Sahni et al., 2023). Examples include reducing treatment costs through personalized healthcare, lowering drug costs through AI-supported effective drug research, and helping payers avoid legal penalties through more accurate diagnosis and treatment of diseases (Al Meslamani, 2023; Khanna et al., 2022). Despite these significant economic impacts, the literature on AI use in healthcare has primarily focused on AI's clinical effects or technical performance, while its economic impact on healthcare has been overlooked (Rao et al., 2025).

3.MATERIALS AND METHODS

This section presents the purpose and significance of the study, the research questions, the collection and analysis of research data, and the limitations of the study.

3.1. Purpose and Significance of the Study

The aim of this study is to analyze trends in the literature through bibliometric mapping of scientific publications on the economic dimension of AI use in the healthcare sector and to present a comprehensive overview of the field's current structure based on quantitative indicators. Furthermore, the limited number of thematic studies on

the economic impacts of AI in the healthcare sector underscores the originality and scientific contribution of this study.

3.2. Research Questions

In line with the research objective, the questions to be addressed in this study are as follows:

- How have studies on the economic dimension of AI in the healthcare sector evolved over the years?
- How have studies on the economic dimension of AI in the healthcare sector evolved in terms of the language used?
- How have studies on the economic dimension of AI in the healthcare sector been distributed across different indexes?
- How have studies on the economic dimension of AI in the healthcare sector evolved across different countries?
- What is the co-authorship analysis of studies on the economic dimension of AI in the healthcare sector?
- Who are the most frequently cited authors in studies on the economic dimension of AI in the healthcare sector?
- What are the most frequently used keywords in studies on the economic dimension of AI in the healthcare sector?
- Which countries are most frequently cited in studies on the economic dimension of AI in the healthcare sector?
- Which institutions are most frequently cited in studies on the economic dimension of AI in healthcare?
- What is the bibliometric matching analysis of journals in studies on the economic dimension of AI in healthcare?
- What is the bibliometric matching analysis of authors in studies on the economic dimension of AI in the field of healthcare?
- What is the bibliometric matching analysis of texts in studies on the economic dimension of AI in the field of healthcare?
- What is the co-citation analysis of authors in studies on the economic dimension of AI in the field of healthcare?

3.3. Data Collection and Analysis

In the study, data were collected from the Web of Science database on February 15, 2026. The Web of Science database was chosen because it covers all scientific disciplines, includes high-quality publications, and is a proven, reliable source (Gün, 2024; Çetin, 2025). As a search strategy, a search was conducted in the Web of Science database using the "Topic" filter with the keywords "artificial intelligence" AND ("cost" OR "economic" OR "cost-effectiveness" OR "economic evaluation" OR "health economics" OR "expenditure" OR "financial") AND ("health sector" OR "healthcare") keywords, resulting in 2,378 publications. The keywords used in this study were determined based on fundamental concepts that directly reflect the economic dimension of AI in healthcare, in line with the study's objective. Expanding the search strategy to include more economic terms was not chosen because it could have resulted in the inclusion of publications not directly related to the topic in the dataset. Therefore, a more targeted search strategy was adopted to strike a balance between scope and specificity.

As a result of the search conducted in the Web of Science database in accordance with the defined search strategy, a total of 2,378 publications were identified. In accordance with the predefined inclusion and exclusion criteria, only articles published in English were included in the analysis, and as a result of this filtering, n = 1,356 records were obtained. Subsequently, since the data collection process was carried out on February 2026 and the year 2026 had not yet ended, studies from 2026 (n = 30) were excluded from the scope of the analysis. Thus, the bibliometric analyses were conducted on n = 1,326 studies. Due to the dynamic nature of the Web of Science database, the same search strategy may yield different numbers of publications at different times. Therefore, the analyses were conducted based on the final dataset obtained on the date of data collection. The methodological approach used to obtain the data in this study is presented below (Figure 1).

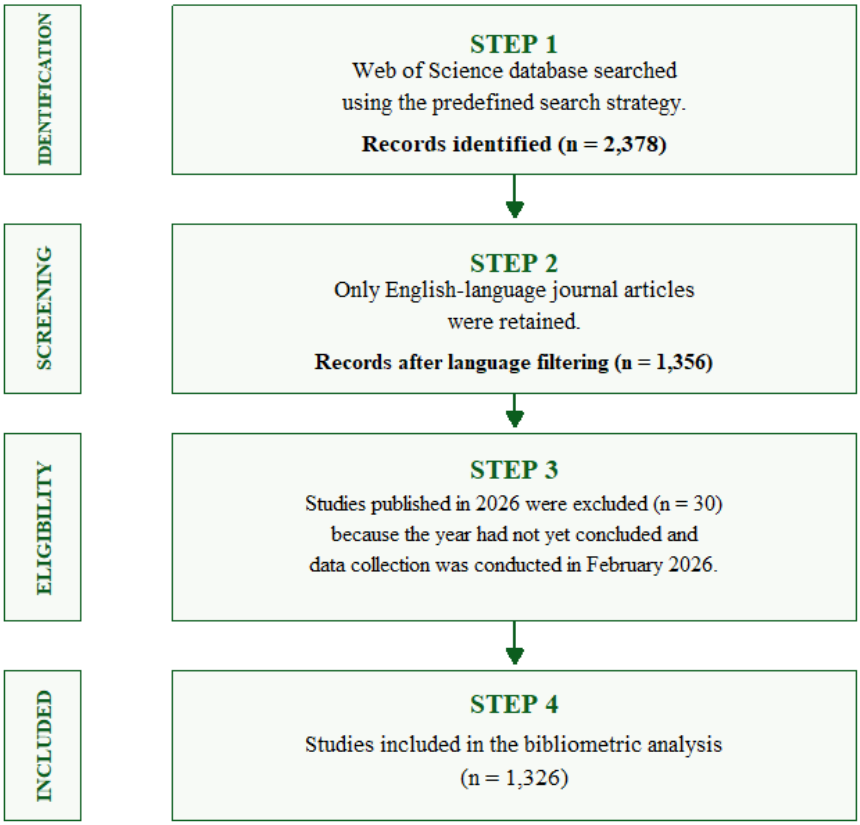


Figure 1. Data Collection Strategy

A bibliometric analysis method was used to analyze the data. Bibliometric analysis serves to define, explain, evaluate, and predict academic communication, thereby enabling a quantitative examination of the subject under study in the context of publications, sources, authors, and citations (Borgman and Furner, 2002; Cobo et al., 2011). In short, bibliometric analysis which involves examining the types and subcategories of scientific publications and visually presenting this data (Hsu et al., 2020) helps us understand the development, interaction, and impact of scientific publications by quantitatively examining the research literature (Ho and Prieto-Gutiérrez, 2024). The VOSviewer program was used for data visualization and mapping. VOSviewer is a program used in conjunction with bibliometric analyses. Developed by Waltman et al. (2010), VOSviewer is a powerful software tool that supports bibliometric analysis and data visualization; it is widely used, particularly for identifying high-frequency keywords and visualizing the relationships among them (Aria and Cuccurullo, 2017). With this feature, the VOSviewer software guides researchers, enabling them to grasp complex information environments in a more accessible and understandable way. In this study, the RStudio package was used to visualize the descriptive findings. Since this study utilized bibliographic data from publicly available, open-access, and published studies in the Web of Science database, ethical committee approval was not required.

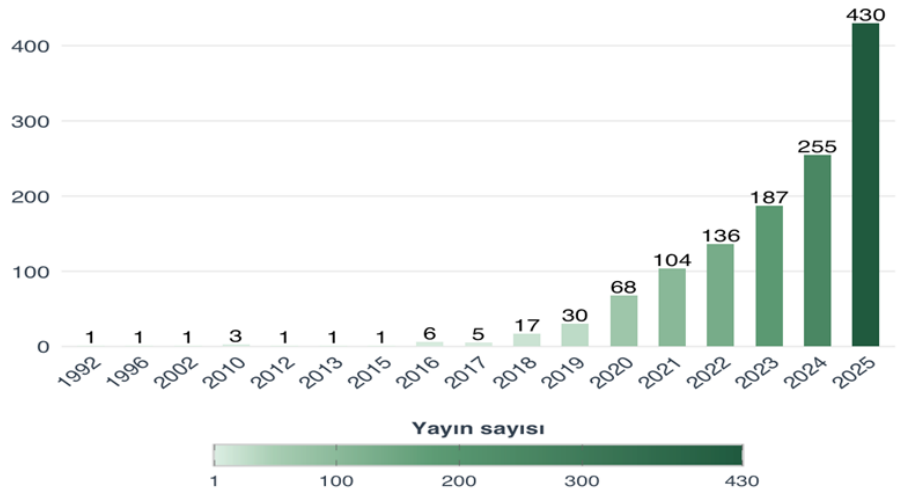
3.4. Research Limitations

The inclusion of only articles published in English is one of the study's significant limitations. Furthermore, the use of only the Web of Science database due to its broad scientific scope, high-quality publications, and status as a reliable source may have resulted in studies from other databases being excluded from the analysis. However, the keywords used in the study were selected in accordance with its objectives, and alternative search strategies incorporating different economic concepts could yield access to additional publications. Therefore, the findings should be evaluated within the framework of the established inclusion criteria.

3.5. Ethical Approval

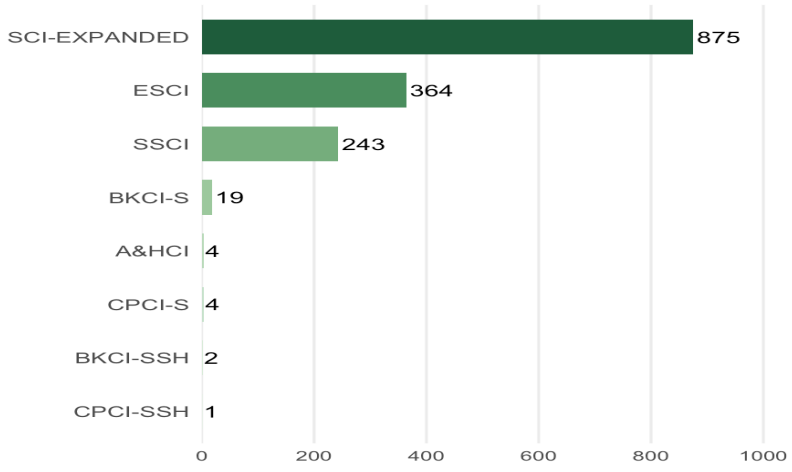
The fact that the study selected only "articles" published in English constitutes a significant limitation of the research. Furthermore, the use of only the Web of Science database due to its coverage of a broad scientific spectrum, its provision of high-quality publications, and its status as a proven, reliable reference while other databases were not considered, also stands out as a significant limitation.

4. RESULTS



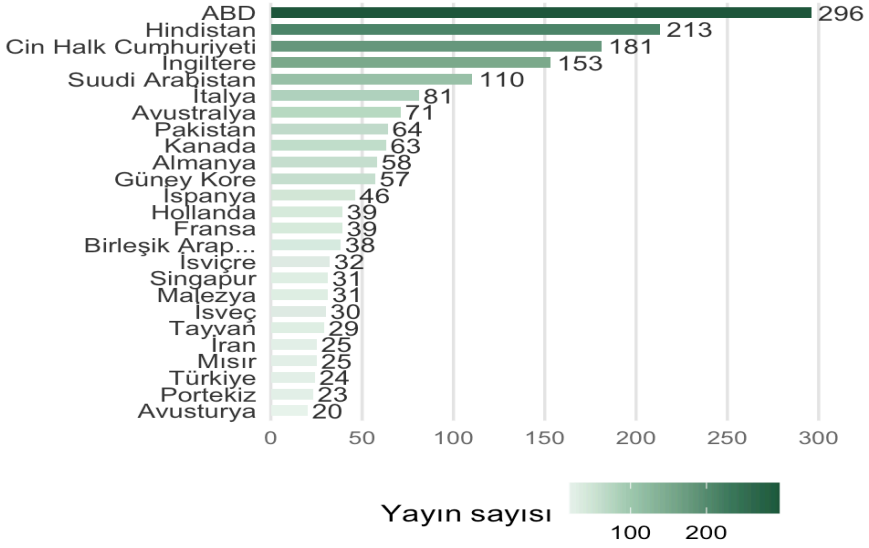
Graph 1. Chart Showing the Distribution of Publications by Year

When examining the distribution of studies on the economic aspects of AI in the healthcare sector by year, it is observed that the years with the highest number of publications were, in order, 2025 (n=430), 2024 (n=255), and 2023 (n=187). In particular, there has been a significant increase in the number of studies on this topic by year since 2019. This trend is attributed to the increased emphasis on AI-based research in the fields of health and healthcare services following the COVID-19 pandemic. Furthermore, an examination of the graph reveals that the earliest publication on this topic dates back to 1992.



Graph 2. Chart Showing the Distribution of Publications by Index

An analysis of the indexes of the published articles reveals that 65.99% of them (n=895) are indexed in the Science Citation Index Expanded (SCI-EXPANDED) database, 27.45% (n=364) in the Emerging Sources Citation Index (ESCI) database, and 18.33% (n=243) in the Social Sciences Citation Index (SSCI) database (Graph 2).



Graph 3. Chart Showing the Distribution of Publications by Country

Figure 3 shows the distribution of research on the economic aspects of AI in the healthcare sector by country. According to the figure, the United States stands out as the country with the highest number of research articles, with 296 (22.32%). India ranks second with 213 articles (16.06%), while China ranks third with 181 articles (13.65%). The concentration of research in countries with high scientific research capacity such as the United States, China, and the United Kingdom can be seen as a reflection of these countries' investments in AI technologies, their strong research infrastructure, their academic expertise in health economics, and their advanced digital health ecosystems. On the other hand, the lower number of publications in some countries may stem from differences among nations in terms of research capacity, funding opportunities, and the prevalence of AI applications.

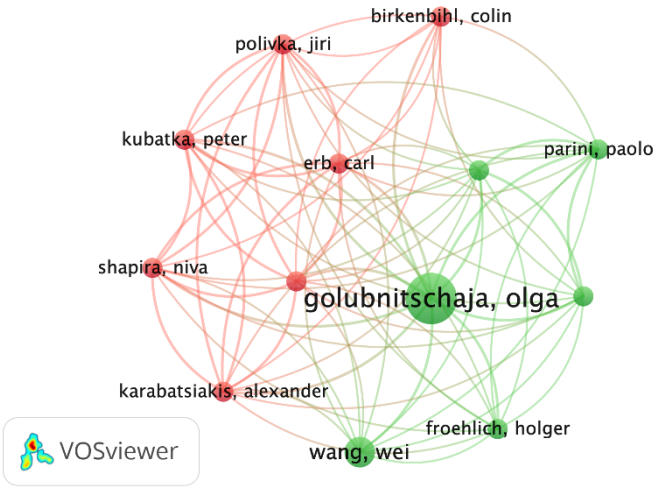


Figure 2. Co-Author Analysis

Taking into account the criteria of at least one publication and one citation, the network map of the authors with the highest interaction is presented in Figure 2. The analysis revealed that the network consists of 13 nodes, 2 main clusters, 76 links, and 106 link strengths.The nodes in the network represent the authors included in the analysis; the links represent the collaborative relationships among the authors; and the total link strength indicates the intensity of these collaborative relationships. The formation of two main clusters suggests that researchers are clustered around specific collaborative groups. According to the findings, Olga Golubnitschaja and Sudeep Tanwar stand out as the most productive authors. Furthermore, Olga Golubnitschaja, Wang Wei, and Carl Erb are among the authors with the most connections and the highest level of interaction. This indicates that these authors are researchers who shape the development of the field, collaborate with various researchers, and contribute to the accumulation of knowledge regarding the economic dimension of AI in the healthcare sector.

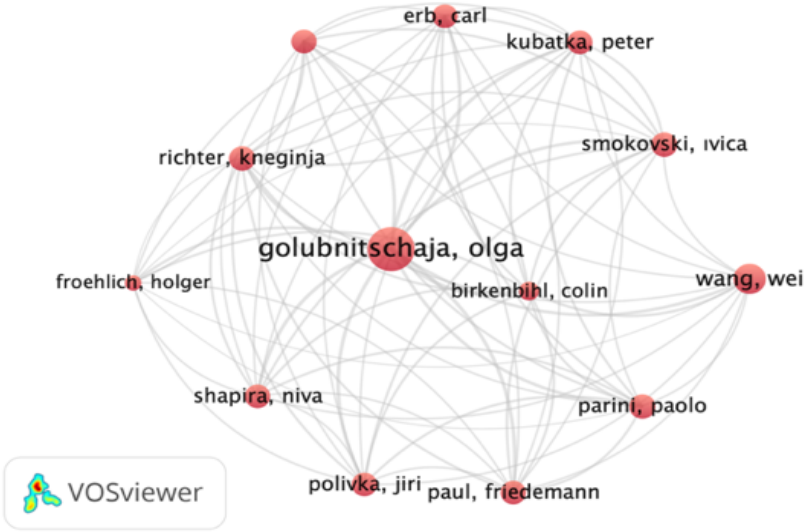


Figure 3. Author Citation Analysis

The network map of the most-cited authors, generated based on the criteria of at least one publication and one citation, is presented in Figure 3. The analysis revealed that the network consists of 13 nodes, one central cluster, 78 links, and a total link strength of 225. According to the findings, Chengkuo Lee (n=374), Zhongling Wang (n=300), Thippa Reddy Gadekallu (n=287), and Olga Golubnitschaja (n=283) stand out as the most highly cited authors. The high number of citations indicates that these researchers' work is widely referenced in the literature and that they have a significant scientific impact. Conversely, authors such as Wang Wei, Sudeep Tanwar, and Carl Erb are among the researchers who make significant contributions to the flow of knowledge in the field and

to scientific interaction among researchers due to their strong connections within the citation network (Figure 3).

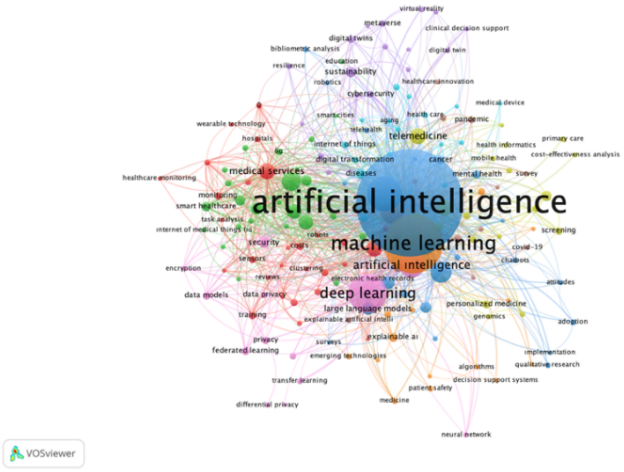


Figure 4. Keyword Analysis

Taking into account 174 observation units that appeared at least five times and shared a common relationship, the network map of the most frequently used keywords is presented in Figure 4. The analysis revealed that the network consists of nine clusters, 1,766 connections, and 3,335 connection strengths. According to the findings, the most frequently used keywords in studies on the economic dimension of AI in the healthcare sector were, in order, artificial intelligence (n=501), machine learning (n=209), and deep learning (n=113) (Figure 4). The prominence of these keywords indicates that research is primarily centered around the fundamental components of AI technologies and that the field is particularly focused on machine learning and deep learning applications. Furthermore, the grouping of these keywords into nine distinct clusters suggests that the economic dimension of AI in healthcare is evolving as an interdisciplinary research area associated with various research themes.

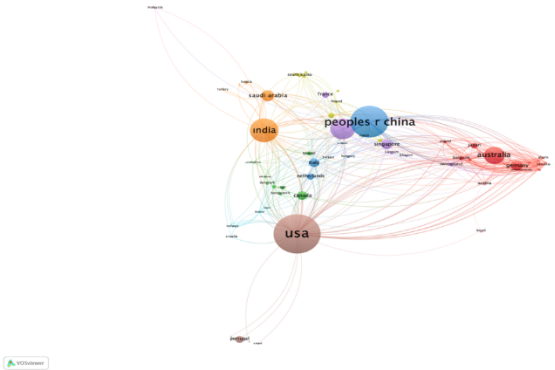


Figure 5. Country Citation Analysis

Based on 70 observation units, using the criteria of at least two publications and two citations, the network map of the most-cited countries is presented in Figure 5. As a result of the analyses, it was determined that the network consists of 10 clusters, 398 links, and 734 link strengths. According to the findings, the countries with the most citations were, in order, the United States (6,461 citations), the People's Republic of China (5,173 citations), and India (3,842 citations). The high number of citations indicates that research conducted in these countries is more visible and influential in the international literature. This situation can be interpreted as an indicator of these countries' research capacity in the fields of AI in healthcare and health economics, as well as their active role in international scientific collaborations (Figure 5).

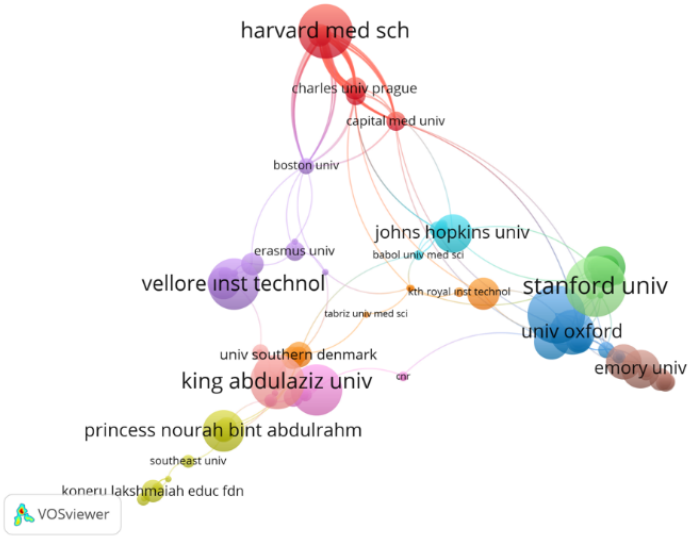


Figure 6. Most Effective Organizations

Taking into account 162 observation units based on the criteria of at least two publications and two citations, the network map of the Most Effective Organizations is presented in Figure 6. As a result of the analyses, 11 clusters, 589 links, and 797 link strengths were identified in the network. According to the findings, the institutions that produced the most publications in research on the economic dimension of AI in the healthcare sector were, in order, Stanford University (n=19), National University of Singapore (n=18), and Harvard Medical School (n=17). The number of publications reflects the level of scientific output of these institutions in the field. In contrast, the institutions receiving the most citations were identified as the Chinese Academy of Sciences (972 citations), Nanyang Technological University (883 citations), and Osaka University (727 citations). A high number of citations indicates that these institutions are not only productive but also have significant scientific impact and visibility in the international literature (Figure 6).

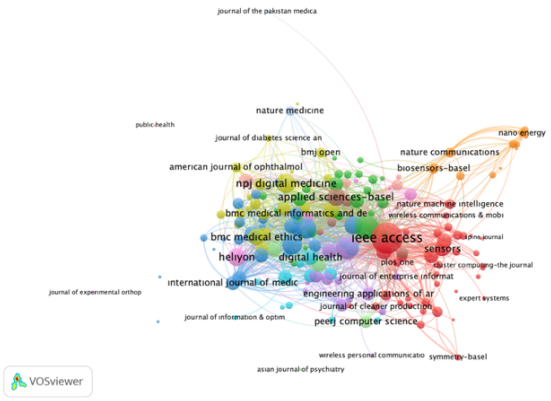


Figure 7. Bibliometric Matching Analysis of Journals

Based on a bibliometric matching analysis of the journals, which considered 177 observation units using criteria of at least two publications and two citations, 12 clusters, 3,597 links, and a total link strength of 8,654 were identified in the network (Figure 7). Based on these findings, the journals with the highest bibliometric similarity regarding research on the economic dimension of AI in the field of healthcare were identified as IEEE Access, Sensors, and Nature Communications, in that order. According to the findings, the journals with the highest bibliographic similarity in research on the economic dimension of AI in the healthcare sector were, in order, IEEE Access, Sensors, and Nature Communications. This finding indicates that these journals host similar research

trends based on shared sources and play a significant role in the development of the field's body of knowledge (Figure 7).

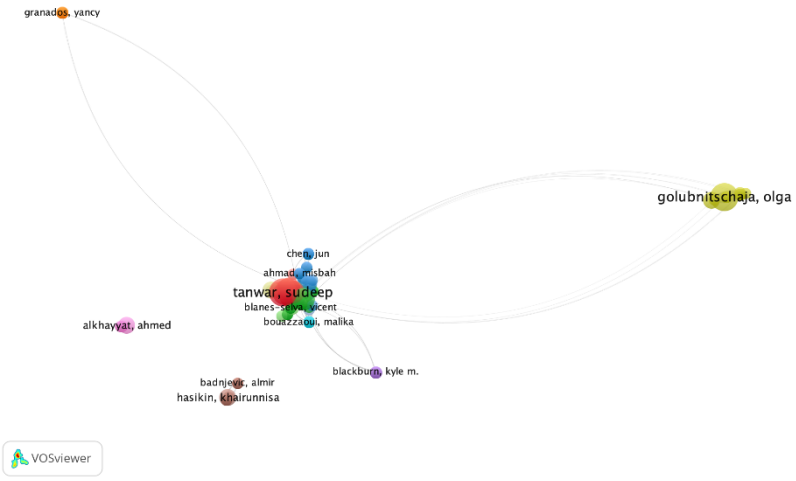


Figure 8. Bibliometric Matching Analysis of Authors

As a result of the bibliographic matching analysis of the authors, conducted by considering 206 observation units based on the criteria of at least two publications and two citations, it was determined that the network consists of 13 clusters, 2,042 links, and a total link strength of 52,742 (Figure 8). According to the findings, Olga Golubnitschaja and Carl Erb are among the authors with the highest bibliographic matching power. This indicates that these researchers have conducted studies based on similar sources and represent common research trends in the development of the literature on the economic aspects of AI in the healthcare sector (Figure 8).

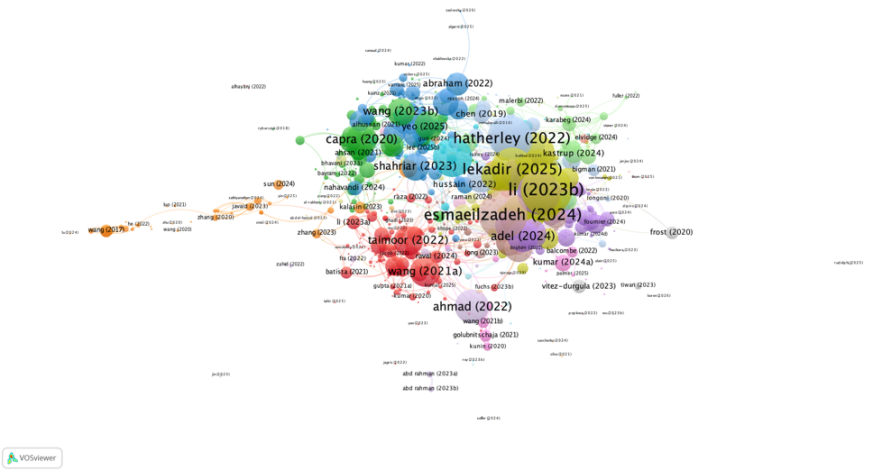


Figure 9. Bibliometric Matching Analysis of the Works

The network map of the bibliographic matching analysis conducted on 836 observation units based on the criterion of receiving at least two citations is presented in Figure 9. The analysis revealed that the network consists of 21 clusters, 10,279 links, and a total link strength of 13,549. The links in the network indicate bibliographic similarity among the studies, while the total link strength reflects the intensity of this similarity. According to the findings, among studies on the economic dimension of AI in the healthcare sector, the studies with the highest bibliographic matching strength were, in order, Li (2023b), Esmaeilzadeh (2024), and Lekadir (2025). Consequently, this

indicates that these studies have strong connections with similar research themes in the literature due to their intensive use of common sources and that they occupy an important position in shaping the knowledge structure of the field (Figure 9).

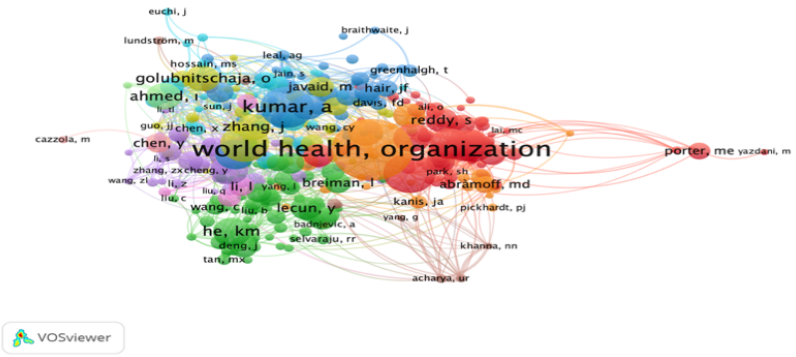


Figure 10. Co-Citation Analysis of the Authors

The co-citation analysis of authors was evaluated based on the criterion of having received at least 10 citations, using 294 observations (Figure 10). The links in the network represent the co-citation relationships among authors, while the total link strength indicates the intensity of these relationships. According to the findings, the authors with the highest number of shared citations were, in order, the World Health Organization, Andre Esteva, and Kumar Anchan. The high number of shared citations indicates that these authors' works, when cited together, have played a significant role in shaping the theoretical and scientific knowledge structure of the field and are recognized by researchers as fundamental reference sources (Figure 10).

5. DISCUSSION

In recent years, one of the areas where AI has brought about the most significant transformation affecting all sectors is the healthcare sector. Having become an indispensable component of the healthcare system, AI has fundamentally changed the organization, delivery methods, and approaches of healthcare services through its implementation in this sector, just as it has in others (Hudes, 2017). On the other hand, the use of AI in the healthcare sector also affects costs in various ways (El Arab & Al Moosa, 2025). Consequently, identifying the cost and economic impacts of AI's use in healthcare and determining the trends in the literature have become an important area of research.

The analysis conducted in this study revealed that studies on the economic aspects of AI in healthcare were published between 1992 and 2025, with the highest number of publications occurring in 2025. In particular, a significant increase in the number of publications was observed after 2020, and this increase is believed to be related to the COVID-19 pandemic making the importance of health technologies more apparent. The rise in AI-supported programs and applications in the healthcare sector in the post-pandemic period parallels the increase in the number of publications (Abdi et al., 2022; Kazak and Kazak, 2023). Furthermore, the fact that the United States is the country with the highest number of publications supports the findings of similar studies on AI and healthcare (Aldousari and Kithinji, 2024; Çetin, 2025; Guo, 2020; Gündüz & Eren, 2024; Hussain et al., 2024; Senthil et al., 2024; Tran et al., 2019). On the other hand, while similar bibliometric studies in the literature primarily focus on the clinical applications, technological development, communication, patient safety, and ethical dimensions of AI, this study distinguishes itself from existing research by evaluating the economic dimension of AI in the healthcare sector using bibliometric methods. Consequently, in addition to presenting publication trends in the field including influential authors, institutions, countries, and journals from a holistic perspective, it also contributes to identifying areas that require future research from a health economics perspective. (Aldousari and Kithinji, 2024; Guo et al., 2020; Hussain et al., 2024; Senthil et al., 2024; Tran et al., 2019). Furthermore, the limited number of bibliometric studies in the national literature focusing on the field of AI and healthcare; the fact that these studies were analyzed using different databases and software and covered different time periods; and their focus on the economic dimension of AI in healthcare are among the key elements that distinguish this study from similar ones (Alp, İşbay

& Öner, 2023; Çetin, 2025; Gerçeker & Erdem, 2025; Gündüz & Eren, 2024). In Çetin's (2025) study on AI and healthcare which analyzed articles in the Web of Science database using R softwarethe most prominent keywords, in order, were artificial intelligence, healthcare, and machine learning. However, the fact that the most frequently used keywords in this study were, in order, artificial intelligence, machine learning, and deep learning indicates that findings may vary across studies even when using the same database depending on the time period, the analysis software employed, and the variables considered. This variation highlights a distinct and original aspect of this study compared to other similar studies in the literature.

Consequently, it can be said that there is growing interest in research highlighting the economic aspects of AI in the field of health care. However, it has been noted that studies in the literature largely focus on the development of AI technologies and their applications in healthcare, while topics such as cost-effectiveness, reimbursement policies, healthcare financing, budgeting, resource allocation, and health inequalities from a health economics perspective have been addressed to a relatively limited extent. Nevertheless, it is believed that a more comprehensive assessment of the economic impacts of AI on the healthcare sector is needed, and the number of studies in this area should be increased. In particular, increasing the number of AI-supported economic evaluation studies which will support decision-making processes related to the formulation of health policies and the effective use of resources is important for guiding practitioners and helping to fill the existing gap in the literature.

6. CONCLUSION AND RECOMMENDATIONS

In conclusion, this study has evaluated the existing body of knowledge in the field from a holistic perspective by using bibliometric analysis to identify trends in scientific output regarding the economic dimension of AI in healthcare. The findings indicate that academic interest in this field has increased significantly, particularly in recent years, and that research has concentrated around specific countries, institutions, and researchers. This situation highlights that the economic impacts of AI in healthcare are gaining increasing importance and that the field is evolving toward an interdisciplinary research structure. By systematically identifying current research trends, key actors, and prominent themes, the findings provide a general framework for the literature on health economics and AI. This study highlights the trends in scientific output regarding the economic aspects of AI in healthcare, providing a comprehensive assessment of the current state of knowledge in the field. The findings indicate that future research should focus not only on the technical and clinical aspects of AI technologies in healthcare but also on economic dimensions such as cost-effectiveness, economic evaluation, healthcare efficiency, reimbursement mechanisms, resource allocation, and health inequalities. Furthermore, conducting multidisciplinary and comparative bibliometric studies that span different databases will contribute to a more comprehensive evaluation of the literature.

DECLARATION OF THE AUTHORS

Declaration of Contribution Rate: The authors have contributed equally to the article.
Declaration of Support and Thanksgiving: This study did not receive any financial or institutional support. There is no institution or individual to acknowledge
Declaration of Conflict: The authors declare that there is no conflict of interest.

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