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International Publications Trends on the Application of Robotic Processs Automation (RPA) in Auditing

Vu Thi Thu Huyen[1], Nguyen Quang Anh[2] , To Ngoc Anh[3], Pham Quynh Anh[4], Nguyen Bich Ngoc Anh[5], Ngo Dieu Linh[6]
[1]*Institute of Accounting and Auditing, Thuongmai University, Vietnam*
[2,3,4,5,6]*Student of Auditing department, Thuongmai University, Vietnam*

Abstract: This research focuses on bibliometric analysis of the application of Robotic Process Automation (RPA) in auditing. Data were collected from OpenAlex database up to September 2025, with 648 science publications, and processed through VOSviewer software to identify: research trends, authors, training institutions, influential countries, as well as keyword mapping. The result emphasizes the interdisciplinary nature of RPA, while suggesting policies regarding workforce training, infrastructure investment and legal frameworks to promote its application in auditing

Keywords: Auditing; bibilometrics; Robotic Process Automation (RPA); VOSviewer

1. Introduction

The accounting and auditing industry has long been the backbone of the financial system and is currently undergoing significant changes due to the impacts of the Fourth Industrial Revolution. This transformation not only improves tools but also reshapes three main pillars of the field: Legal framework, Human resources, and Technology (Duong, 2024).

Robotic Process Automation (RPA) is a type of technology that enables the automation of business processes through a software whereas robots mimic human actions when interacting with digital systems (Tran, 2025). The adoption of RPA in auditing in Vietnam is influenced by various organizational and individual factors. Studies indicate that RPA is highly valued for its flexible configuration and minimal requirement for in-depth IT knowledge, making its implementation in corporate environments more feasible (Nguyen, 2021) This user-friendly feature can positively influence auditors' intention to adopt RPA, especially when accompanied by organizational support and technological readiness (Nguyen, 2023).

In the context of the Industrial Revolution 4.0 and the rise of Artificial Intelligence (AI), digital transformation in auditing further highlights the role of technological infrastructure and strategic alignment in implementing RPA (Huang and Vasarhelyi, 2019). New-generation automation platforms, such as UiPath or Automation Anywhere, demonstrate the potential to streamline processes, boost productivity, and create additional momentum for RPA adoption in auditing (Nguyen, 2021; Deloitte, 2022)

Moreover, contextual characteristics such as organizational size, digital maturity, and technical expertise are direct factors that influence the decisions to adopt RPA. Small enterprises with limited technological infrastructure may face many challenges, thus slowing down the application of RPA in auditing in Vietnam (Tran, 2025).

In addition, perceived benefits of RPA, including enhanced efficiency and accuracy, are considered important drives encouraging organizations to integrate this tool into their auditing practices (Nguyễn, 2023). However, resistance to change, lack of awareness, and insufficient training may become barriers, raising the need for appropriate management strategies shift (Tran, 2025).

Research also shows that RPA can automate several manual tasks, reduce errors, and allow auditors to focus on more analytical and value-added work (Moffitt, Rozario and Vasarhelyi, 2018). Nevertheless, practical implementation requires careful consideration of organizational readiness as well as the development of clear orientation frameworks (Durão and Palma dos Reis, 2025).

2. Methodology

Step 1: The research team collected review documents of both international and Vietnamese publications related to the topic, along with other materials such as textbooks and the relevants from Google Scholar. The collection aimed to justify the necessity of this study, provide an overview, and to identify research gaps.

Step 2: The research team utilized Python to extract data with the keyword "RPA" or "robotic automation process" and "audit", filtered in the Title field from OpenAlex database, accessed on September 16, 2025. The result yielded 648 related articles, and these data were input into the bibliometric analysis of VOSviewer 1.6.20 to further analyze and answer the following questions:

Q1: International publications on the application of Robotic Process Automation (RPA) in auditing up to September 2025.

Q2: The most influential authors based on the citation count of an article, number of publications, and total citations in international publications on the application of RPA in auditing.

Q3: The most influential universities based on the number of publications and citations in international publications on the application of RPA in auditing.

Q4: The most influential countries based on the number of publications and citations in international publications on the application of RPA in auditing.

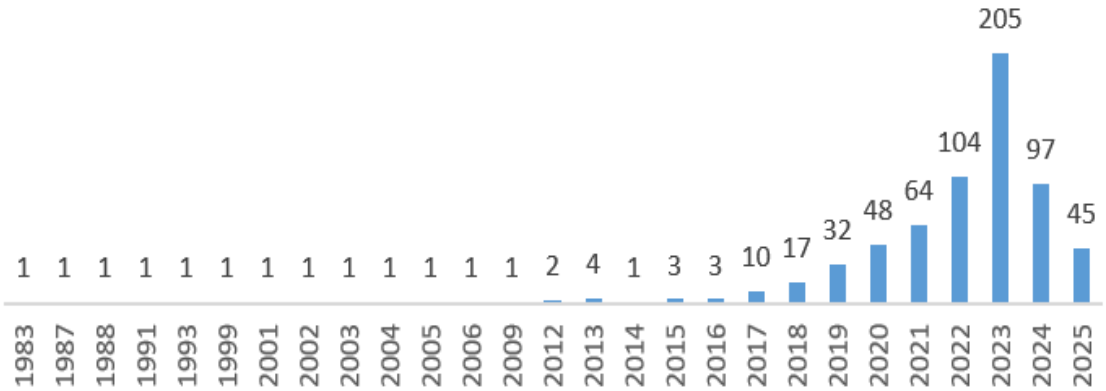
Q5: Keyword analysis in international publications on the application of RPA in auditing.

3. Research Results

3.1. Publication counts

International publications on the application of Robotic Process Automation (RPA) in auditing are presented through Figure 1.

Fig. 1: Annual publications statistics



(Source: Compiled from VOSviewer software)

According to statistics, the earliest publication on Robotic Process Automation (RPA) in auditing was in 1983 by James F. Hubbert, titled "Auditing a Manufacturing Control System" (Hubbert, 1983). In the following years, up until 2017, the number of studies on RPA in auditing remained limited, as the topic was still relatively new. Over the time, Process automation in auditing gradually attracted attention from scholars. Between 2017 and 2022, the number of studies steadily increased, from 10 to 104 publications. Notably, in 2023, the number of studies reached its peak with 205 publications. Continuing through the second quarter of 2025, the number of publications on RPA in auditing remained impressive, with 97 in 2024 and 45 in the first half of 2025. These statistics show that the issue of Robotic Process Automation (RPA) in auditing has been receiving substantial attention from scholars in recent years.

3.2. Most influential author counts

To assess the most influential authors in international publications, the research team gave evaluations based on: the number of citations (Table 1), as well as the authors with the most publications and citations (Table 2, Figure 2).

3.2.1. Articles with the highest citation counts

Table 1: Articles with the highest citation counts (n=648)

Document	Citations
jodie moll (2019)	464
rehan syed (2019)	436
jorge ribeiro (2021)	375
hussein issa (2016)	342
kevin moffitt (2018)	337
roger debreceny (2001)	267
yingying zhang (2020)	259
feiqi huang (2019)	247
anastassia fedyk (2022)	219
karen v. pincus (2017)	179

(Source: Compiled from VOSviewer software)

The research team selected the 10 most-cited articles for this analysis. The results in Table 1 show that the publication with the highest citation count is by Jodie Moll et al. (2019), titled "The role of internet-related technologies in shaping the work of accountants: New directions for accounting research" (Moll and Yigitbasioglu, 2019) with 464 citations, followed by "Robotic Process Automation: Contemporary themes and challenges" (Syed *et al.*, 2020). Among these highly cited works, Anastassia Fedyk et al. (2022) recently published "Is artificial intelligence improving the audit process?" (Fedyk *et al.*, 2022). Meanwhile, the oldest paper in this group is by Roger Debreceny et al. (2001), "The production and use of semantically rich accounting reports on the Internet: XML and XBRL" (Debreceny and Gray, 2001), which still received a significant number of citations (267 citations), indicating its foundational influence on subsequent studies.

3.2.2. Authors with the most publications and citations

Based on this criterion, the research team identified 14 authors with the highest number of publications and citations, filtering for those with at least 3 publications and 5 citations. Table 2 presents information on the authors with the highest number of publications and citations on the application of Robotic Process Automation (RPA) in auditing. Leading in terms of the number of publications is Marc Eulerich with six papers; however, he does not have the highest number of citations. Following him are Miklos A. Vasarhelyi, David A. Wood, and Muyiwa Emmanuel Dagunduro, each with five papers. Among them, Miklos A. Vasarhelyi has the highest citation count with 952 citations.

In terms of citations, Miklos A. Vasarhelyi is the most influential author, with 952 citations despite from only 5 papers, reflecting his significant scientific impact. He is followed by Othmar M. Lehner (500 citations) and David A. Wood (149 citations). Some authors, such as Muyiwa Emmanuel Dagunduro, have a relatively high number of papers (five) but a low citation count (34). In summary, Vasarhelyi and Lehner stand out as the two most academically influential authors in this group.

Table 2: Authors with the most publications and citations (n=648)

Author	Documents	Citations
marc eulerich	6	143
miklos a. vasarhelyi	5	952
david a. wood	5	149
muyiwa emmanuel dagunduro	5	34
nathan waddoups	4	138
othmar m. lehner	4	500
damian kedziora	4	59
adriana tiron-tudor	3	55
azuraidah taib	3	29
mariia nezhyva	3	15
mohd sidki hasan	3	29
norfadzilah rashid	3	29
shazalina mohamed shuhidan	3	29
yunita awang	3	29

(Source: Compiled from VOSviewer software)

A detailed review of publications by year in Figure 2 shows that all authors have had recent publications (2019–2023). Miklos A. Vasarhelyi is positioned at the center of the network, connecting with many other authors. This, together with his citation count (952), reaffirms his leading role and extensive collaboration. The collaboration network is divided into three main clusters, including:

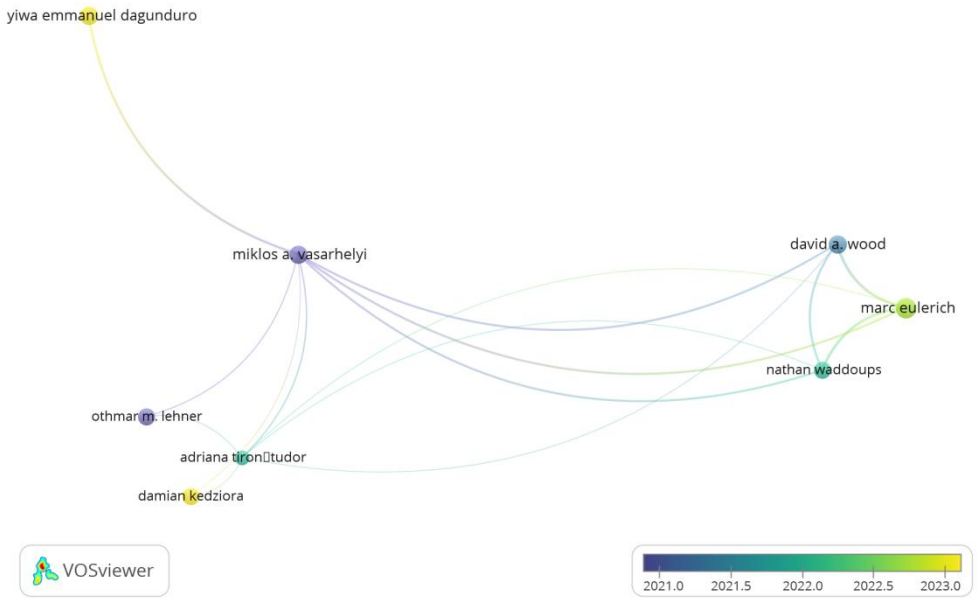
Cluster 1: David A. Wood – Marc Eulerich – Nathan Waddoups, who work closely together and are directly connected to Vasarhelyi. This group has produced many recent publications (2022). This also explains why Marc Eulerich, despite having the highest number of publications, does not have a high citation count.

Cluster 2: Othmar M. Lehner – Adriana Tiron-Tudor – Damian Kedziora, collaborated with Vasarhelyi but forming a separate branch, indicating more specialized collaboration.

Cluster 3: Muyiwa Emmanuel Dagunduro, directly connected to Vasarhelyi, represents an emerging research trend in 2023.

In terms of temporal trends, since 2021, the collaboration network has gradually expanded horizontally, reflecting the continuous development of the research topic. New researchers (Dagunduro, Kedziora) began connecting with the central group (Vasarhelyi). During 2021–2022 (dark blue), the network was mainly concentrated around Vasarhelyi, Lehner, and Tiron-Tudor. By 2022–2023 (green → yellow), new expansions emerged with authors such as Dagunduro, while the Eulerich–Wood–Waddoups group also became more active.

Figure 2: Authors with the highest average publications by year



(Source: Compiled from VOSviewer software)

3.3. Universities with the most publications and citations

The statistics result in 11 universities having at least 5 publications and 3 citations. The university with the highest number of publications is the Bucharest University of Economic Studies (15 papers), followed by BINUS University (11 papers). Next, with 8 papers each, are Rutgers, The State University of New Jersey and Universiti Teknologi MARA. The remaining universities had between 5 and 7 papers, as shown in the table below. When considering citation counts, the university with the highest impact is Rutgers, The State University with 1,089 citations. Other universities also achieved relatively high citation counts, such as Brigham Young University (328 citations) and the University of Denver (317 citations), while the remaining universities had significantly lower citation numbers compared to these leading institutions.

Table 3: Universities with the most publications and citations

Organization	Documents	Citations
bucharest university of economic studies	15	111
binus university	11	50
rutgers, the state university of new jersey	8	1089
universiti teknologi mara	8	56
university of duisburg-essen	7	198
brigham young university	6	328
university of denver	5	317
afe babalola university	5	34
university of craiova	5	87
manipal university jaipur	5	27
state university of trade and economics	5	35

(Source: Compiled from VOSviewer software)

Figure 3 provides additional information on publications by year, showing that most publications and citations from universities were concentrated between 2021 and 2023. This indicates that while some universities produced a large number of publications, their citation counts were also relatively high. Rutgers, The State University of New Jersey had earlier publications. Although its number of papers was not as high as

that of the Bucharest University of Economic Studies, it had the highest number of citations. Rutgers thus appears to be the center of the collaboration network, acting as a bridge among other universities. The network can be divided into four clusters, with each cluster consisting of universities that tend to collaborate more closely with one another than with those outside their group:

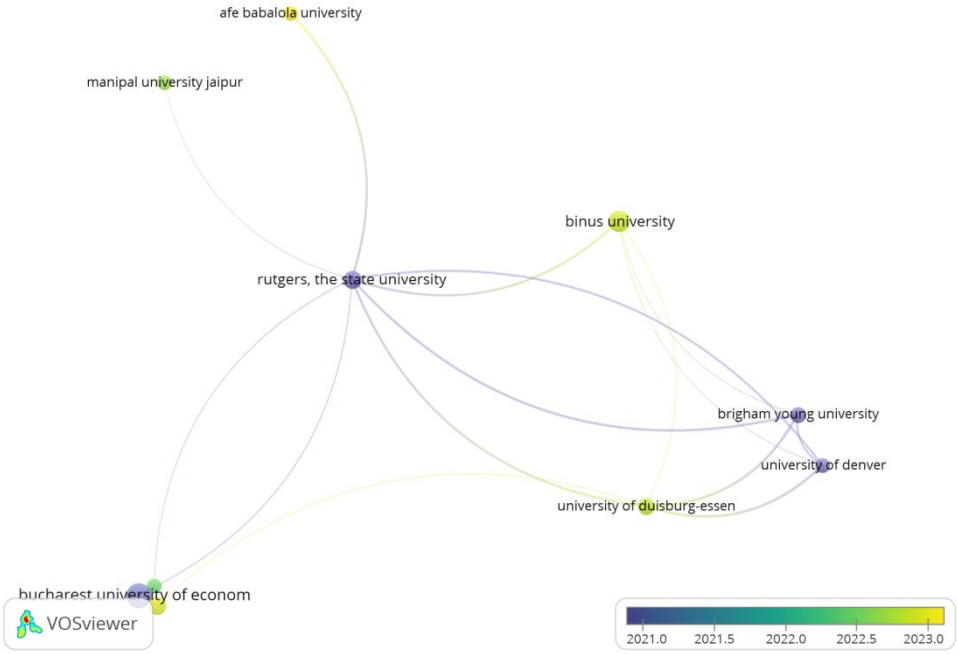
Cluster 1: Afe Babalola University – Manipal University Jaipur – Rutgers, The State University of New Jersey. These institutions come from different regions (Africa, Asia, and North America), but they maintain strong research ties and international collaboration. Their connection likely revolves around process automation and financial technology (FinTech), especially its application in auditing. Rutgers is strong in research on accounting and auditing, particularly in the application of technology in these fields, serving as a "knowledge hub" that provides theoretical frameworks, models, and methodologies on RPA. Manipal University Jaipur (India) is a strong technical center, focusing on RPA's technical aspects such as algorithm development, software optimization, or challenges in implementing RPA in auditing environments. Afe Babalola University (Nigeria) represents the practical application of RPA in emerging or developing markets, focusing on infrastructure barriers, human factors, or legal and regulatory challenges when applying RPA in auditing processes.

Cluster 2: Bucharest University of Economic Studies – Universiti Teknologi Mara - University of Craiova. This cluster consists of two universities from Roania (Bucharest and Craiova) and one from Malaysia (Universiti Teknologi Mara). These institutions focus on auditing and technology-related issues in Eastern European markets, such as regulatory frameworks, infrastructure, or corporate acceptance of new technologies. The Malaysian institution adds a Southeast Asian perspective, where the business and auditing environment is different, allowing for cross-regional comparisons of factors influencing RPA adoption in auditing.

Cluster 3: Brigham Young University, University of Denver, và University of Duisburg - Essen This group represents a close and sustainable collaboration network. Analysis from VOSviewer and the network diagram shows that the link between Brigham Young University and the University of Denver is strong and was established early, indicated by the color-coded connections (blue to green), reflecting a long-standing and stable partnership based on geographic proximity and similar research directions. The participation of the University of Duisburg-Essen expanded the collaboration internationally. The partnership between the U.S. and German universities has been further strengthened in recent years, evolving from a stable bilateral relationship into a growing international collaboration network.

Cluster 4: BINUS University. This institution stands alone as a separate cluster. While it maintains collaborative links with other universities, these connections are not strong enough. This suggests that BINUS may engage in short-term or one-off projects, serving as a specialized partner providing expertise in a particular aspect.

Figure 3: Universities with the highest average publications by year



(Source: Compiled from VOSviewer software)

3.4. Countries with the most publications and citations

Table 4 summarizes 13 countries with at least 10 publications and more than 150 citations on the topic of Robotic Process Automation (RPA) applications in auditing. Leading both in terms of the number of publications and citations is the United States, with 76 publications and 2,652 citations, showing that the U.S. is the country with both the largest output and the highest influence. Next is Indonesia, with 47 publications but only 194 citations. Despire ranking second in the number of publications, its citation count is relatively low compared to other countries. This suggests that while Indonesia produces many studies, their international impact remains limited, likely being more regional or focused on specific fields rather than global in scope. In third place is China, with 40 publications and 852 citations, indicating a more balanced performance compared to Indonesia, as well as stronger academic influence. Particularly notable is Australia, which has an exceptionally high citation count relative to its number of publications: with only 11 papers, it has achieved 1,238 citations. This shows that although Australia's research productivity is not high, the quality and influence of its contributions are significant.

Based on the data, the countries can be categorized into three main groups:

The United States stands out as the leader in both scale and influence, with the highest number of publications and citations, underscoring its dominant role in the field.

Countries such as Australia, the United Kingdom, Portugal, Finland, and Germany demonstrate exceptional research quality, evidenced by very high average citations per paper. This reflects the significant impact their work has on the research community.

A group of developing countries in terms of research volume—including Indonesia, China, Romania, and Ukraine—are actively publishing, indicating growing research activity in these nations. However, with the exception of China, the other countries in this group have relatively low average citations per paper. This suggests their research may have a more localized influence or may require additional time to achieve broader international recognition.

Table 4: Countries with the highest number of publications and citations

Country	Documents ▼	Citations
united states	76	2652
indonesia	47	194
china	40	852
romania	33	338
ukraine	21	172
germany	19	776
united kingdom	16	949
malaysia	16	195
portugal	12	726
jordan	12	258
finland	11	517
australia	11	1238
spain	10	174

(Source: Compiled from VOSviewer software)

Figure 4 provides additional information on the annual publication and citation trends of the countries. The United States holds the most central position in the network, exhibiting dense and diverse connections with other nations. This indicates its role as a major hub for research collaboration. The green and yellow links in the network diagram signify that collaborative activities have remained particularly active in recent years (2021-2023).

The data has also grouped the countries into three distinct clusters based on their collaborative relationships, as follows:

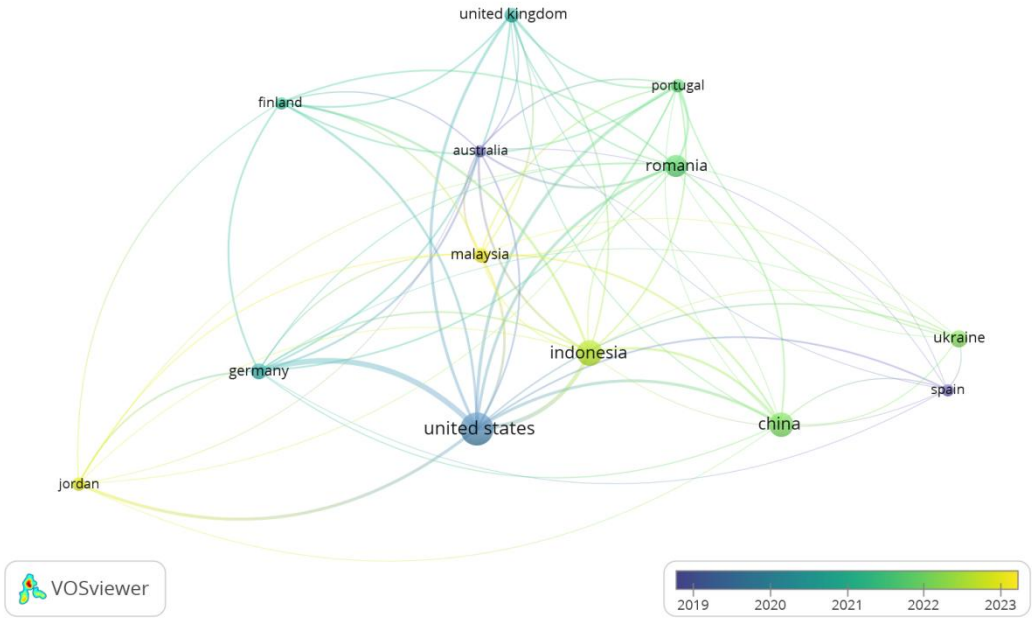
Cluster 1 comprises six countries: Australia, Finland, Malaysia, Portugal, Romania, and the United Kingdom. These nations form a relatively cohesive collaborative group, often cooperating with each other or

with a similar set of external partners. In the network diagram, these countries (with the exception of Malaysia) are concentrated in the upper-left section and share numerous connections. Malaysia acts as a bridge, connecting Cluster 1 with other clusters, notably the United States and Indonesia.

Cluster 2 consists of four countries: China, Indonesia, Spain, and Ukraine. This cluster is located on the right and bottom areas of the network diagram. Indonesia and China serve as the primary collaborative hubs within this cluster, with Ukraine and Spain playing linking roles.

Cluster 3 includes the remaining nations: Germany, Jordan, and the United States. This cluster is positioned in the bottom-left section of the network diagram. The United States functions as the central node, with Germany and Jordan having strong direct ties to it. Germany and Jordan are also connected to each other.

Figure 4: Countries with the Highest Annual Publication Output



(Source: Compiled from VOSviewer software)

3.5. Keyword Analysis

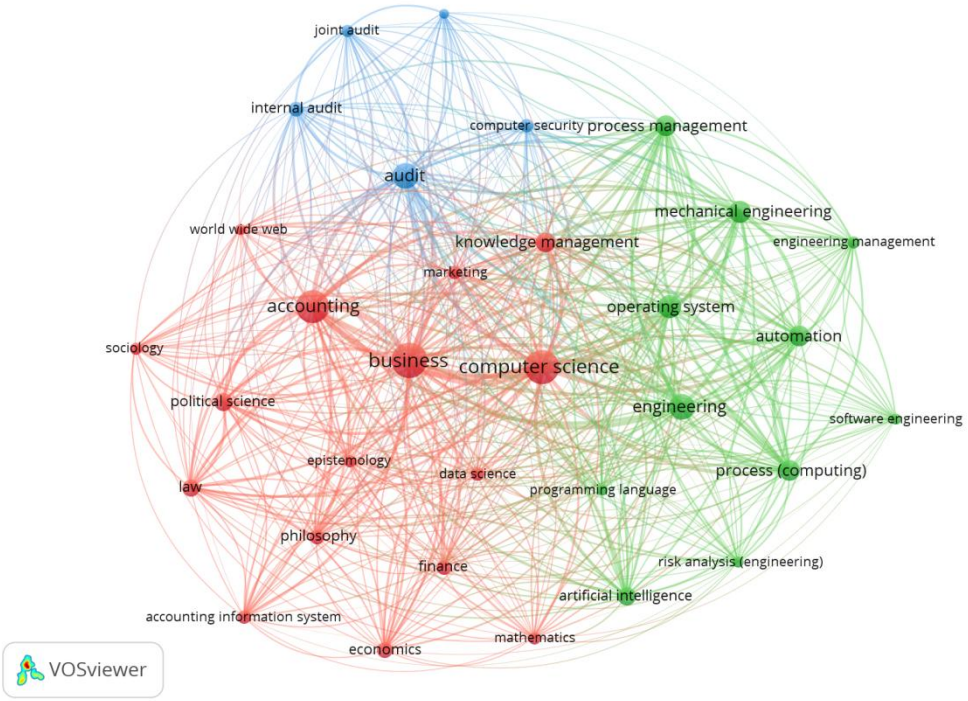
The authors analyzed keywords using VOSViewer software on a dataset of articles from OpenAlex, considering only keywords that appeared at least 50 times. The results showed 38 keywords meeting the analysis criteria. After reviewing, the authors excluded six irrelevant keywords, resulting in 32 keywords for further analysis. The keyword analysis results generated by VOSviewer were categorized into three clusters, as presented in Table 5 and Figure 5.

Table 5: Keyword analysis statistics

No.	Cluster	Quantity	Keywords	Cluster Topic
1	Cluster 1	16	accounting, accounting information, business, computer science, data science, economics, epistemology, finance, knowledge management, law, marketing, mathematics, philosophy, political science, sociology, world wide web	Social sciences, economics, accounting, and management
2	Cluster 2	11	artificial intelligence, automation, engineering, engineering management, mechanical engineering, operating system, process (computing), process management, programming language, risk analysis (engineering), software engineering	Technology, engineering, and automation
3	Cluster 3	5	audit, computer security, information technology audit, internal audit, joint audit	Audit and information systems security

(Source: Compiled from VOSviewer software)

Figure 5: Keyword Co-occurrence Network Map



(Source: Compiled from VOSviewer software)

The keyword map reveals that RPA research in auditing is centrally positioned, linking three clusters: (1) automation technology, (2) auditing - system security, and (3) accounting - management platforms. This clearly reflects the interdisciplinary nature of RPA, serving both as a technological solution and a tool for improving audit quality and transforming corporate governance models. Specifically:

Cluster 1 (Red - Social Sciences, Economics, Accounting, and Management): Keywords such as "accounting," "business," "knowledge management," "marketing," and "finance" are closely interconnected. In the context of RPA application in auditing, "accounting" and "business" are primary application areas. RPA will automate accounting and financial processes within the business environment. "Knowledge management" is also crucial because RPA needs to be "taught" rules and processes, and the data processed by RPA can contribute to the enterprise's knowledge management system. The presence of "computer science" at the center of this cluster indicates the profound technological foundation RPA relies upon, even as it is applied in economic and management fields. "World Wide Web" may relate to data collection from online sources or web-based systems with which RPA can interact.

Cluster 2 (Green - Technology, Engineering, and Automation): This is the core cluster for RPA, with keywords such as "engineering," "automation," "mechanical engineering" (potentially related to physical robots or symbolizing automation), "operating system," "process management," "programming language," "software engineering," and "artificial intelligence." "Automation" is the heart of RPA. "Process management" is a crucial factor for identifying and optimizing processes before automation. "Software engineering" and "programming language" are the technical foundations for developing and deploying RPA solutions. "Artificial intelligence" shows the trend of integrating AI into RPA to enhance self-learning, decision-making, and handling more complex tasks. This is particularly important in auditing when analyzing big data and detecting anomalies. "Risk analysis (engineering)" represents risk assessment in the design and implementation of technical solutions, as well as how RPA can be used for risk analysis in auditing.

Cluster 3 (Light Blue - Auditing and System Security): This cluster clearly defines the context and focus of the topic: RPA applied to auditing activities. Keywords "audit," "computer security," "information technology audit," "internal audit," and "joint audit" directly relate to the auditing field. "Computer security" and "information technology audit" are critically important when implementing RPA, as automating audit processes requires ensuring the security, compliance, and integrity of data and systems. Auditors will need to audit the RPA robots themselves and the processes they execute.

Considering the connections between the clusters, the diagram shows clear links, reflecting the interdisciplinary nature of RPA in auditing:

Connection between Cluster 1 (Economics/Management) and Cluster 3 (Auditing): Keywords like "accounting" and "business" from Cluster 1 have strong ties to "audit" and "internal audit" from Cluster 3. This indicates that auditing is a crucial function in accounting and business operations, and where RPA can generate significant value.

Connection between Cluster 2 (Technology/Automation) and Cluster 3 (Auditing): Keywords such as "automation," "software engineering," and "process management" from Cluster 2 directly connect with "audit" and "information technology audit" from Cluster 3. This illustrates how automation technologies are used to improve the efficiency of audit processes. "Risk analysis (engineering)" can also relate to risk analysis in auditing through technical tools.

Connection between Cluster 1 (Economics/Management) and Cluster (Technology/Automation): "Computer science" serves as a strong bridge, demonstrating that technology underpins both business processes and automation solutions. "Knowledge management" can benefit from data generated by RPA systems.

Analysis of RPA's Role through Key Keywords: Automation: Central to Cluster 2 and the primary objective of RPA. RPA automates repetitive, rule-based tasks in auditing. Process Management: Crucial for identifying suitable processes for automation and ensuring effective RPA deployment. Software Engineering: The foundation for building and maintaining RPA robots. Audit: The specific application area where RPA is expected to enhance audit quality, speed, and scope. Computer Security: An indispensable factor when implementing RPA in auditing to protect sensitive data.

In summary, this keyword map illustrates that "Robotic Process Automation (RPA) in Auditing" is a multidisciplinary field, closely combining knowledge of economics, management (especially accounting), information technology (automation, software engineering, AI), and auditing expertise. RPA acts as a technological bridge, helping to automate and optimize audit processes, thereby improving the efficiency and reliability of auditing, while also imposing high demands on security and process management.

4. Conclusion

Using data on publications with the keywords "RPA"/"robotic process automation" and "audit" in their titles, collected from the VOSviewer OpenAlex database up to September 2025, the author team identified 648 publications. Based on this dataset, we employed descriptive statistical and bibliometric analysis to address the stated research questions. The findings reveal that the application of RPA in auditing is a topic of growing interest among scholars from numerous countries. This is evidenced by a rapid increase in the number of studies in this field since 2017, with continuous growth in subsequent years, peaking in 2023 (Figure 1).

Current research not only focuses on describing changes in audit processes but also delves into analyzing the economic and social impacts of RPA adoption. The integration of RPA significantly enhances the efficiency and accuracy of audit procedures, while also freeing auditors from repetitive tasks. This allows them to dedicate more time to higher-value professional work, such as complex risk assessment and providing strategic advisory services. By synthesizing and analyzing empirical evidence, this study also offers practical policy recommendations for managers and policymakers. These recommendations are particularly crucial for formulating appropriate strategies to maximize the benefits of this technology. From workforce training and investment in technological infrastructure to the enactment of legal frameworks, such policies can foster a more

sustainable auditing sector, enhance compliance, and contribute more effectively to the digital business environment.

The bibliometric analysis confirms the increasingly important role of auditing in the context of rapid scientific and technological advancement. Specifically, with the emergence and application of Robotic Process Automation (RPA), researchers are continuously seeking new empirical evidence to clarify the relationship between technology and the auditing profession. This demonstrates that the intersection of auditing and RPA is not merely a trend, but rather a structural transformation. It necessitates that relevant stakeholders continuously update their knowledge and innovate methodologies to ensure that auditing maintains its role as a reliable tool in the modern era.

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