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REVIEW ARTICLE

Mapping the Evolution of Money Laundering Detection Strategies: A Bibliometric Perspective

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ABSTRACT

The war against money laundering has been widely advanced over the decades as a result of the change in the detection strategies and therefore is an important field of study in the effort to improve detection strategies and minimize money laundering offenses. Therefore, this paper mapped out the history of these detection strategies with a bibliometric approach, by investigating a Scopus publication database. The database was used to select a total of 1070 articles with the following keywords Money Laundering OR Anti- Money Laundering AND Detection Strategies. Bibliometric and citation analyses were done on these documents following the selection. The frequency analysis and the citation metrics were evaluated with the help of the Microsoft Excel and Harzing Publish or Perish, respectively, and the visualization of the data were implemented with the help of VOS Viewer. In the bibliometric study, one can see that the number of studies describing the methods of money laundering detection increased significantly in 2021 due to such advancements as machine learning. The second issue highlighted in this study is the significance of international cooperation, where the U.S, U.K., China, India, and Australia play the most important roles. Recommendations on the policy are: promoting technological innovation, international cooperation, strengthening regulatory framework, and assisting the interdisciplinary research. The study is limited to the Scopus database and the keywords having been applied in the search.

Contribution/Originality: This The paper is a contribution to the body of literature as it has the first exhaustive bibliometric analysis of money laundering detection techniques (1991-2024). It immerses into the trends of research worldwide and the pattern of international collaboration in systematic analysis employing Scopus database and VOS Viewer.

1. Introduction

Any effort of covering the proceeds of criminal acts is referred to as money laundering. In this form of criminal offense, there is the attempt to mask the illegality of the proceeds as the legal and legitimate earnings (Al-Suwaidi and Nobanee 2021).

Detection of money laundering is among the hardest anomaly correlates to find. To start with, there is no universal guideline that sets standards on transactions that are considered suspicious during the execution of money laundering activities. Moreover, the traditional methods of detecting anomalies through transaction analysis individually may fail because the money laundering operations involve numerous transactions of various financial instruments among other counterparties (Labanca et al., 2022).

Therefore in this paper the following research questions will be addressed: Question 1: What is the state of research on Money Laundering, Anti-Money laundering and Detection Strategies? Question 2: What have been the most cited papers on these topics? Question 3: What are the most prominent writers in the area of Money Laundering, Anti-Money laundering and Detection strategies? Question 4: What are the most popular areas in this realm by the key words? The remaining part of the paper will be in the following format: Section 2 will be the literature review, Section 3 will be the description of how the existing literature was analyzed, Section 4 will be the analysis findings, and the discussion and conclusions will be presented in Section 5.

2. Literature Review

Money laundering refers to the process of hiding the sources of the illegally obtained money, which is usually through transfers through a foreign bank or a valid business (Utami et al., 2023). Money Laundering is a commonly known term that is used to describe the ways through which criminals launder money that they have acquired due to illegal activities commonly known as dirty money. Such Illicit gains are a result of a continuum of legal undertakings like drug dealing, human trafficking, fraud, embezzlement, insider trading, bribery, bribery, theft or tax evasion. Money laundering has the primary aim of covering the source of illegally obtained money and converting it into an asset that is apparently legitimate (Gao and Xu, 2009). Money laundering is a multidimensional process and more complex than just monetary transactions. It is usually a process comprising of three interconnected processes that can occur simultaneously. These are integration, placement and layering. Therefore, it is essential to note that money laundering does not just involve use of physical cash. It may engage the use of different financial tools and means. Therefore, money laundering should be fought in a holistic manner.

The problem of money laundering is a grave menace to the financial systems in the world, and it requires the creation of efficient detection tools. Lawbreakers have developed more advanced methods of covering the origin of their illegal proceeds and it is hard to stop and check such practices by the regulators and financial institutions (Yusoff et al., 2023). In this way, different solutions have emerged, which are based on technological advancements and data analytics that are used to enhance the detection of suspicious financial transactions.

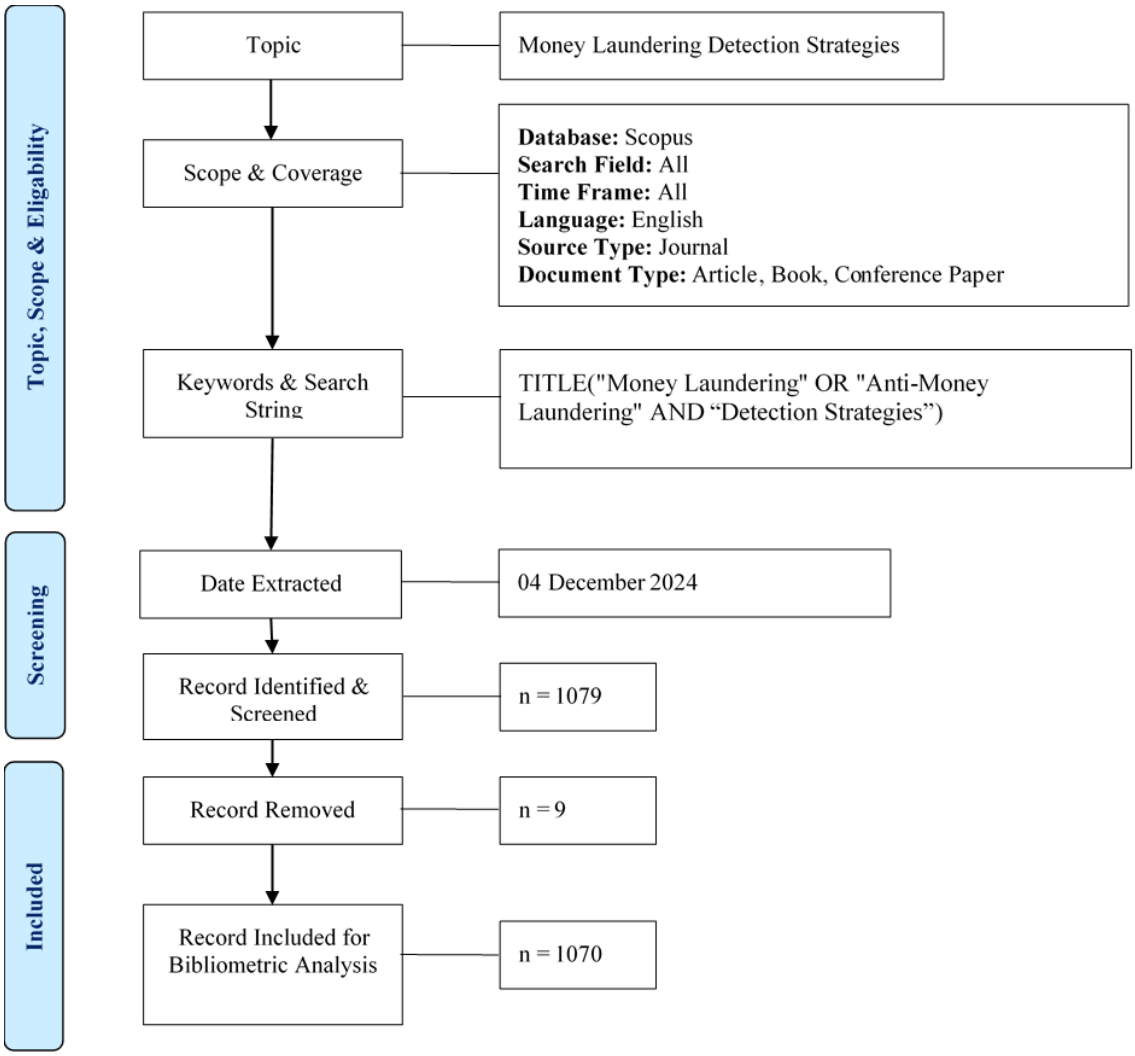
Over the past few years, scholars have explored many ways of enhancing detection and tracking of money laundering. It is also interesting that artificial intelligence and

machine learning can help detect suspicious patterns by examining financial transactions (Rouhollahi, 2021). These analytics can be used to automate the process of detecting money laundering and reduce or eliminate the use of manual processes and human resources (Rouhollai, 2021).

3. Research Methods

We searched Scopus on December 04, 2024, to obtain the appropriate data used to write this article. The keywords were Money laundering or Anti- Money laundering and Detection Strategies and the database was searched through the subject area, type of documents, language, type of sources and level of publications. We have selected these terms because money laundering detection schemes are related to money laundering, anti-money laundering as well as detection schemes. Our search time, or topic, was not limited to achieve the best results. The query returned 0 results which were relevant. Figure 1 below shows the procedure flowchart of searching the database. Bibliometric analysis was done using VOSViewer. Also, citation metrics and other frequencies were obtained in the Publish or Perish software provided by Harzing. Microsoft Excel was used to generate some calculations and graphs.

Figure 1: Flow diagram of the search strategy



Source: Zakaria et al. (2021)

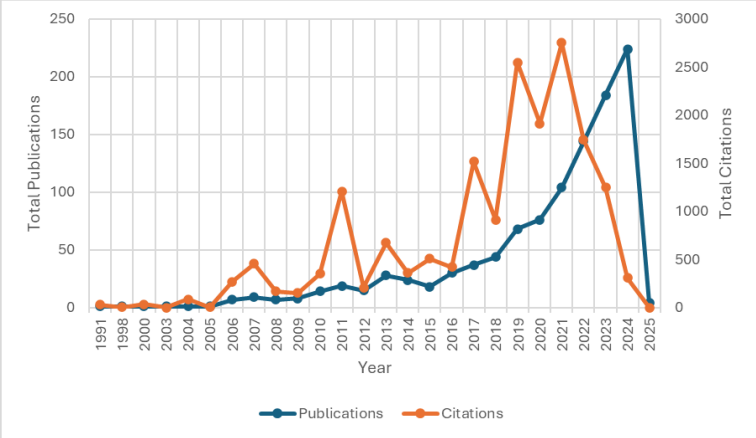
4. Results

The bibliometric analysis applied in this study investigated the data includes the publication year, authors, the subject area, the type of document, the title, the keywords that the authors used, the institution, the country of publication, the type of source and language used. Also, citation metrics and frequencies were obtained to study common citation trends of the publication. The frequencies of the data are shown in numerical and graphical forms.

4.1. Research Trends

Figure 2 below depicts the trend of publication Money Laundering Detection Strategies. The information indicates that the earliest publication on the study are was in 1991, which is called, Cultural literacy in criminal justice: A preliminary assessment by LJ. Siegel and M. Zalman. The high of 2021 with 3 digits was the first time the total publications went to a three-digit number and others followed 2022, 2023 and 2024 with 104, 144 and 184 and 224 respectively. The average number of publications is also increasing significantly since 2021 as the chart shows. The amount of publications and citations per year also depicts the total figure as shown in the figure 2 below.

Figure 2: Total Publications and Citations by Year



The table 1 below identifies the leading 5 countries that made contributions in publications about the research topic. The United State has the highest number of publications of 183 (17.10%). Second are the authors of the United Kingdom with 133 publications (12.43%), authors of China, India and Australia, with 77 publications (7.20%), 72 publications (6.73%), and 123 publications (11.23), respectively.

Table 1. Top 5 Countries contributed to the publications

Country	Total Publications	Percentage
United States	183	17.10%
United Kingdom	133	12.43%
China	126	11.78%
India	77	7.20%
Australia	72	6.73%

4.2. Citation Analysis

A citation analysis was done on documents concerning the topic of Money laundering detection strategies to study its effects. Citation measures were calculated with the help of Harzing Publish and Perish, and a visualization map of a network has been drawn with VOSViewer. According to the information retrieved on the Scopus database on December 4, 2024, 1070 articles were mentioned 17,897 times. These measures are presented in Table 2 and indicate an average of 542.33 citations per year and 16.73 citations per paper between the years 1991 and 2024 (33 years).

Table 2: Citations Metrics

Metrics	Data
Papers	1070
Number of Citations	17897
Years	33
Citations per Year	542.33
Citations per Paper	16.73
Cites_Author	7337.38
Papers_Author	528.47
Authors_Paper	3.05
h_index	59
g_index	110

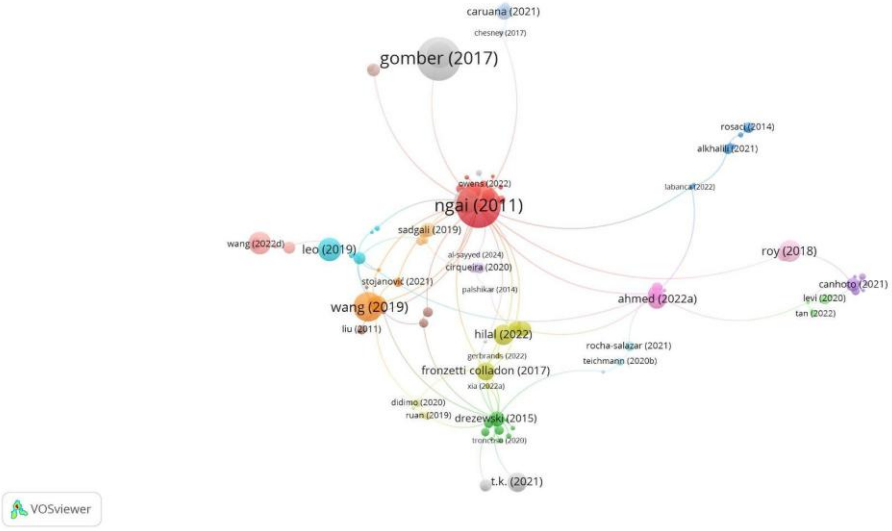
Table 3 indicates that the articles by Janiesch et al., (2021) has the greatest cited with a total of 419.67 cites per year followed by Ngai et al., (2011) with 789 yearly cites.

Table 3: Top 20 Highly cited articles

No.	Authors & Year	Title	Cites	Cites per year
1	Janiesch et al. (2021)	Machine learning and deep learning	1259	419.67
2	Ngai et al. (2011)	The application of data mining techniques in financial fraud detection: A classification framework and an academic review of literature	789	60.69
3	Gomber et al. (2017)	Digital Finance and FinTech: current research and future research directions	766	109.43
4	Hassan et al. (2019)	Privacy preservation in blockchain based IoT systems: Integration issues, prospects, challenges, and future research directions	419	83.8
5	Sarker et al. (2020)	Cybersecurity data science: an overview from machine learning perspective	377	94.25

Figure 3 represents the graphical representation of the citation by documents, where at least 5 citations are made in each document. This map shows the central position of the influential papers in financial fraud detection, the emerging document Ngai et al. (2011) became a key document with 789 citations. The map shows clear clusters featuring the interdisciplinary research works such as Halil et al. (2022) and Gomber et al. (2017). Besides, the map indicates the most influential researchers who are in the forefront of research in this area.

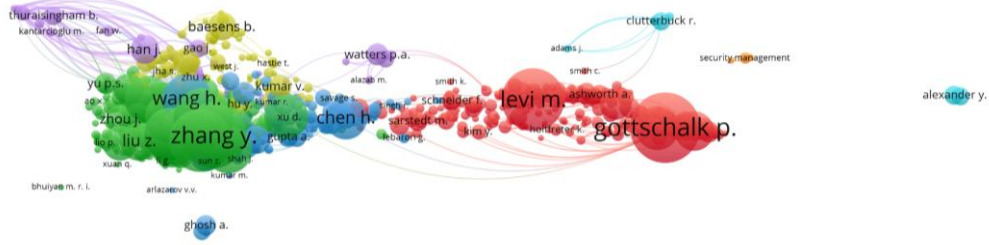
Figure 3: Network visualization map of the citation by documents



Note: Minimum number of citations of a document = 5

The visual map of co-citation between cited authors presented in figure 4 is within a minimum citation threshold of 20 per author. The number of authors who fulfilled this citation was 862 as illustrated in figure 3. Gottschalk P.the most connected authors.

Figure 4: Network Visualization map of co-citation Note: Authors; counting methods: Full counting; Minimum number of counting of an author = 20.



4.3. Keywords

Table 4 below shows the top 10 with greater than five instances is crime that has 132 publications then machine learning with 103 publications and money laundering with 80 publications.

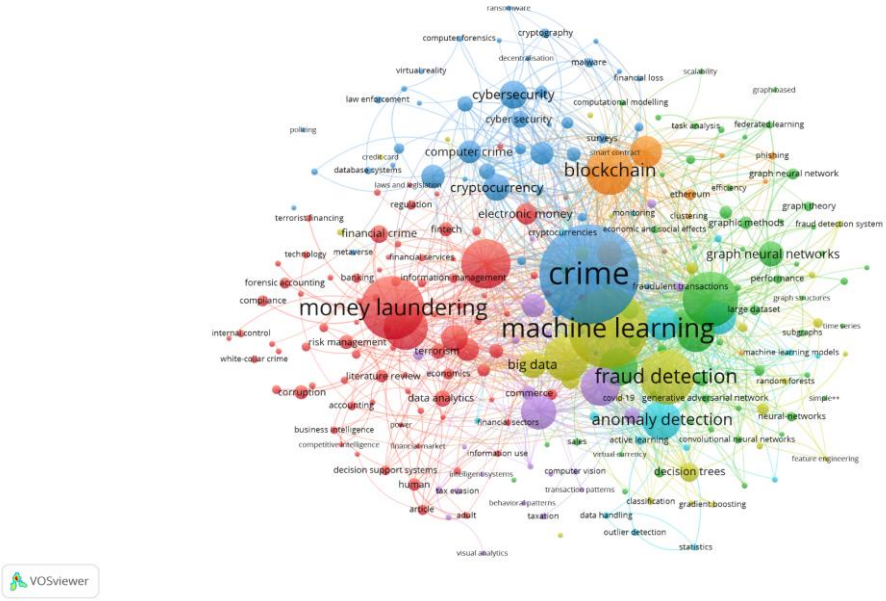
Table 4: Top 10 Keywords (with more than 5 occurrences)

Author Keywords	Total Publications (TP)	Percentage (%)
Crime	132	12.34%
Machine Learning	103	9.63%
Money Laundering	80	7.48%
Learning Systems	69	6.45%
Fraud Detection	68	6.36%
Artificial Intelligence	61	5.70%

Block Chain	58	5.42
Finance	55	5.14%
Fraud	54	5.05%
Anomaly Detection	47	4.39%

The co-occurrence of all the keywords network map was visualized in figure 5. The blue lines symbolize crime, and the yellow ones symbolize machine learning. The red line also depicts money laundering and green line depicts learning systems.

Figure 5: Network visualization map of the co-occurrence keywords



5. Conclusion

This paper gives a clear picture of the current or modern research on money laundering, anti-money laundering and money laundering detection strategies by attempting to address four broad questions. Based on the information, the detection of money laundering has experienced a considerable rise in publications, especially since 2021. This is an indication of increased concern on fighting financial crimes using sophisticated methodologies and technologies. The analysis indicates that the concerted effort is witnessed worldwide, with significant efforts being made by countries like the United States, the United Kingdom, China, India and Australia indicating the International Collaboration in this direction.

Moreover, the analysis of citations reveals that the most referenced article is by Janiesch et al. (2021), which is called Machine Learning and deep learning and has 1259 citations and 419.67 citations per year on average. The other important article is by Ngai et al. (2011), the article is entitled The application of data mining techniques in financial fraud detection: A Classification framework and an academic review of literature and has a total of 789 citations with a mean citation of 60.69 per year. This implies that these documents have been critical in determining the research landscape in detection of money laundering.

Additionally, the network visualization maps will help to identify important authors that have contributed to the work. Gottchalk P. is the most linked author with the largest link

strength of the co-citation analysis, which means that he plays the central role in the research network. Other influential authors such as Janiesch et al., have also made their impact on the field through their well-cited article on the use of machine learning in detecting financial fraud.

The key word search shows that the keywords of the most studied topics in this sphere are crime, machine learning, and money laundering, and these two keywords are the most widespread ones. Such keywords suggest that there is a tendency to pay much attention to the exploitation of the opportunities of technological advances, especially artificial intelligence, to improve detection. The other popular keywords are such as fraud detection, blockchain, and anomaly detection that indicate a tendency towards the use of innovative technologies in more efficient fraud detection in finance.

The present work contributes greatly to the current range of literature as it provides a detailed bibliometric overview of the research field on money laundering detection methods. It illuminates the major trends, influential articles and major contributors that are of significance to academicians, policy makers, and even practitioners. Due to the importance of the research topic, the gap in interdisciplinary research, which would involve contribution of knowledge in the fields of finance, criminology, and IT, and investigate geographical and cultural differences in detection practices, is also noted by the study. More longitudinal studies focusing on how detection strategies evolve and become effective with the passage of time are required to revise and enhance these strategies.

Although this is a weakness of the analysis, the papers that are considered in this analysis are limited to Scopus database only, and other databases might also limit the analysis; changing these keywords may produce a very different result. Other methodological solutions that can be used to conduct further research include database searches, multiple combination solutions, and bibliometric analysis. Future research would be improved by including a wider scope of the literature review and expanding the scope of the analysis.

Ethics Approval and Consent to Participate

The researchers used the research ethics provided by the Research Ethics Committee of Universiti Teknologi MARA (UiTM). All procedures performed in this study involving human participants were conducted in accordance with the ethical standards of the institutional research committee. Informed consent was obtained from all participants according to the Declaration of Helsinki.

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Conflict of Interest

The authors reported no conflicts of interest for this work and declare that there is no potential conflict of interest with respect to the research, authorship, or publication of this article.

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