

Exploring Trade-Based Money Laundering Research: A Bibliometric Review

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Abstract:

International trade involves liberalization of trade restrictions on foreign goods and services. With liberalization, trade related compliance issues may arise resulting in trade-based money laundering financial flows. If not monitored and controlled, the illicit financial flows can be detrimental to the integrity of financial service sector at country and global level. This study explored trade-based money laundering research landscape through bibliometric analysis. The objectives being to identify the scholarly output performance for TBML and reveal the scientific mapping status of TBML. Documents were retrieved from Scopus database by applying the appropriate search key strings. This enabled identification of relevant documents which were further screened for completeness and relevance. Results were based on 164 documents which had an annual growth rate of 1.4%, indicating increase in TBML related scholarly output. In terms of scientific mapping, thematic mapping categorized the four quadrants based on the relevance degree against development degree, namely basic themes, niche themes, motor themes, and emerging or declining themes. Also, the findings revealed the growing influence of Belt and Road Initiative (BRI), free trade zones, trade finance documentation, sanctioned countries and digital based transactions. In conclusion, TBML is a growing subject which requires more support in terms of technical research from the FATF and subordinated organizations. Thus, the current regulations and frameworks being developed should align to the environment so that they do not become irrelevant. This novel study contributed to the TBML subject, by offering insights into the future emerging issues on TBML, thereby contributing to practice, policy and knowledge.

Keywords:

Trade Based Money Laundering, International Trade, Laundering, Sanctions, Trade Finance

Submitted: 2025-12-23. Revised: 2026-01-17. Accepted: 2026-01-24.

Introduction

International trade involves opening the economy and liberalizations of trade restrictions to foreign goods and services. As part of foreign exchange control policy, opening the economy brings in the much-needed foreign currency to build foreign reserves and contribute to the country's economic development. On the other hand, arise trade related compliance and complexities issues. To counter these issues, companies can implement illegal measures such as false declarations and tax evasion among others while regulators increase monitoring and compliance across all sectors. These measures promote illicit financial flows in the form of Trade Based Money Laundering (TBML).

Money launderers use commercial transactions to transfer illicit monies across borders by taking advantage of the complexities associated with international trade (Milon & Zafarullah, 2023). Indeed, TBML is multifaceted involving many parties, rendering those tasked with combating and identifying such a challenge (Sinno, Baldock, and Gleason, 2023). The highly regulated financial service sector is the front door of money laundering which is closed while the back door is international trade which remains open (McSkimming, 2010; Zdanowicz, 2009). The concept of back door is attributed to limited TBML knowledge.

Despite limited enforcement and rising global trade, TBML continue to be prevalent and not widely recognized than other traditional forms of money laundering (Miller, Liana and James, 2016). Marzouk (2022) and Menz (2019) concur with the assertion by Miller et al (2016) and Zdanowicz (2009) that for TBML a knowledge gap does exists among the practitioners and stakeholders. TBML remains a global threat which undermines integrity of the financial services sector and destabilize the global economy (Milon, Zafarullah & Poli, 2025; Nanyun & Nasiri, 2021). Also, TBML is an attractive option particularly in countries where there is political and economic instability and a high possibility of capital flight (Schlenthner, 2016).

Estimation of TBML values remain scanty available due to illegalities and data collection challenges among others. For the 26 EU countries, between 2005 and 2015 it was found that TBML averaged USD0.9 to USD1.8 trillion annually (Saenz & Lewer, 2022). According to Suspicious Activity Reports between 2004 and 2009, FinCEN (2019) identified countries such as Mexico, China, Panama and Domic Republic and Venezuela as the top countries involved in TBML. In 2016, the US Department of State (2016) identified countries that included Iran, Afghanistan, Australia, Brazil, Panama and Mexico among others as countries with high TBML frequency and volume.

In terms of prior studies, Sivaguru and Tilakasiri (2023) conducted a trade-based money laundering study for Sri Lanka. They revealed TBML was prevalent in Sri Lanka and had the potential to contribute to socio-political conflicts. Menz (2019) highlighted that with the well developed financial sector of UK,

they should have a better understanding of TBML and how it operates. Makkink, Steyn and Bezuidenhout (2024) conducted a study among the freight forwarders in South Africa. The findings revealed a knowledge gap among the freight forwarders staff in terms of identifying, and reporting TBML anomalies. This was attributed to lack of training and awareness.

Another study by Marzouk (2022) revealed that post Brexit UK faces difficulties to address TBML due to skills, technology and resources challenges. Tiwari, Ferrill, and Allan (2025) conducted a systematic literature review on TBML. The findings revealed that the studies done had focused on TBML definition, how it can be detected and associated risk assessment frameworks.

Prior study's findings reveal existence of knowledge gaps in the areas of TBML practice and associated literature among others. Thus, this study aims to achieve the following objectives 1) identify the scholarly output performance for TBML 2) scientific mapping status of TBML. This novel study provides bibliometric mapping of TBML and offers insights into the future emerging issues on TBML, thereby contributing to practice, policy and knowledge.

This study is organized into six sections. Firstly, the Introduction which highlighted the TBML concept. Secondly, Literature Review provides the foundations of TBML. Thirdly, Research Methodology which gives an overview of the how the data was collected. Fourthly, Results with presentation of the findings Fifthly, Discussion of the study's findings. Lastly, Conclusion, gives the study's conclusion, implications and areas of further study.

Literature Review

In this section, to have a better understanding of TBML, discussed are elements underpinning the subject. To be discussed are, forms of trade-based money laundering, Free Trade Zones as emerging hubs for TBML, Financial Action Task Force (FATFT) organisation and recommendations, Customer Due Diligence and Enhanced Due Diligence.

Forms of Trade Based Money Laundering

For TBML to be effective, two preconditions should be met (Delston & Walls, 2009). Firstly, collusion between importer and exporter is required. These two agree to enter a relationship through submission of fake invoices serving personal interests to launder (Savona & Riccardi, 2019). Secondly, laundered money should exceed the trade transaction value. TBML comes in five forms, namely over invoicing, under invoicing, multiple invoicing, over and under shipment of goods and false description (Tiwari. et al, 2024). These forms are discussed below:

Over and Under Invoicing

This occurs when trade invoices are priced at abnormal prices with the motive to conceal the true value and evade tax obligations. This approach has been associated with countries at capital flight risk such as those subjected to political and economic instability. Also, restrictive foreign currency policy contributes to abnormal pricing incidences. McSkimming (2010) observed that abnormal pricing occurs either prices exceed market price (over invoicing) or prices are less than the market prices (under invoicing). For regulatory authorities, this method is difficult to monitor and detect due to collusion between parties (Goldbarsht, 2024). Suffice to say, the parties know when and how the laundered value reaches the associated parties.

Multiple Invoicing

This involves using multiple invoices and documents for the same trade transaction (Tran, 2024). Further these are used across different financial institutions rendering identification and tracking a challenge for financial institutions. Hataley (2020) posits that multiple financial institutions and invoices makes it complex and difficult to detect. For example, exporter M issues an invoice of products worth USD5,000.00 to an importer B. To launder, multiple invoices which can be four are raised and processed with different banks. The importer can transfer USD 15,000.00 plus the original USD 5,000.00 using the same documents reflecting the same price and quantity.

Over and Under Shipment of Goods and Services

The importer and exporter are involved in the misrepresentation of quantity of goods and phantom shipment (Hataley, 2020). For this to be effective, the pre-condition is collusion by importer and exporter. Phantom shipment means there is no physical movement of goods at all. An exporter of sugar issues an invoice to the importer with the correct details, quantity and price. However, the container shipment is empty, but money was transferred.

Misrepresentation is through either understating or overstating the quantity which entails the values is exchanged between the importer and exporter at time of payment (Makkink, Steyn, & Bezuidenhout, 2024). For instance, on over-shipment, an exporter exports 1 ton of goods but falsely declares weighing 0.5 ton. The importer pays for 0.5 ton with the 1 ton being sold at full value by the importer. Also, on transaction documents for under shipment, a company that exports 1 ton of goods falsely declares the weight as more than 1 ton with higher value. Then the value is transferred to the exporter when the importer pays the entire invoice amount.

False Description of Goods and Services

This approach involves misrepresenting in terms of quality, description and type of goods being exported or imported (Sivaguru & Tilakasiri, 2023; Naheem, 2015). The aim to conceal the true value of the goods by misleading the customs authority. The goods can be described as those of low quality when they are of high quality. During COVID 19, there was an increase of counterfeit goods labelled as personal protective equipment (Sivaguru & Tilakasiri, 2023).

Free Trade Economic Zones

Free ports, or Free Trade Zones (FTZs), are areas where commodities may be landed, handled, manufactured or reconfigured, and re-exported without the interference of customs authorities (Liu & Feng, 2024). Only when goods are delivered to customers in the nation where the zone is located are customs taxes and charges levied. He, Tian, & Zhang (2025) observed that as of early 2025 there were over 3,000 FTZs worldwide which undoubtedly offer a substantial possibility to promote investment and economic growth.

However, Kalu & Aniche (2025) argued that FTZs pose financial crime risks, which is why the FATF designated FTZs as areas of increased TBML risk. Furthermore, the European Union has referred to them as a "new emerging hazard" and discouraged their growth. Consequently, the duty status and special tariffs associated with free trade zones (FTZs) have often been associated with inadequate AML/CFT prevention measures, ineffective product inspection protocols, weak collaboration among stakeholders.

FATF and AML/CFT Recommendations 1

The global Anti Money Laundering and Combatting Financing of Terrorism (AML/CFT) framework is anchored on the FATF's 40 recommendations. FATF collaborates with other international organisations in the sharing and dissemination of AML/CFT associated information. FATF, as part of its mandate, established a minimum regulatory criterion known as the forty (40) recommendations in combating money laundering and terrorist financing (Koker, 2022; Sujee, 2016). These recommendations provide minimum guidelines measured against member countries' approach (Held, 2019). However, depending on the country's risk appetite, they can enhance or use the 40 recommendations as basis for the country's AML/CFT regulations. These recommendations are not internationally binding, even though most countries have made political commitment to abide by the recommendations (Sujee, 2016; FATF, 2012).

According to Recommendation 1, each country is supposed to conduct a risk assessment of AML/CFT typologies and design an appropriate risk-based approach to ensure the risks are managed effectively

(FATF (2012-2025)). For high risk, the enhanced AML/CFT risk regime should be designed with appropriate resources, while for low-risk areas simplified risk regime should be applied accordingly (FATF – Egmont Group, 2020). For instance, countries such as German conducted its National Risk Assessment (NRA) in 2017 and identified TBML as a very significant risk to the country. Also, in 2018, USA issued an updated NRA which highlighted TBML as a key laundering method.

Customer Due Diligence (CDD)

The financial services sector remains as the medium to launder the proceeds of crime. This requires having controls in the establishment of bank-customer relationship. Accordingly, CDD entails risk profiling customers based on verified and authenticated customer documents before engaging in a banking relationship. Gaviyau and Sibindi (2023) argued that CDD is critical in minimising emergent money laundering risks in the banking sector. After all, this is achieved through customer risk profiling and designing of bank account monitoring mechanisms. Suffice to say, development of customer risk profiles is based on submission of required documents and banks performing assessment of business relationship and conducting ongoing due diligence.

Enhanced Due Diligence (EDD)

The cornerstone of an effective anti-money laundering compliance programme is the implementation and adoption of risk based CDD policies and procedures for all customers. Financial institutions are moving from the tick box approach to a risk-based approach, which entail that customers are being onboarded based on the AML/CFT risk posed, which is Enhanced Due Diligence (EDD). Transition from rule based to risk based regulatory approach in CDD of AML/CFT shows the evolving nature and understanding the modifying factors in face of technological innovations (Chitimira & Munedzi, 2023).

Applying EDD, requires gathering specific and/or private information on the clients to properly monitor the activities. High risk customers pose the greatest money laundering risk. These include Political Exposed Person (PEP) and those companies involved in cross border transactions. In relation to NRA high risk require more controls to monitor the activities and vice versa for low risk. For instance, Germany and USA classified TBML as high risk which means more controls contributing to identification of related money laundering risks in real time.

Research Methodology

A bibliometric analysis was used in this study's to investigate the subject of trade-based money laundering in the financial technology (FinTech) era. The basic search key strings, identification criteria, selection criteria, synthesis method, and quality evaluation of the bibliometric data used are covered in detail in this section. The process followed is shown in Figure 1 and explained below:

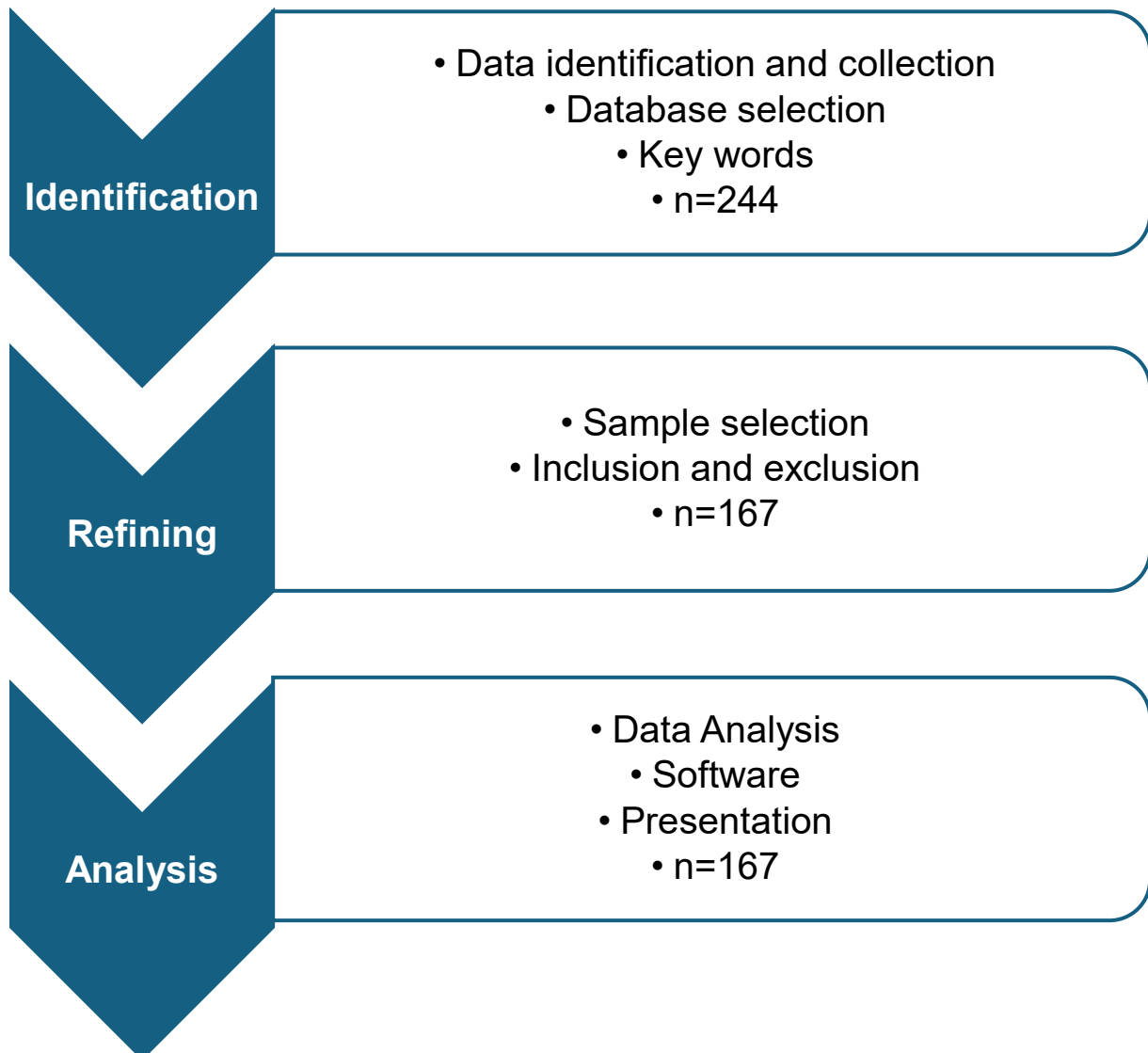


Figure 1: Process Flow

Data Collection

Firstly, to collect the relevant data, the researcher should identify the relevant key words. Selecting and identifying the key words is vital in conducting bibliometric analysis. For this study, the key words were money laundering, and international trade or import or export. By filtering based on the title, abstract and keyword, these words were used to retrieve from data from the Scopus database . The search resulted in 244 documents which required further refinement. The search string used was (TITLE-ABS-KEY (money laundering) AND TITLE-ABS-KEY (international trade) OR TITLE-ABS-KEY (import) OR TITLE-ABS-KEY (export)).

Sample selection

Secondly, the dataset was refined by screening the documents based on the inclusion and exclusion criteria. Included documents were those limited to English language and produced within the period 2010 to November 2025. Selection of 2010 was informed by the first TBML guidelines issued by FATF in 2007 and increased country mutual evaluations thereafter. Also, since international trade of products and services cuts across all the disciplines, a decision was made not to limit to any discipline so that more information can be gathered on prevalent TBML areas. Finally, the publication considered were those at the final stage of publication. The application of inclusion and exclusion criteria resulted in 167 documents.

Data Analysis

Lastly, software tools to analyze the retrieved data were Bibliometrix and Scival. These software tools enabled choosing the appropriate application for each research objective. Results were presented in the form of tables and graphs.

Results

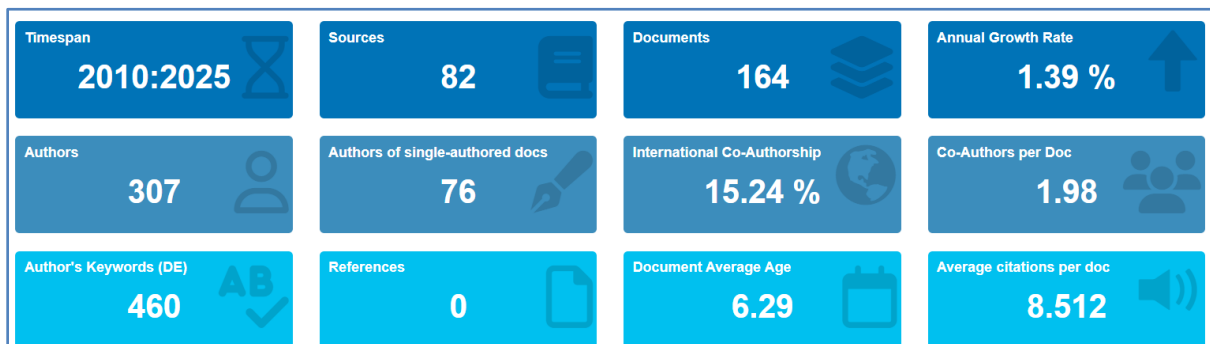


Figure 2: Summarized results

Figure 2 shows the study's summarized results. The study period was 2010 to 2025 which resulted in 164 documents being retrieved and used for analysis. The retrieved documents had an annual growth rate of 1.4% indicating increase in TBML related scholarly output.

In terms of the authorship metrics, a total of 307 authors were identified to have contributed to TBML subject. Of the total authors, 76 were authors of single authored documents with international co-authorship recorded at 15.3% and an average co-authorship recorded at 15.3% and an average co-authorship of 1.98 per document. Admittedly, these finding indicate that international co-authorship exists on the TBML subject. For this reason, TBML is a growing subject which requires information and knowledge sharing within and outside the scholarly community .

The average age of documents utilised was 6.29 years with average citation per document being 8.5. Thus, the average age of documents shows that the documents were produced mainly from the period 2016/17 which can be attributed to TBML gaining prominence after the country mutual evaluations and enforcement actions by regulators post 2007/8 GFC.

Identify the Scholarly Output Performance for TBML

This section shows the author's production which can indicate growth of the TBML subject. The results are presented below:

Annual Scientific Production

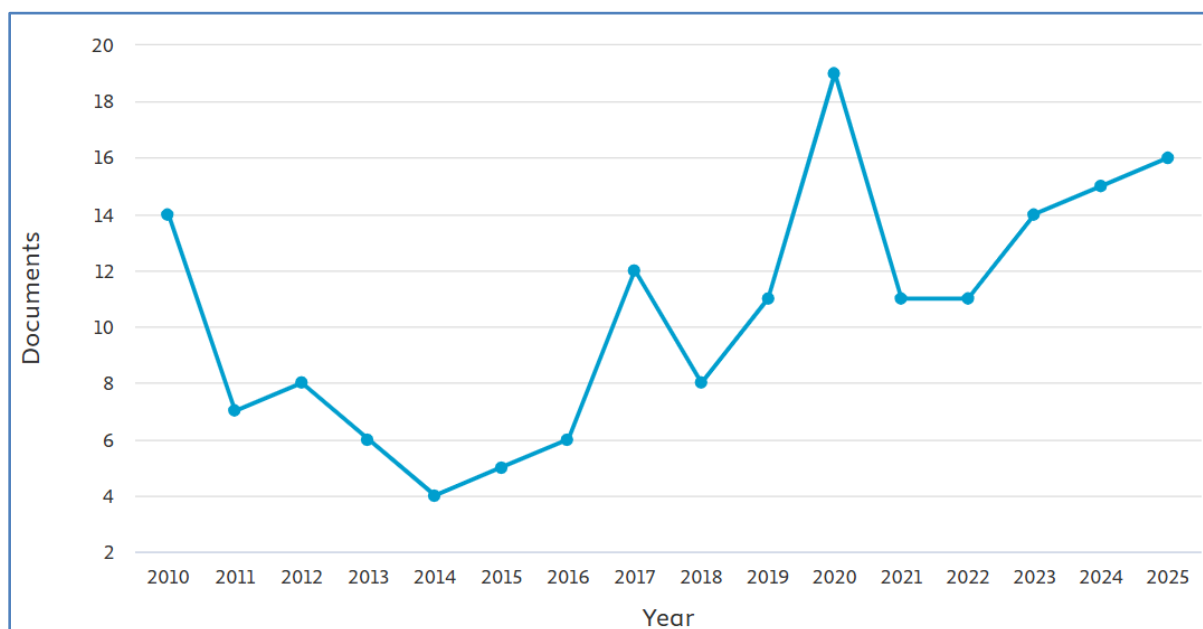


Figure 3: TBML Scholarly Output, 2010 to 2025.

As shown in Figure 3, the TBML publication trend shows that the highest publication of 19 articles was recorded in 2020 with the lowest publication of 4 articles being published in 2014. The trend which can be broken down into three indicates fluctuations and eventual growth in TBML scholarly publications over the period 2010 to 2025.

Top Authors

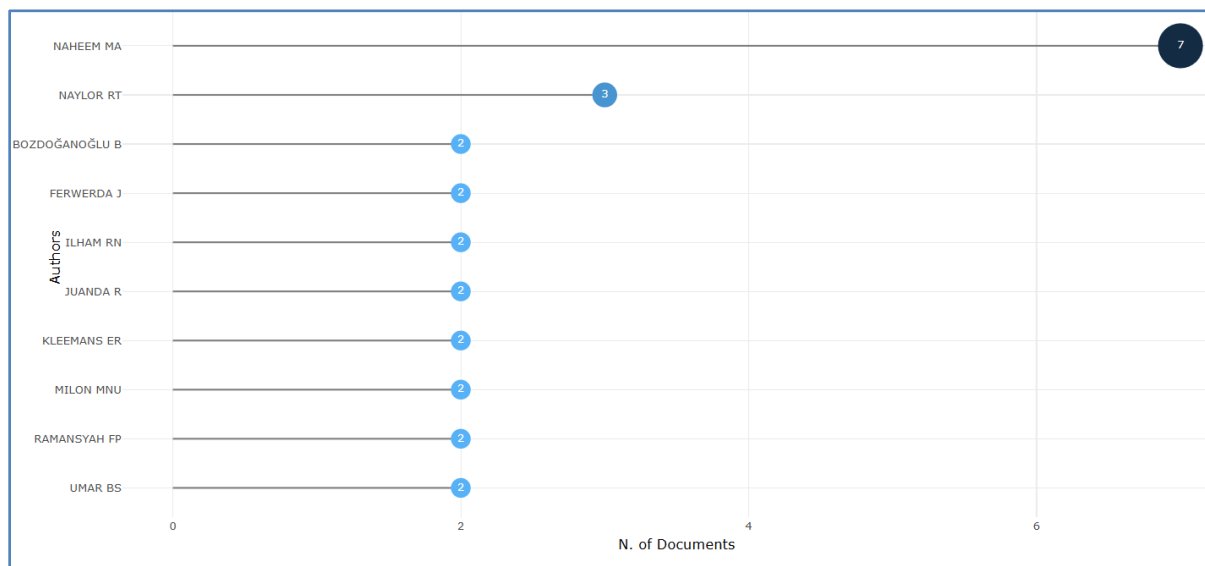


Figure 4: TBML Authors Output

Figure 4 shows the author’s publication on the TBML subject. Of the authors, Naheem was leading with 7 articles followed by Naylor with 3 articles and the rest with 2 articles. The authors with 2 articles included Ferwerda, Juanda and Umar among others. These results indicate a highly skewed authorship distribution which is typically associated with niche and emerging disciplines. Accordingly, these findings concur with Lotka’s law which states that the majority of authors produce fewer articles while the minority authors produce . the majority of published work.

.Thus, these results indicate an underdeveloped research area which creates research opportunities in areas such as methodological and empirical among others.

Author’s Impact

Author	h_index	g_index	m_index	TC	NP	PY_start
Naheem MA	6	7	0.667	92	7	2017
Ferwerda J	2	2	0.154	59	2	2013
Milon Minu	2	2	1.000	12	2	2024
Naylor RT	2	3	0.125	14	3	2010
Umar BS	2	2	0.333	15	2	2020
Zafarullah HM	2	2	1.000	12	2	2024

Abbey JD	1	1	0.25	26	1	2022
Abu MM	1	1	0.167	5	1	2020
Abu Taher M	1	1	0.500	1	1	2024
Acharya A	1	1	0.067	16	1	2011

Table 1: TBML Author`s scholarly impact

Table 1, shows the author`s impact in the TBML field, based on h-index, g-index, m-index and total citations. These metrics measures the author`s output and impact in the TBML field. In terms of citations, the top five authors were Naheem with 92, Ferwerda had 56, Abbey had 26, Acharya had 16 and Umar had 15. However, focusing solely on citations does not reflect the impact of the author, hence inclusion of other metrics.

The h-index measures the author`s prominence in the field. Of the top five authors in terms of citations, Naheem had an h-index of 6 while the majority had h-index of 2 and others 1. This shows Naheem as the only prominent author in the TBML field. These findings support results which showed Naheem as the lead author.

The g-index represents the cumulative citations number and compared with (g)² of productive years of the author. Naheem and Naylor had g-index factor of 7 and 3 respectively. These are the leading authors with these results supported by previous findings. For the m-index factor, Million and Zafarullah had scores of 1 and are the influential authors despite being emergent authors in the TBML field.

Lotka`s Law of Productivity

Documents written	No of Authors	Proportion of authors	Theoretical
1	295	0.961	0.724
2	10	0.033	0.181
3	1	0.003	0.080
7	1	0.003	0.015

Table 2: Study`s Lotka`s productivity law

Lotka`s law describes the author`s productivity based on the articles they have published. The law posits that minority of authors produce the majority of published while large number of authors produce minority of work. Of the articles produced, 72% of the authors produced one article with 18% of the authors having 2 documents. The authors who produced one article were 295 while those with 2 were 10 authors. Those who produced 7 documents was one author and 3 documents was one as well. Thus,

the lotka`s law was proved as the small number of authors produced many articles as evidenced by 7 articles by one author. While the large number of authors, 295 produced one document. These results imply that only a few authors were productive.

Top Articles Cited

Paper Title	Author	Total Citations	TC per year	Normalized TC	FWCI
Deep learning anomaly detection as support fraud investigation in Brazilian exports and anti-money laundering – Brazil	Paula E.L.; Ladeira M.; Carvalho R.N; Marzagão, T	131	14.56	6.52	8.95
The Colombian artisanal mining sector: Formalization is a heavy burden – Canada	Veiga M.M; Marshall, Bruce G.	81	11.57	3.99	5.18
Behaviour monitoring methods for trade-based money laundering integrating macro and micro prudential regulation: A case from China – China	Chao, X; Kou G; Peng, Yi; Alsaadi, Fawaz E.	76	10.06	3.74	7.38
A typological study on money laundering – China	He, Ping	65	4.06	4.20	4.15
Recalibrating the Banking Sector with Blockchain Technology for Effective Anti-Money Laundering Compliances by Banks – India	Thommandru A; Chakka, B	48	16	6.5	6.22

Table 3: Total Article Citations

Of the scholarly output, the top articles cited are shown in Table 3. The table shows the total citations, total citations per year and normalized total citations each showing a different analytical approach. Normalized total citations are used when comparing the articles and there impact as to whether low or high in the specialized field. As shown in Table 3, the conference paper entitled Deep learning anomaly detection as support fraud investigation in Brazilian exports and anti-money laundering by Paula. et al, 2017 had the highest total citations of 131. This was followed by a paper entitled The Colombian artisanal mining sector: Formalization is a heavy burden – Canada by Veiga. Et al, 2019 with 81 citations. On the third was the article with 76 citations, entitled Behaviour monitoring methods for trade-based

money laundering integrating macro and micro prudential regulation: A case from China – China. The paper was authored by Chao. et al, 2019. On the fourth had 65 citations entitled A typological study on money laundering – China by He (2010). Lastly the paper had 48 citations entitled Recalibrating the Banking Sector with Blockchain Technology for Effective Anti-Money Laundering Compliances by Banks – India authored by Thommandru & Chakka (2023).

Relying on the citations only can give a wrong impression about the article`s research relevance and impact. The Normalized TC and FWCI were used further. The article entitled Deep learning anomaly detection as support fraud investigation in Brazilian exports and anti-money laundering by Paula. et al, 2017 had a FWCI of 8.95 and Normalized TC per year of 6.52. On top of being the highest in terms of total citations, the article also had the highest FWCI and Normalized TC per year. This shows that the article has strong impact in the area of TBML. This could be attributed to the cross disciplinary nature of the paper.

The second article in terms of FWCI with 7.38 is entitled Behaviour monitoring methods for trade-based money laundering integrating macro and micro prudential regulation: A case from China – China. Though the article was second in terms of FWCI, on the normalized TC per year of 3.74 they were number five, while in total citations they were number three. These findings prove that reliance on one metric can limit the scope of understanding.

The third article with FWCI score of 6.22 was the paper on the fourth position in terms of citations while normalized TC per year of 6.5 was on number two. The paper was entitled Recalibrating the Banking Sector with Blockchain Technology for Effective Anti-Money Laundering Compliances by Banks – India. On the fourth position in terms of FWCI had a score of 5.18 with normalized TC per year score of 3.99 while total citations were 81. The paper was entitled The Colombian artisanal mining sector: Formalization is a heavy burden – Canada by Veiga. et al, 2019. The metrics reveal that the paper on citations was second while on normalized TC per year was fourth.

Lastly on FWCI, the paper had a score of 4.15 with second on the normalized TC per year score of 4.2. For citations the paper had 65 on number four. The paper entitled A typological study on money laundering – China.

Research Output by Country

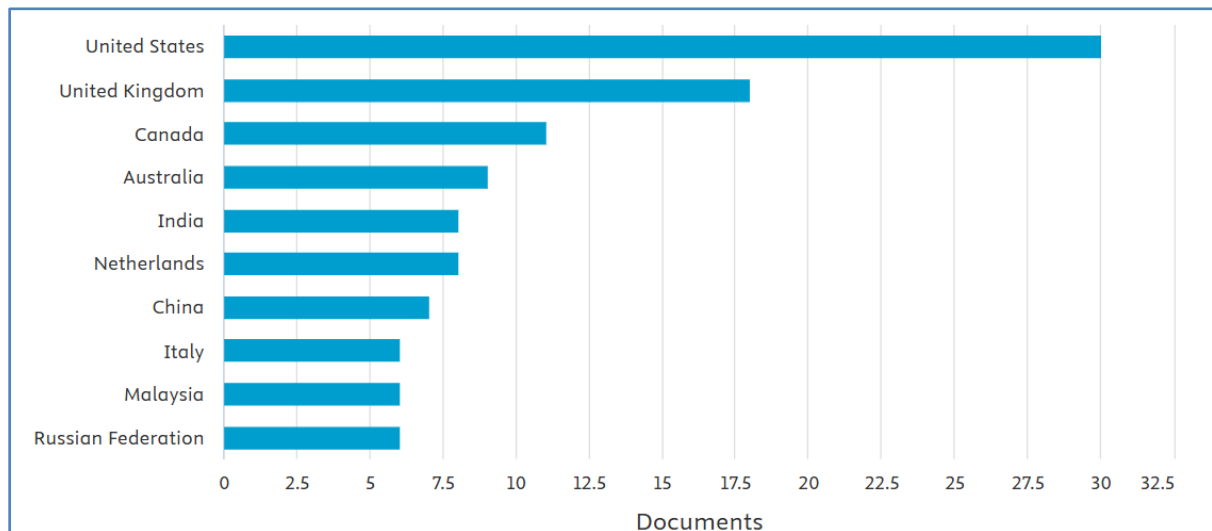


Figure 5: Scholarly Output by Country

The scientific production by countries is shown in Figure 5. The findings show that United States had the highest scholarly output with 30 articles followed by United Kingdom with 18 publications. The third was Canada with 11 articles, fourth was Australia with 9 articles and fifth was India and Netherlands with 8 articles. Thus, the results indicate that scholarly output on TBML was centred in developed countries.

Scientific Mapping Status of TBML

Scientific mapping guides in the identification of areas that are of relevance to TBML subject. The mapping is through keyword identification and thematic mapping. The findings are presented below:

Thematic Map

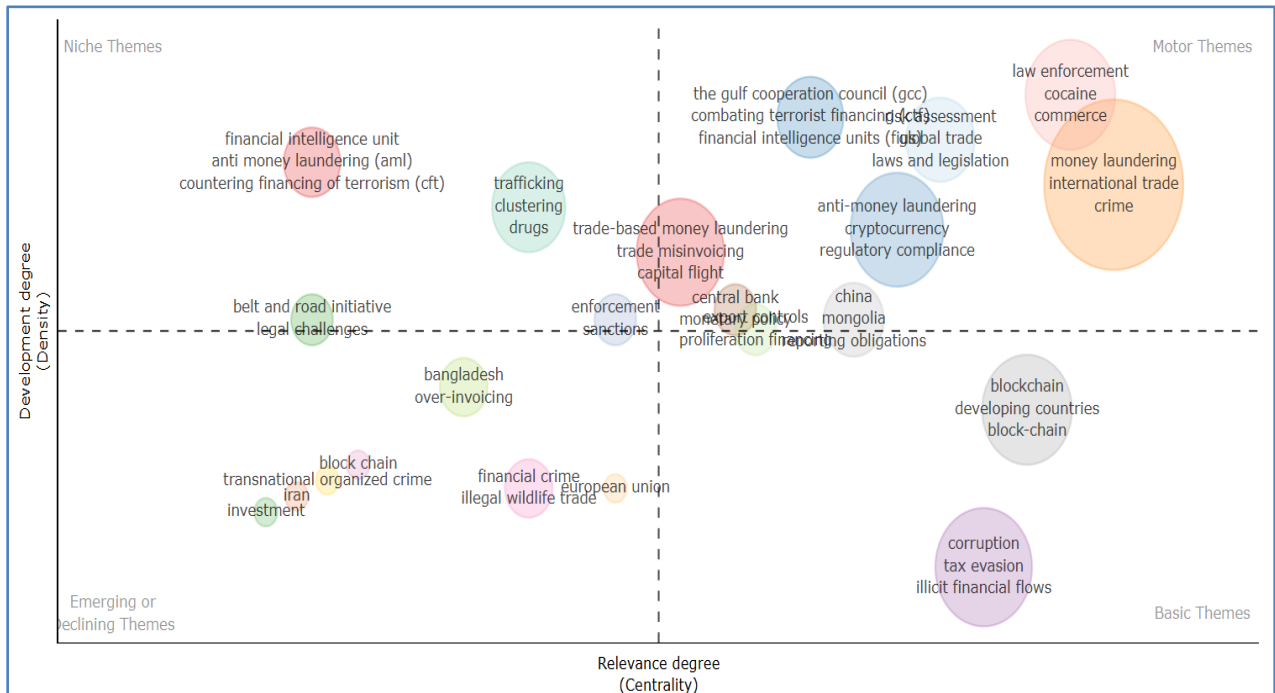


Figure 6: TBML thematic mapping

Thematic mapping consists of four quadrants which are categorised based on the relevance degree against development degree. As shown in Figure 6, the four quadrants represent the themes namely basic themes, niche themes, motor themes, emerging or declining themes. The findings are discussed below.

Motor Themes

These are central and mature themes that drive the TBML agenda. As shown in Figure 6, the key subjects in this quadrant are money laundering, international trade, crime, law enforcement, cocaine, commerce, anti-money laundering, cryptocurrency, regulatory compliance central bank, China, Mongolia and financial intelligence units among others. The themes are clustered into four, namely, money laundering and international trade, law enforcement and crime, crypto currency regulations, and FIUs and AML/CFT frameworks.

Basic Themes

This quadrant consists of central topics which are not yet developed. Notable subject areas in this basic themes' quadrant includes blockchain/developing nations and tax evasion, corruption, and illegal financial transactions.

Niche Themes

These are well-developed but occupy a specialized or peripheral role in the TBML landscape. Dominant topics in this niche theme comprise financial intelligence units, Anti-Money Laundering/Counter Financing of Terrorism mechanisms, Combating the financing of terrorists, trafficking and narcotics, legal impediments, and Belt and Road Initiative (BRI).

Emerging Themes

In this quadrant, the subject areas indicate low relevance and density. This means that there are still developing or declining. Figure 6 revealed the key areas which are emergent themes as Bangladesh, over invoicing, Iran, European Union, financial crime, block chain, trans organised crime, illegal wildlife trade and investment.

Keyword



Figure 7: TBML Keywords

Keyword	Relevance	Scholarly Output 2015 to 2025
Money laundering	1	150%
International Trade	0.55	
Laundering money	0.55	
Trade finance	0.35	
Terrorism	0.40	+300%
Corruption	0.35	+100%

Table 4: Keyword - Relevance and Scholarly Output growth

Figure 7 and Table 4 show the key word using the frequency and word cloud. Keyword analysis brights to light the dominant subject areas in TBML. The keywords highlighted in the study were money laundering, international trade and laundering money. Thus, the results indicate that TBML is a category of money laundering even though others view TBML as independent from money laundering.

Discussion

Scholarly Output of TBML

In terms of TBML publication trend over the period under study as shown in Figure 3, they were categorised into three. Firstly, the period 2010 to 2014, indicates a decline which could be attributed to awareness as evidenced by the FATF TBML initial guidelines issued in 2007. Also, the period indicates limited conceptualisation as the researchers and practitioners were still establishing clarity and what TBML constitutes (Ferwerda, 2023). Thus, this period indicated development of an emergent area within the AML/CFT discipline. Despite FATF issuing guidelines, TBML was not considered a threat.

The second period, 2016 to 2020, shows an increased interest and financial sector regulators demanding accountability. There are three plausible explanations for this trend. Firstly, AML/CFT related regulatory penalties on HSBC Bank and Danske Bank during the period heightened academic and policy interest in the financial crime subject (Makuyana, 2024). Further in support, FATF and subordinated bodies increased country mutual country evaluations to check on level of compliance with the FATF recommendations. Secondly, digital trade and data availability increased the scope for researchers to explore the TBML risks. Lastly, TBML typologies were developed by incorporating new methodological approaches. In summary, this period showed TBML development into a scholarly discipline driven by regulatory and technological factors.

The final period, 2021 to 2025, shows stabilization and renewed growth of TBML. This can be explained by the incorporation and appreciation that TBML is part of financial crime subject. This was observed by increase in TBML related conferences and discussions. For instance, Asia Development Bank developed a roadmap in partnership with United Nations Office on Drugs and Crime (UNODC) to address the TBML risks in Asia (Asia Development Bank, 2024). Also, FATF introduced revised TBML guidelines in 2020 (FATF – Egmont Group, 2020). These activities contributed to the accelerated policy driven and technical research on TBML.

Notably from the 2010 to 2025 trend, TBML has developed from a specialized academic discipline into a crucial component of research on AML/CFT and international trade. The growth after 2016 is consistent with the acknowledgment that TBML is a significant method for illicit financial flows, precipitated by the intensification of global AML/CFT measures, and the growing complexity of trade finance systems (FATF – Egmont Group, 2020). By 2025, the steady growing trend suggests a long-term, established field of study with increasing methodological diversity and more policy relevance.

Of the top TBML authors, the results shown in Figure 4 can be classified into three authors namely primary, secondary and emerging. Naheem is the primary and foundational author who shaped the TBML conceptual framework. Naheem is from Mayfair Compliance, Germany. Naylor as the secondary contributor introduced divergent views concerning TBML. Naylor is from Université McGill, Montreal, Canada. The others with 2 articles are emerging authors from Southeast Asia and developing economies who brought a different geographical dimension of TBML

The presence of the secondary authors represents an increased growth with different methodological and empirically grounded research which promoted the TBML discourse. Understandably the primary and secondary authors are from developed countries, Germany and Canada, which can indicate the proactive recognition of TBML as a threat and instituting appropriate measures

Output by country as shown in Figure 5, the plausible explanation being these countries (USA, UK, Canada, Australia, India and Netherlands) are responsive to TBML regulations and are susceptible to financial crime due to a well-developed and integrated financial architecture. These findings support previous results which identified primary and secondary authors from developed countries. This explains that developing countries follow the TBML guidelines set by the developed countries.

Scientific Status Mapping of TBML

Of the four TBML themes, Firstly the motor theme has three clusters The first cluster, FIUs and AML/CFT framework, represent the institutions responsible for developing and enforcing the AML/CFT regulations in a country. Concerning the TBML, they develop the TBML framework based on FATF and affiliated regional organisations guidelines. The framework includes cross sharing of information, TBML

typologies and measures to protect the financial institution from the risk among others. FATF collaborates with other international organisations in the sharing and dissemination of AML/CFT associated information. The presence of this cluster is in line with FATF Recommendation 1 which requires countries to conduct National Risk Assessment to enable risk classification (FATF – Egmont Group, 2020).

The second cluster, money laundering and international trade, reflects the relationship between money laundering and international trade. This is the foundational element of TBML in which preconditions for TBML exists such as collusion between importers and exporters to mis invoice and false declarations. This concurs with Tiwari. et al (2024) who revealed that TBML comes in five forms, namely over invoicing, under invoicing, multiple invoicing, over and under shipment of goods and false description.

Third cluster, cryptocurrencies and regulatory compliance, demonstrates a developing trend. Money launderers use trade activities to conceal crypto-derived earnings by combining TBML with digital assets. This implies that financial crime and digital finance are converging. Also, the presence of mature and central themes suggests that TBML is predominantly examined from the perspectives of legal systems and transnational organized crime.

Final cluster, law enforcement and commerce centres on the drug related TBML. Drugs in the form of cocaine being traded illegally is part of TBML. The cluster shows an increasing trend towards drugs as driving the TBML subject.

The four cluster under motor theme shows the central areas which drives TBML. Thus, the motor themes indicate that TBML research is deeply intertwined with overarching AML/CFT frameworks and international trade. Moreso in the digital era, technology precipitating financial crime.

The basic theme reveal that areas that are not yet developed. Notwithstanding their significance for transparency, blockchain applications in border customs controls, logistics, and accounting remain underdeveloped. This points to low adoption rate in developing economies, where the risk of trade-based money laundering (TBML) is significant and there are digital infrastructure limitations. With the necessary supporting framework blockchains applications can be integrating to address some of the trade limitations.

The existence of corruption and illicit financial flows (IFFs) in this theme indicates an intricate association with TBML. Corrupt customs officials, weak oversight, and unlawful trade networks facilitate trade mis-invoicing and smuggling. The growing importance of these topics indicates they are acknowledged yet remain inadequately examined within TBML-associated research. In short, this quadrant encompasses potential growth areas that may enhance TBML detection, particularly in the areas of digital traceability and the expansion of IFF frameworks to address financial fraud.

The presence of FIUs, AML and CFT clusters in the niche theme signify specialized and extensively developed areas of research. They mitigate TBML risks indirectly by enhancing monitoring and information exchange among the stakeholders within each country's AML/CFT regulatory frameworks.

Drug and human trafficking's presence in this quadrant indicate a form of an illicit market. By utilization of TBML in these types of illicit markets serves to reflect illegal financial gains, though these proceeds are relatively minor in comparison to the broader spectrum of trade-related financial crime. Furthermore, BRI and legal challenges highlight that extensive infrastructure and international trade routes contribute to increased vulnerabilities in trade-based money laundering. These are done through lack of uniform standards, multiple supply chains and large volume of trade. BRI is an economic strategy adopted by China to grow the economy through various trade and investment pathways across the world. The presence of BRI shows the growing influence of China in the international trade. This requires a coordinated approach when establishing bank-customer relationship to properly risk classify the customers which is in line with FATF Recommendations on NRA and CDD (Chitimira & Munedzi, 2023; FATF – Egmont Group, 2020). The subject areas under this theme converge at the nexus of TBML and other illicit markets. They are complex but do not serve as the primary framework of TBML research.

Emerging themes are country specific TBML studies as reflected by Bangladesh, Iran, and European Union. These studies of countries indicate the growing application of trade mis-invoicing and sanctions evasion. Also, the associated regional TBML risks. Additionally, another area is the association of illegal wildlife trade and financial crime which indicates areas that are yet to be explored. These present potential for further research and policy-centred exploration.

The keywords show that TBML is associated with trade finance documentation. The documentation includes letters of credit, international law, and trade finance among others. The existence of these trade documentation entail information asymmetries among the banks, logistics players, importers, and exporters. These information gaps are opportunities that money launderers exploit. Key words indicates the intricate nature and how TBML arises to have five forms of TBML (Tiwari. et al, 2024; Delston & Walls, 2009).

Conclusion

The subject of trade-based money laundering has gained a lot of attention worldwide; through this study emergent areas and status of the related research were discovered. This was done through a bibliometric analysis. The findings revealed that scholarly output has increased with a number of academic discussions centred on TBML increasing. The growth has been noted to be mainly in developed countries who have adequate response mechanism. Also, the authors were categorised into

three primary, secondary and tertiary. The primary and secondary authors have been the driver of knowledge sharing and dissemination of TBML.

In terms of scientific mapping, the central themes advancing the TBML agenda focused on money laundering and international trade, law enforcement and crime, crypto currency regulations, and FIUs and AML/CFT frameworks. These themes indicate the deep relationship between AML/CFT and international trade which is being perpetuated by digital innovations. Also identified were niche themes which remain special and crucial in the TBML agenda. Notably, China's BRI growing influence on the international trade presents challenges that should be addressed.

Emergent themes indicate the trade mis invoicing and sanctions evasion which reflect regional TBML done by sanctioned countries. While the basic themes indicate the areas that promote TBML. The keyword for the subject shows the growing areas and how related they are. These include the use of Free Trade Zones, trade finance documentation, sanctioned countries and digital solutions in the form of bitcoins and cryptocurrency in the process of trade-based money laundering. In conclusion, TBML is a growing subject which requires more support in terms of technical research from the FATF and subordinated regional organisations.

Practical Implications

The current study contributes to the need for financial services sector stakeholders instituting appropriate measures in mitigating financial crimes. TBML continues to advance given the digitalisation of the world. Thus, the regulations and frameworks being developed should align to the environment so that they do not become irrelevant. Digital solutions should be developed to enable the digital traceability of international trade transactions.

Theoretical Implication and Further Research

This study contributes to the body of knowledge on TBML which is part of broader money laundering subject. Very few studies have focused on TBML so this study additionally contributes to TBML body of knowledge. Though the study contributed to the TBML subject, it should be noted that areas of further study should incorporate the relationship between Free Trade Zones and TBML, block chain and crypto currency as solution to address TBML risks. Other areas include country and regional specific TBML studies and estimations of TBML.

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International Journal of Applied Research in Business and Management (ISSN: 2700-8983)

an Open Access journal by Wohllebe & Ross Publishing, Germany.

Volume: 07 Issue: 03 Year: 2026

<https://doi.org/10.51137/wrp.ijarbm.499>

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