

# Unveiling the Core Dimensions of Financial Statement Fraud: An In-depth Bibliometric Review

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## ABSTRACT

**Manuscript type:** Research paper

**Research aims:** The study aims to filter for core publications based on bibliometric coupling and to identify theories, determinants, measurements, and attributes (TDMA) from the literature through a mapping analysis of Financial Statement Fraud (FSF).

**Design/Methodology/Approach:** This study identifies TDMA in the FSF literature through a mapping analysis of the centrality and impact of each cluster. It has used a two-stage analytical framework combining bibliometric coupling (via the Bibliometrix 4.1 R package using the Louvain clustering algorithm) and TDMA-based systematic mapping. A total of 521 Scopus-indexed journal articles were analysed, and the top 15 publications from each cluster were evaluated based on centrality and impact scores to reveal core research patterns and interconnections.

**Research findings:** Four clusters of FSF were identified. Cluster 1 provides the fundamental theoretical background of FSF, including its deductions and predictions. Cluster 2 examines the relationship between essential governance practices, earnings management, and FSF literature. Cluster 3 presents contemporary artificial intelligence (AI) and machine learning (ML) approaches for accurately forecasting FSF, and Cluster 4 offers exploratory research to analyse FSF.

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**Theoretical contribution/Originality:** The findings contribute to the fields of accounting, auditing, and finance. Their novelty lies in the dynamic structure used to explain multiple clusters of FSFs by mapping them to the TDMA literature.

**Practitioner/Policy implications:** The findings emphasise the need for integrated fraud-prevention frameworks that combine traditional governance mechanisms with AI-driven analytical tools. Policymakers, regulators, and auditing bodies can leverage these insights to enhance transparency, strengthen internal controls, and design proactive fraud detection systems that align with international accounting standards.

**Keywords:** Financial statement fraud, Bibliometric analysis, Bibliometric coupling, TDMA literature mapping, Accounting standards, Fraud detection and prevention

**JEL Classification:** M4, M42, G34, K22

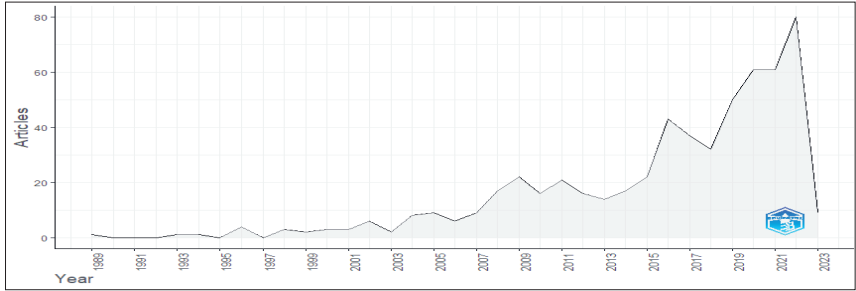
## 1. Introduction

Financial statement fraud (FSF) is among the most significant forms of corporate fraud in the modern world (Farooq et al., 2025a). It involves deliberately manipulating company accounts to violate laws, policies, or rules, to confer unauthorised benefits to a specific individual or group (Fitri et al., 2019). FSF has become increasingly prevalent in today's business landscape, and its consequences can be severe. It undermines financial reporting standards and erodes public trust, as well as the confidence of regulators and investors (Zhou & Kapoor, 2011). Enron, WorldCom, Lehman Brothers, Olympus, and Valeant Pharmaceuticals are just a few examples of FSF that have resulted in multi-million-dollar losses for stakeholders (Toms, 2019). Figure 1 illustrates that considerable importance has been placed on FSF literature following the WorldCom and Enron scandals. The number of FSF publications has been rising significantly in recent years, indicating their growing relevance in the field for identifying gaps and challenges for future research.

That is why detecting and preventing FSF has become a critical concern for companies, regulators, and investors. However, certain variables provide significant insight into the causes, detection criteria, prevention, and outcomes of FSF, which aid in evaluating the fraud appetite and raising awareness among stakeholders (Liu et al., 2023). Nonetheless, identifying the motives behind fraud remains challenging. Previous studies have emphasised the motivations, causes, and consequences of FSF and have pinpointed potential areas for future research (Farooq et al., 2025b). Kulikova and Gafieva (2014) provided an overview of the evolution and history

of financial statement falsifications. They concluded that there is a lack of transparency regarding the causes and consequences of FSF. Moreover, Trompeter et al. (2014) discussed financial crimes and fraud from the perspectives of psychological, ethical, sociological, and criminological theories. They synthesise the literature on fraudulent financial reporting (FFR) and highlight support for the fraud triangle theory (FTT) in fraud detection. Nigrini (2017) applies Bradford's law to identify potential fraud in reported numbers, sample sizes, and data types, highlighting several red flags that indicate possible fraud.

**Figure 1: Annual Scientific Production**



Although some review studies have been published on FSF, their primary focus has been on detection and prevention approaches without utilising thematic analysis. For instance, Yue et al. (2007) summarised the literature on detecting financial fraud. They highlighted the literature's inability to provide an optimal mechanism for detecting financial fraud. They emphasised the need to combine qualitative measures, such as auditor details and governance style, with financial data to facilitate early detection of FSF. Wang (2010) reviewed the literature on data structure and mining technologies for fraud detection. West and Bhattacharya (2015) compared control experiments and the utilisation of big data for fraud detection. Toms (2019) reviewed fraud scams, summarised the findings and future directions regarding fraud risk and opportunities, and linked them to the regulatory framework, business strategy, complexity, development, and diversification. Al-Hashedi and Magalingam (2021) summarised the literature regarding four fraud categories: financial statements, banks, insurance, and cryptocurrency. They also analysed 35 data mining techniques for fraud detection and found that support vector machines (SVMs) were the most commonly used method.

Systematic literature reviews and bibliometric analyses have previously demonstrated differences in FSF across its prevention,

development, and evolution. They employ a traditional bibliometric strategy to identify the most influential authors, articles, journals, sources, research streams, and themes. These studies are either time-lapse or rely on a specific database or traditional methodology, and they lack novelty in reporting the particular theories, determinants, measurements, and attributes (TDMA) literature. However, the current study aims to perform a TDMA literature mapping analysis, first identifying significant research streams from core publications through bibliometric coupling based on centrality. It then systematically evaluates the underpinning theories, main determinants, suggested measurements, and core attributes of FSF from each cluster. The key objectives of the study are to (1) identify the core research clusters of FSF through bibliometric coupling; (2) analyse and categorise the theories, determinants, measurements, and attributes (TDMA) underpinning FSF literature; and highlight the conceptual and methodological gaps in existing FSF research and suggest directions for future studies. This approach goes beyond citation counts to reveal how theoretical foundations interact with empirical and technological advancements, such as the growing use of artificial intelligence (AI) and machine learning (ML) in fraud detection.

This research is crucial because FSF has substantial consequences for the general public, regulators, and investors. Improved fraud detection tools could reduce the prevalence of FSF and promote greater transparency and accountability in the corporate world. Therefore, this study has the potential to make a significant contribution to accounting, auditing, and finance. Its novelty lies in using a dynamic structure to explain various clusters of FSFs and mapping them to the TDMA literature. It contributes to both academic research and practical policymaking. The post-pandemic era and the rapid digitisation of financial reporting have magnified the risks of fraudulent manipulation, while regulatory and auditing frameworks struggle to keep pace with emerging technologies. By systematically mapping the FSF literature, this study provides scholars, policymakers, and regulators with a comprehensive overview of the field's evolution, identifies underexplored research directions, and offers actionable insights to strengthen transparency, corporate accountability, and fraud-prevention mechanisms.

The remainder of this paper is organised as follows: Section 2 provides an in-depth literature review and comprehensive theoretical support for FSF. Section 3 explains the research methodology, including query development, data extraction, and cleaning. Section

4 discusses the bibliometric coupling process and the TDMA mapping approach. Section 5 presents the findings and discussion of the four FSF clusters. Section 6 provides the conclusions, study implications, and recommendations for future research.

## **2. Literature Review and Theoretical Support**

This section discusses the findings of prior literature, based on relevant systematic reviews and bibliometric analyses related to FSF. It explains the evolution, development, theories, and research gaps in earlier research, which significantly justify the need for the current study in the context of concept development. Kulikova & Gafieva (2014) explained the history of financial statement falsification and noted that no specific definition of the concept existed in the literature. Some researchers connected it to the truthfulness or clarity of balance sheet information (Humpherys et al., 2011). At the same time, some consider it an intentional misrepresentation in the financial statements (Treadway, 1987) or in accounting data, or a misstatement or omission of material facts that can influence the decisions of those concerned (Zhou & Kapoor, 2011). Kulikova & Gafieva (2014) found that there was no clear understanding of the causes and consequences of FSF, prompting scholars to explore diverse methods for detection and prevention.

FSF is viewed across diverse research domains in finance, accounting, auditing, sociology, criminology, and psychology, making it challenging for scholars and practitioners to reach consensus on a single definition, methodology, or data type. Albizri et al. (2019) have shed light on the FSF findings from accounting, analytics, and information systems that can affect different levels of the economy. They found variations across research domains, like accounting, which is more domain-focused and relies on historical data for fraud detection. In contrast, analytics and information systems are more concentrated on data types and future predictions through advanced modelling techniques. However, they emphasised combining literature from various domains to develop effective detection and preventive measures.

Trompeter et al. (2014) analysed non-accounting publications in ethics, psychology, criminology, and sociology on financial crimes and frauds. Their objective is to discuss the perspectives of non-accounting researchers on theories, ideas, variables, and designs for anti-fraud activities. Trompeter et al. (2013) also synthesised the literature on FFR and supported the components of FTT proposed by auditors for detecting and assessing fraud. They concluded that

the clients' anti-fraud measures and concealment techniques could reduce their financial losses and risk of FSF. Hogan et al. (2008) found the characteristics of the companies committing FSF and supported the FTT. They discussed auditors' skills and abilities to identify fraudulent acts and how this impacts their planning and testing strategies. Nigrini (2017) stressed the need to apply new perspectives on Benford's law for reporting mathematical basis fraud numbers, including their data type, sample size, and limitations in application. It will help identify potential red flags useful for fraud detection.

Yue et al. (2007) claimed that previous studies focused on synthesising the literature on fraud detection. They specifically reviewed financial fraud detection (FFD) methods and the relationships among auditors, governance style, and fraud from 1995 to 2007. They proposed a detection framework for FSF and noted that there is still no consensus in the literature on how to identify fraudulent activities. But they stressed the need to combine financial data with qualitative information, such as auditors' details and governance style, for early detection. Yue et al. (2007) emphasised the application of advanced FFD strategies, including combining supervised and unsupervised learning. They proposed an evaluation framework for detection tasks, including terrorist, financial crime, spam, and intrusion detection. Ashtiani & Raahemi (2022) conducted a systematic analysis of FSF detection. They found that supervised algorithms are more commonly employed in prior studies than non-supervised mechanisms. So, future researchers should focus on these methodologies and on implied textual and audio qualitative data for fraud detection.

Wang (2010) reviewed the literature on data structures and proposed suitable data and mining technologies to develop optimised models for detecting accounting fraud. He believes regression models can be used to conceal information. Therefore, neural networks better detect fraud than auditing without assistance (S. Gupta & Mehta, 2021). West & Bhattacharya (2015) suggested a need for future comparisons of the performance metrics implied by controlled experiments. Forensic accounting tools and software can be used for fraud detection, leveraging big data (Ozili, 2020), and for computerised accounting to record and analyse (Cusack & Ahokov, 2016). Amiram et al. (2018) stated that different data sets yielded different results regarding corporate financial misconduct. So it can be challenging for future researchers to develop methodologies that validate the model's findings and build consensus in detecting and preventing fraud. Han (2017) used and compared data mining

techniques (decision trees, neural networks, and Bayesian belief networks) for fraud detection and found that Bayesian belief networks were best for reporting FSF.

Toms (2019) analysed fraud scandals and summarised the findings, stating that fraud risk, or opportunity, is linked to business complexity, growth, diversification, and a robust regulatory framework. Nasir et al. (2019) stated that accounting records should be maintained in accordance with the law; non-compliance may result in a firm being convicted by the FSF. Mongwe & Malan (2020) analysed various case studies and reported key findings on FSF detection techniques. They defined fraud, its characteristics, the origin of the cases, the data types, the methodology, the treatments for missing data, and the performance measures implied. All this information helps determine an effective way to prevent FSF. Al-Hashedi & Magalingam (2021) reviewed 75 relevant articles and divided the fraud categories into four groups (bank, financial statement, insurance, and cryptocurrency). They analysed 35 data mining techniques and found that SVMs were commonly used in the sample data. Amiram et al. (2018) reported that accounting ratios, such as earnings management proxies or discretionary accruals, can signal corporate wrongdoing, which can be further confirmed through compliance with modernised techniques.

Financial statements are a major indicator for decision-making, and FSF can damage firms' reputations, growth, and sustainability, and impact financial markets (Singh Yadav & Sora, 2021). Therefore, FFD is essential through active models to avoid future losses. Camfferman & Wielhouwer (2019) discussed the risk approach to stakeholders: perceived or actual, and its measurement, as well as mitigation strategies following 21st-century scandals. They suggested improving the regulatory framework to minimise risk factors and enhance stakeholder trust. The financial sector's fraud risk is high due to technological advancements (Sood & Bhushan, 2020). Hawala and Ponzi schemes prompted regulators to more effectively identify and tackle cybercrime and online theft, without harming banks' reputations or public confidence. Reurink (2018) distinguished three types of financial fraud: false disclosures, scams, and mis-selling. They reported the key factors that facilitate the accuracy of financial frauds are: (1) the conflict of interest due to incentive structure; (2) new and uninformed entrants in the marketplace; (3) increasing complexity in the legal structure and rapid innovation due to technological advancements; and (4) maintaining high secrecy in trading models adopted for investment.

The stakeholders' perspective on FSF is presented in Table 1.

**Table 1: Perspectives on Financial Statement Fraud**

Auditors	Corporate	Regulatory/ Professional Authorities	External Observers/ Stakeholders
<ul style="list-style-type: none"> <li>• Auditor's skills and abilities to identify fraud</li> <li>• Planning and designing testing strategies</li> <li>• Clients' anti-fraud measures, fraud schemes, and concealment techniques</li> <li>• Application of Benford's law</li> </ul>	<ul style="list-style-type: none"> <li>• Combining the literature from various domains to build up constructive detection and preventive measures</li> <li>• Blending the financial data and qualitative information</li> <li>• Emphasise mining technologies for building optimised models</li> <li>• Effective internal control and governance system</li> <li>• Use AI and ML techniques</li> </ul>	<ul style="list-style-type: none"> <li>• Misrepresentation in the form of a material misstatement, misreporting, or omission</li> <li>• An intentional act designed to deceive others, where victims bear a loss, and the perpetrator gains benefits</li> <li>• Legitimate disagreement over GAAP</li> </ul>	<ul style="list-style-type: none"> <li>• Increasing scandals are an indicator of regulatory flaws</li> <li>• Regulatory reforms are insufficient</li> <li>• Virtuous professionalism is required for transparent financial reporting</li> <li>• Increase in the compliance cost for all market participants</li> <li>• Development of an advanced and intelligent FSF detection method</li> </ul>

The FSF affects all stakeholders, including companies, potential investors, fellow companies, and auditors, and, in the case of false reporting, everyone has to bear the costs (Xiaoyu et al., 2018). Therefore, traditional fraud-detection methods, such as ratio analysis, should be considered to avoid such losses. Lail et al. (2017) explained the concerns of external observers regarding financial reporting and fraudulent activities. They stated a need to develop virtuous professionalism in the field and revise regulatory frameworks to restore their professional identity shaped by virtues. Abed et al. (2022) emphasised the adoption of creative accounting practices to minimise the likelihood of FSF. C. M. Gupta & Kumar (2020) explained the procedure of creative accounting and how it leads to financial crime. Sanad & Al-Sartawi (2021) emphasised the

application of advanced intelligent FSF detection and prevention methods to expand knowledge among various stakeholders and help them make informed decisions. Corporate governance tools can be effective in early detection of FSF, helping successfully tackle agency conflicts among multiple stakeholders (Velte, 2021).

The literature also suggested preventive measures to detect fraudulent activities. Pandit & Baker (2021) clarified the responsibilities of auditors and management in assessing misstatements arising from material errors and fraud. However, it remains challenging to uncover fraudsters who commit modernised fraud using traditional, manual methods (Raudha & Saeedi, 2019). They claimed that the introduction of Fintech increased the rate of financial crimes. Therefore, there is a need to use AI and ML techniques in the early detection and prevention of fraud (Roszkowska, 2021). Companies should review financial statements carefully and with due diligence, particularly during pre- and post-merger and acquisition periods (McGee & Byington, 2016). It can help them avoid future consequences of FSF and red flags that may indicate FFR. An effective internal control system that complies with the internal-external law can be a more effective corporate fraud-prevention strategy (Kulikova & Satdarova, 2016).

Cohen et al. (2010) stated that the components of planned behaviour theory better explain fraudsters' intentions. Orth et al. (2023) discussed fraudsters' motivations in light of organismic integration theory. They stated that if organisations understand the reasons for their employees' immoral behaviour, they can better prevent fraudulent activities. They believe that agency cost theory and FTT are insufficient to describe individuals' rationale for committing fraud. Soepriyanto et al. (2021) discussed the four main theories of FSF (FTT, Fraud Diamond Theory, Fraud Scale Theory, and Fraud Pentagon Theory). They identified common themes that fraudsters follow (opportunity, incentive, pressure, integrity, competence, and rationalisation) in committing fraud. Orth & Maçada (2020) discussed theoretical models supporting FSF but emphasised empirical investigation and testing to further validate them. The details of the supporting theories are presented in Table 2.

**Table 2: Theories and Key Concepts**

Theories	Concepts	References
Organismic Integration Theory	<ul style="list-style-type: none"> <li>• Autonomy</li> <li>• Competence</li> <li>• Relationship</li> </ul>	(Orth et al., 2022)
Fraud Triangle Theory	<ul style="list-style-type: none"> <li>• Pressure</li> <li>• Opportunity</li> <li>• Rationalization</li> </ul>	(Hogan et al., 2008)
Fraud Diamond Theory	<ul style="list-style-type: none"> <li>• Pressure</li> <li>• Opportunity</li> <li>• Rationalization</li> <li>• Capability</li> </ul>	(Soepriyanto et al., 2021)
Fraud Scale Theory	<ul style="list-style-type: none"> <li>• Situational pressures</li> <li>• Opportunity to commit fraud</li> <li>• Personal integrity</li> </ul>	(Soepriyanto et al., 2021)
Fraud Pentagon Theory	<ul style="list-style-type: none"> <li>• Competence</li> <li>• Arrogance</li> <li>• Pressure</li> <li>• Opportunity</li> <li>• Rationalization</li> </ul>	(Soepriyanto et al., 2021)
Agency Cost Theory	Executives would deceive the market for their own benefit.	(Orth & Maçada, 2020; Velte, 2021)
Theory of Planned Behaviour	<ul style="list-style-type: none"> <li>• Attitude</li> <li>• Subjective norms</li> <li>• Perceived behavioural control</li> </ul>	(Cohen et al., 2010)
Cognitive Social Theory	Accountants' beliefs and attitudes toward their clients are intertwined with the organisational ethical climate.	(Domino et al., 2015)
Organisational Justice Theory	Organisational reporting policies and procedures are designed to incorporate the dimensions of justice.	(Seifert et al., 2010)

The review papers on FSF mainly focused on systematic literature reviews with a small sample size, such as 18 research articles by Yue et al. (2007), or did not cover a wide time range. There is rarely a bibliometric methodology adopted in the literature to report future research themes and streams. The current study uses a unique method for the bibliometric analysis of FSF. First, it applies the clustering technique via bibliometric coupling to identify themes, and then reports the influential aspects of each theme. It can be a unique feature of the research. Further, previous studies focus on the specific perspectives of one of the parties (auditors, independent accounting authorities, or companies) regarding a particular fraud mechanism (detection, prevention, data type, sampling technique, methodology). Still, the current study presents stakeholders' views, the mechanism for fraud detection and prevention, and the suitability of methods and data in a more effective way through bibliometric coupling.

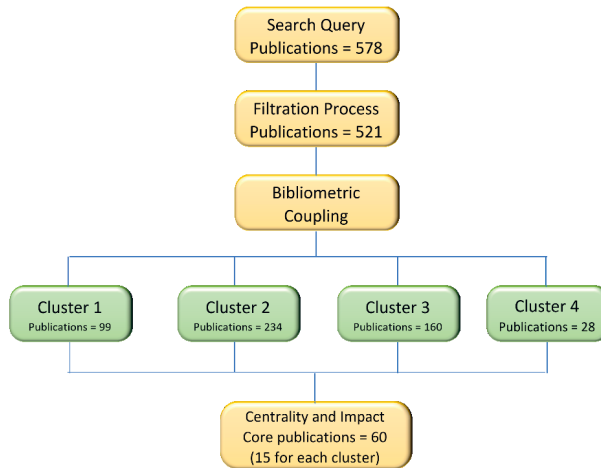
### **3. Research Methodology**

This study employs a combination of bibliometric analysis and a framework-based systematic literature review. The Scopus database was used to find the FSF literature, and a systematic approach was employed to develop a search query using the four-step process proposed by Farooq et al. (2023). The query was applied to March 2024, covering data from 2000 to that date. The first step identified the relevant keywords related to FSF from different sources. The initial set of keywords was extracted from previous review studies. The initial list of keywords was extended using AI tools such as "ChatGPT" and "Google Bard." We also searched this initial extended list in Scopus and analysed all the 'Author Keyword' and 'Keyword Index' for possible inclusion in the list of keywords. Finally, the list is reviewed by a committee of three specialists to finalise the keywords. The second step was to add appropriate Boolean operators with keywords. We used the OR operator to search for related financial statements and fraud keywords separately, then combined the results using the AND operator. The third stage defined the search space, i.e., the bibliographic data, within which selected keywords were searched. The keywords are searched in Title, Keywords, and Abstract, but different strategies are deployed for each search space. The study developed four search queries using Title, Author, Index Keywords, and Abstract, using the crisscross strategy.

**TITLE** ( ( "financial statement" OR "financial report\*" OR "annual report" OR "balance sheet" OR "statement of financial position" OR "income statement" OR "statement of comprehensive income" OR restatement OR "earnings management") AND ( fraud\* OR "financial crime" OR misrepresent\* OR misreport\* OR misstatement OR fals\* OR scandal OR scam OR shenanigans ) ) OR "fraudulent reporting" OR "Abusive earnings management" OR "financial misstatement" OR "financial misreporting" ) OR (**KEY** ( ( "financial statement" OR "financial report\*" OR "annual report" OR "balance sheet" OR "statement of financial position" OR "income statement" OR "statement of comprehensive income" OR restatement OR "earnings management" ) AND ( fraud\* OR "financial crime" OR misrepresent\* OR misreport\* OR misstatement OR fals\* OR scandal OR scam OR shenanigans ) ) OR "fraudulent reporting" OR "Abusive earnings management" OR "financial misstatement" OR "financial misreporting" )) OR ( **KEY** ( "financial statement" OR "financial report\*" OR "annual report" OR "balance sheet" OR "statement of financial position" OR "income statement" OR "statement of comprehensive income" OR restatement OR "earnings management" ) AND **TITLE** ( fraud\* OR "financial crime" OR misrepresent\* OR misreport\* OR misstatement OR fals\* OR scandal OR scam OR shenanigans ) ) OR ( **TITLE** ( "financial statement" OR "financial report\*" OR "annual report" OR "balance sheet" OR "statement of financial position" OR "income statement" OR "statement of comprehensive income" OR restatement OR "earnings management" ) AND **KEY** ( fraud\* OR "financial crime" OR misrepresent\* OR misreport\* OR misstatement OR fals\* OR scandal OR scam OR shenanigans ) ) OR (**ABS** ( ( "financial statement" OR "financial report\*" OR "annual report" OR "balance sheet" OR "statement of financial position" OR "income statement" OR "statement of comprehensive income" OR restatement OR "earnings management" ) W/7 ( fraud\* OR "financial crime" OR misrepresent\* OR misreport\* OR misstatement OR fals\* OR scandal OR scam OR shenanigans ) ) OR "fraudulent reporting" OR "Abusive earnings management" OR "financial misstatement" OR "financial misreporting" ))

Following Farooq et al. (2023), we developed four search queries and combined them with the OR operator. Here, we made a minor change to the query, using W/7 rather than the AND operator for the financial statement and fraud-related keywords. The W/7 operator extracts only those articles in which financial statement and fraud-related terms lie within a distance of 7 keywords. It is done to extract only relevant studies and to ignore articles in which both keywords appear in the abstract but are not related to the FSF. Finally, in the fourth step, we employed the filtration process, including only journal articles written in English. The authors also reviewed the titles and abstracts of each article and excluded those that were irrelevant. The duplicate records were removed by matching DOIs and titles. Records with missing author information, publication years, or citation counts were manually inspected and either corrected or excluded. Inconsistencies in keyword fields were standardised (e.g., "fraud detection," "fraudulent detection," and "fraud identification" were unified under "fraud detection"). As a result, 521 publications were found for final analysis. Figure 2 summarises the core publications search flowchart, which explains the process of publication distribution.

**Figure 2: Core Publications Search Flow Chart (made by authors)**



In the initial stage, selected FSF literature is clustered using bibliometric coupling. Bibliometric coupling is a technique that groups literature into heterogeneous categories based on intellectual structure, calculating the similarity index from common citations (Nasir et al., 2023). We used the R package ‘Bibliometrix 4.1’ for coupling analysis, specifically utilising the ‘couplingMap’ function with a Louvain clustering algorithm and a minimum frequency of 50. The study revealed that the FSF literature can be categorised into four distinct clusters. In the second stage, the top 15 publications (based on centrality and impact) from each cluster are extracted and analysed using the TDMA framework. The selection of the top 15 publications is made to ensure an accurate representation of each cluster.

#### **4. Bibliometric Coupling**

Bibliometric coupling is a crucial tool for identifying current research trends by highlighting the common references shared among two or more research articles. The current study preferred this methodology over other bibliometric analyses, such as keywords, co-citation, and co-occurrence, because it is well-suited to identifying contemporary research clusters. The co-citation analysis focuses on reference patterns to reflect the historical intellectual linkages between publications. In contrast, keyword analysis highlights the most consistent and recurring concepts in the literature, while co-occurrence analysis emphasises current themes and streams by

linking documents that share common references at a given time. The bibliometric coupling is particularly suitable for dynamic, evolving fields such as FSF, based on the relative strength index, which evaluates the significance of their proximity (Khan et al., 2021). Table 3 presents the publication frequency within these clusters, along with the impact and centrality values for each. Cluster 4 focuses on research topics with low impact and centrality, while the other clusters are positioned in areas of high impact and centrality. Cluster 1 includes fraud theories, their deductions, and the factors influencing FSF. Governance practices, earnings management, and financial statement misappropriation are the central themes of Cluster 2. Cluster 3 provides insights into ML and AI tools that are essential for predicting FSF. Cluster 4 explores the emerging field of exploratory studies that analyse the determinants and causes of financial statement misappropriations.

**Table 3: Frequency and Centrality of Core Clusters**

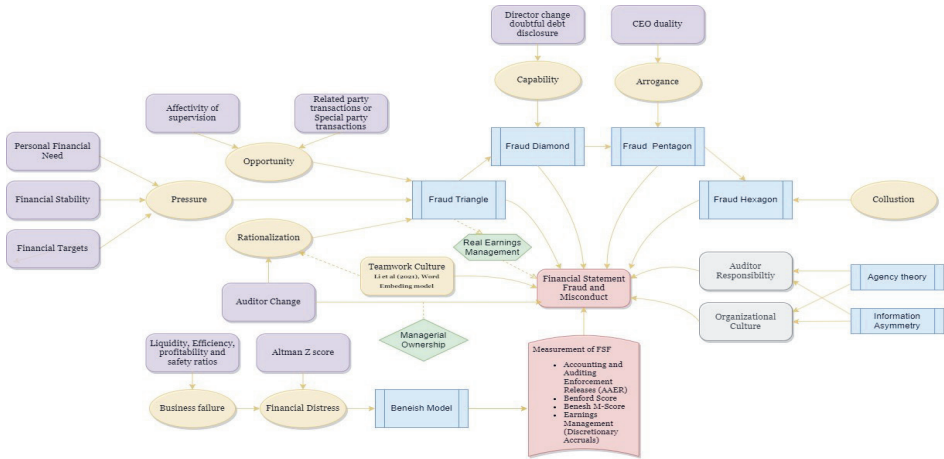
Cluster	Freq	Centrality	Impact
1	99	0.1271069	1.748167
2	234	0.1860017	2.039175
3	160	0.2492465	2.802301
4	28	0.0966515	1.655172

## 5. TDMA Literature Mapping

### 5.1 Cluster 1: Traditional Theoretical Framework, Proxies, and FSF

Cluster 1 focuses on the theoretical explanation of FSF. It highlights a comprehensive history and background of the theoretical framework, covering the fraud triangle, diamond, pentagon, and hexagon. Most studies rely on secondary data analysis. The core studies primarily employ deductive reasoning grounded in established theoretical frameworks, ranging from the fraud triangle to the fraud hexagon theory. It includes measurements of FSF determinants derived from the fraud theoretical framework. Figure 3 provides a comprehensive representation of cluster 1, illustrating the relationships among various explanatory variables for predicting and estimating FSF misappropriation. Each shape and colour conveys specific meanings, explained in Appendix A.

Figure 3: Cluster 1 Representation of Core Publications



### 5.1.1 Underpinning Theories of Cluster 1 Core Publications

Cluster 1 is based on the fundamental theories of FSF. The most commonly used theory in the FSF literature is the fraud triangle, which elaborates on the components of fraud: pressure, opportunity, and rationalisation. It aims to predict FSF using proxies for financial pressure in party transactions, opportunities, rationalisation, and auditor opinion. The fraudster is capable of committing fraud, which contributes to the FTT and leads to the fraud diamond theory (Wolfe & Hermanson, 2004). Additionally, a certain level of arrogance allows the predator to believe they deserve compensation for their fraudulent activities. These two terms have been discussed in the fraud pentagon theory (Devi et al., 2021). The prediction of FSF using the determinants derived from the fraud pentagon theory is the main objective of this cluster of FSF literature. Furthermore, the dimensions have expanded with the introduction of the fraud hexagon, which encompasses six dimensions, including capability and collusion. In addition to traditional fraud theories, groupthink theory suggests that financial statement misconduct can be addressed by improving teamwork culture (Liu et al., 2023). Agency cost and information asymmetry are the primary capital structure theories that examine the relationship between management entrenchment, the auditor's role, and the free cash flow (FCF) hypothesis. Table 4 presents the key theories discussed in the highly centralised articles of the FSF literature.

**Table 4: Theoretical Framework: Stratification of Cluster 1**

Underpinning theory	Supported Studies	Core Objectives Covered
Fraud Triangle	(Fitri et al., 2019; Hudayati et al., 2022; Wuerges & Borba, 2014)	<ul style="list-style-type: none"> <li>• Estimating the probability of FSF.</li> <li>• Examining the relationship between financial pressure and FSF.</li> <li>• Investigating the hypothesis that companies that detect fraud experience greater pressure, opportunities, and rationalisation than those that do not detect fraud.</li> <li>• Examining the relationship between fraud interpretation and disclaimer audit opinions.</li> </ul>
Fraud Diamond	(Omukaga, 2020)	<ul style="list-style-type: none"> <li>• Determining the Influence of Fraud Diamond Elements on FSF.</li> <li>• Investigating the relationship between teamwork culture and financial statement misconduct.</li> </ul>
Fraud Pentagon Theory	(Devi et al., 2021)	<ul style="list-style-type: none"> <li>• Examining the Pentagon Fraud model in detecting FSF.</li> </ul>
Fraud Hexagon	(Handoko et al., 2021)	<ul style="list-style-type: none"> <li>• Investigating the relationship and underlying cause of FSF cases.</li> </ul>
Groupthink, collusive financial fraud	(Liu et al., 2023)	<ul style="list-style-type: none"> <li>• Investigating the relationship between teamwork culture and financial statement misconduct.</li> </ul>
Agency Theory, Information Asymmetry	(Lynn et al., 2020; Seifzadeh et al., 2022)	<ul style="list-style-type: none"> <li>• Examining the factors that contribute to fraud and the role of auditors in preventing it.</li> <li>• Evaluating the Beneish M-Score model in detecting FSF.</li> </ul>
Information Asymmetry	(Irwandi et al., 2019)	<ul style="list-style-type: none"> <li>• Examining the relationship between management entrenchment and FSF.</li> </ul>

### 5.1.2 Determinants of FSF

This section covers the key determinants of FSF (See Table 5). Wuerges and Borba (2014) are leading researchers who provide comprehensive measurements of the fraud triangle variables: pressure, opportunities, and rationalisation. Financial stability, personal financial needs, and targets are significant subsets of financial pressure discussed by Hudayati et al. (2022). Fitri et al. (2019) measure financial stability through asset growth, financial

need via leverage and liquidity, and financial targets as return on total assets. Arshad et al. (2015) evaluate business failure by analysing liquidity, efficiency, profitability, safety, financial ratios, and the Altman Z-score. They concluded that companies facing business difficulties and financial distress are more susceptible to FSF. Opportunity is another factor of the fraud triangle; weak policies, inadequate security, and insufficient internal controls contribute to it. The tendency of auditor change serves as a significant indicator of opportunity, as it enhances underdeveloped internal control. It is also gauged by the extent of related-party transactions and specific-party transactions (Fitri et al., 2019).

Rationalising the organisation's overall behaviour also creates opportunities for fraudulent activities, which can be assessed through earnings management (Perols & Lougee, 2011). Wolfe and Hermanson (2004) highlighted that the fraudster's ability is the fourth element that provides a solid foundation for the other three factors. A fraudster in a position can understand the opportunities within the organisation. He can handle pressure and create documented support to justify their fraudulent activities. Omukaga (2020) explained the elements of the fraud diamond. Devi et al. (2021) highlight the positive impact of the fraud pentagon on FSF, including aspects of the fraud triangle, such as competence and arrogance. Arrogance is a condition in which one considers oneself superior to others, potentially leading to a superiority complex that causes the perpetrator to rationalise their decisions. Management positions, such as CEOs, presidents, and politicians, tend to be more involved in FSF. Liu et al. (2023) highlighted the negative aspects of organisational teamwork culture, which can increase the likelihood of FSF. It can incentivise financial misconduct and engage accounting personnel, particularly in companies with Big Four auditors. Cluster 1 discusses preventive measures for FSF. Lynn et al. (2020) considered the importance of organisational culture in preventing fraud. Lenard et al. (2017) suggested that fraud probability would be significantly reduced if at least one woman were on the board of directors and the executive committee.

**Table 5: Top Centralized and Impactful Research Publications of Cluster 1**

Reference	Independent Variable	Dependent Variable	Method	Area	Data
(Wuerges & Borba, 2014)	<b>PRESSURE:</b> Cash Scaled by a total asset, Current Asset Divided by Current liability, Working Capital divided by a total asset, account receivable divided by a total asset, Total liability scaled by a total asset, Sales to account receivable, Interest expense divided by total liability, Fixed asset to a total asset, Current asset divided by a total asset, cost of goods sold divided by sales, Earning before interest and taxes divided by sales, EBIT scaled by total asset, net profit divided by total asset, Inventory divided by sales, Inventory divided by total asset <b>OPPORTUNITY:</b> Dummy for auditor change (AUDCH) <b>RATIONALISATION:</b> Assign 1 if the audit report provides an unqualified (clean) opinion (UQUAL)	Accounting and Auditing Enforcement Releases by the SEC	Logistic Regression Analysis	Detection	118 US companies accused of fraud by the SEC from Jan. 1, 1998, to Nov. 23, 2010
(Liu et al., 2023)	Teamwork culture	Benford Score	OLS regression analysis	Detection	45988 firm's data from Compustat
(Fudayati et al., 2022)	Financial pressure and related party transactions	FSF	Logistic regression analysis with control variables	Detection	96 companies listed on the Indonesia Stock Exchange
(Fitri et al., 2019)	Opportunity rationalisation pressure	Fraud	Mean comparison of fraud triangle components with fraud and non-fraud companies	Detection	270 non-financial companies on the Indonesia Stock Exchange from 2013 to 2015

Reference	Independent Variable	Dependent Variable	Method	Area	Data
(Arshad et al., 2015)	Liquidity, efficiency, profitability, safety ratios, and financial distress (Altman Z score)	FFR	Comparison between failed and non-failed firms based on business failure, financial distress, and FFR	Outcomes	24 failed and 24 non-failed firms' data from 2004 to 2012
(Malau et al., 2019)	Fraud interpretation	Issuance of a disclaimer audit opinion	Qualitative analysis	Outcomes	10 interviews with auditors and accountants
(Utomo et al., 2019)	Auditor switching, managerial ownership	FFS	Logistic regression analysis	Detection	90 companies in fraud categories from 2013 to 2017
(Lynn et al., 2020)	Auditors' responsibility and organisational culture	Fraud detection	Qualitative study	Prevention	20 external auditors
(Devi et al., 2021)	Fraud Pentagon measures: pressure, opportunity, rationalisation, competency, arrogance	Financial statements fraud	Structural equation modelling (sem)	Detection	20 state-owned companies' data from 2014 to 2019
(Handoko et al., 2021)	FSF schemes, management motivation to commit fraud, and auditor negligence in a case	Fraud statement fraud case	Qualitative research (inductive case study analysis)	Prevention	Secondary sources, news articles, court documents, and academic journals
(Omukaga, 2020)	Rationalisation, opportunity, pressure, capability	Fraud occurrence	Regression analysis	Detection	Non-financial firms listed on the Nairobi Stock Exchange in Kenya from 2013 to 17

Reference	Independent Variable	Dependent Variable	Method	Area	Data
(Nindito, 2018)	Rationalisation, opportunity, pressure, capability, arrogance	FSF	Logistic regression	Detection	Fourteen companies listed on the Indonesian Stock Exchange incurred sanctions from financial service authorities.
(Kamal et al., 2016)	Days Sales in a receivable index, Gross Margin Index, Asset Quality Index, Sales Growth Index, Depreciation Index, Sales, General and Administrative Index, Leverage Index, Total Accruals to Total Assets	M-Score	Beneish M-Score model	Detection	17 listed companies whose directors and top management have been charged by the Securities Commission of Malaysia for fraudulent reporting from 1996 to 2014
(Stalebrink & Sacco, 2007)	Rationalisation	FSF	Conceptual framework	Detection	Austrian government firms
(Irwandi et al., 2019)	Financial stability, Nature of Industry, Audit opinion, Real Earnings management	FSF	Beneish M-score model	Detection	Listed companies on the Indonesian Stock Exchange from 2013 to 2017

### *5.1.3 Measurement of FSF Cluster 1*

The most reliable indicators of FSF and misconduct are the accounting and auditing enforcement releases issued by the Securities and Exchange Commission (Wuerges & Borba, 2014). It is measured by the fraudulent companies reported by regulatory authorities (Utomo et al., 2019). Benfold and Beniesh M scores have been recognised as significant indicators of misappropriations in financial statements (Fitri et al., 2019). Kamal et al. (2016) reported that 82 per cent of the scores from fraudulent Malaysian companies were greater than -2.22, suggesting that Beniesh's M-score has significant measurement accuracy. Omukaga (2020) considers discretionary accruals as a substantial measure of FSF. Perols and Lougee (2011) highlight the reasons for committing fraud, including the reversal of discretionary accruals and constraints on earnings management. Furthermore, the debt covenant hypothesis indicates that firms may engage in revenue-increasing discretionary accruals to circumvent debt covenants. The market expectation hypothesis posits that managers either meet or miss analyst forecasts by misstating financial statements or engaging in earnings management.

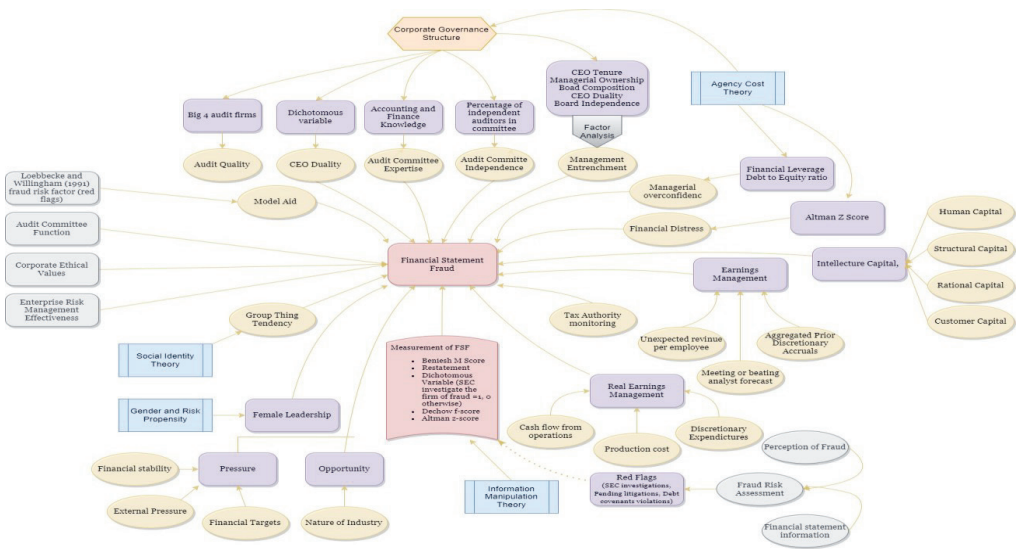
### *5.1.4 Critical Attributes of Cluster 1 Core Publications*

The core publications of Cluster 1 are divided into three research areas. These studies focus on detection models, fraud prevention, and the outcomes of fraudulent misappropriation. Their findings focus on prediction models that use proxies for the fraud triangle, diamond, pentagon, or hexagon to predict FSF. Two studies pertain to the preventive area and address research issues related to external auditors' responsibilities, fraud schemes, management motives, and auditor negligence in preventing fraud misappropriation. The third area of research focuses on outcomes, encompassing studies that address the impact of FSF or the misappropriation of other detrimental factors on the organisation. Cluster 1 comprises two core publications that discuss the effects of fraud on auditor opinion (Malau et al., 2019) and the prediction of business failure due to FSF (Arshad et al., 2015). The scope of the core publication is broad, as it analyses data from the USA, Indonesia, Japan, Nairobi, Austria, and Malaysia. Logistic regression, ordinary least squares (OLS), and the Beneish M-score model are used to identify the research area. Qualitative approaches are used in prevention and outcome research.

## 5.2 Cluster 2: Governance, Earnings Management, and FSF

Cluster 2 examines the dynamic approach of FSF literature in relation to TDMA literature, which significantly deviates from the traditional theoretical framework. Figure 4 highlights essential implications for FSF prediction concerning corporate governance practices and earnings management. It addressed topics that offer insights into various dynamic issues, including intellectual property, discretionary accruals, and internal control mechanisms that elucidate the misappropriation of financial statements. Overall, this cluster utilises capital structure theories, such as the agency cost theory, to justify financial statement misappropriations. It also highlights significant gaps for researchers and implications for corporate governance structures, social norms, earnings management, and control.

Figure 4. Cluster 2 Representation of Core Publications



### 5.2.1 Underpinning Theories

Unlike the fundamental theories reported in Cluster 1, Cluster 2 employs capital structure, earnings management, and corporate governance-related approaches to identify various proxies for predicting FSFs (See Table 6). Seifzadeh et al. (2022) provided a compelling explanation of managers' fraudulent behaviour using agency theory. They explained that the agent-principal relationship,

along with the shareholders' inability to supervise the firm's activities, creates an opportunity for self-interested management strategies. Nor Azhari et al. (2020) examined how corporate governance structures contribute to the management of accounting misstatements. Where clusters stand out across various capital structure theories, some studies incorporate social elements, such as social identity theory, to examine tendencies toward groupthink (Li, 2023). Others, such as Lenard et al. (2017), propose analysing FSF misappropriation under female leadership in terms of gender and risk-taking propensity. BenYoussef and Khan (2017) applied the counterfactual reasoning theory to investigate the possibility of audit enforcement action in relation to auditors' fraud risk awareness.

**Table 6: Theoretical Framework: Stratification of Cluster**

<b>Underpinning theory</b>	<b>Supported Studies</b>	<b>Core Objectives Covered</b>
Agency Theory	(Nor Azhari et al., 2020; Seifzadeh et al., 2022)	<ul style="list-style-type: none"> <li>• Examining the relationship between management entrenchment and FSF.</li> <li>• Investigating the relationships between managerial overconfidence, audit committee, CEO duality, audit quality, and accounting misstatements.</li> </ul>
Earnings management reversal and Constraint hypothesis	(Perols & Lougee, 2011)	<ul style="list-style-type: none"> <li>• Exploring the relationship between earnings management and FSF and building a fraud model.</li> </ul>
Gender and risk	(Lenard et al., 2017)	<ul style="list-style-type: none"> <li>• Investigating the relationship between female business leaders and the incidence of fraud litigation.</li> </ul>
Fraud Triangle	(Brazel et al., 2015; Saleh et al., 2021)	<ul style="list-style-type: none"> <li>• Examining the performance of fraud detection models in predicting FFS.</li> </ul>
Counterfactual reasoning theory	(Eutsler et al., 2016)	<ul style="list-style-type: none"> <li>• Understanding investors' perceptions of FSF and their use of red flags in detecting fraud.</li> <li>• Investigating whether auditors' fraud risk awareness affects the likelihood of audit enforcement action.</li> </ul>
Information Manipulation Theory Social identity theory	(BenYoussef & Khan, 2017) (Li, 2023)	<ul style="list-style-type: none"> <li>• Examining the effectiveness of restatement information in detecting fraud.</li> <li>• Analysing the relationship between groupthink tendencies in top management teams and financial reporting fraud.</li> </ul>

### 5.2.2 *Determinants of FSFs*

Table 7 presents the key publications that identified the determinants of FSF. Nugraheni et al. (2022) are the most prominent researchers in this cluster, who analysed the effects of audit committee functions, ethical values, and risk management effectiveness on the FSF tendency from the theoretical perspective of agency cost. Nor Azhari et al. (2020) discussed how overconfidence may lead managers to create overly optimistic financial statements to minimise agency costs. They also emphasised that the independence and financial expertise of audit committees help decrease the misappropriation of financial reporting. Perols and Lougee (2011) suggest that earnings management is a significant factor in fraud. They indicate that total discretionary accruals, market expectations, and unexpected revenue per employee are indicators of fraud. Bell and Carcello (2000) provide auditors with a tool to prevent financial statement misappropriation by using risk factors. Lotfi et al. (2022) suggest that human, structural, customer, and rational capital are the reasons for substantial internal control and provide foundations for reducing the probability of FSF. Achieving financial stability and meeting financial targets also lowers the likelihood of FSF. Kalbers (2009) considered corporate governance practices and ethical systems to serve as the foundation for reducing FSF.

This cluster also includes the primary study analysis. It highlights investors' perceptions of financial reporting fraud in the economy and their reliance on financial statement information to assess fraudulent activities increases the tendency to use red flags, such as SEC investigations, ongoing litigation involving the company, and debt covenant violations, when making investment decisions (Ali & Khan, 2022). A significant body of literature exists on the relationship between changes in earnings management and fraud in firms. Md Nasir et al. (2018) contributed to the literature by reporting real earnings management, measured by cash flow from operations, discretionary expenditures, and production costs. They indicated that fraudulent firms have lower cash flow from operations, suggesting their involvement in real earnings management. Firms engaged in fraud pursue more aggressive real earnings management strategies compared to non-fraudulent firms. They experience high production costs, lower cash flow from operations, and elevated accruals. Cluster 2 establishes the foundation of positive variables and describes how these variables reduce the likelihood of FSF.

**Table 7: Description of Top Centralised and Impactful Research Publications of Cluster 2**

Reference	Independent Variable	Dependent Variable	Method	Area	Data
(Nugraheni et al., 2022)	Audit Committee Function, Corporate Ethics Values, Enterprise Risk Effectiveness Management	FFS tendency	Explanatory research method	Detection	Questionnaire from 66 companies listed on the Indonesian stock exchange
(Seifzadeh et al., 2022)	Management entrenchment, firm size, leverage, and profitability	FSF	Logit Model Regression model	Detection	187 listed firms at Tehran Stock Exchange from 2013 to 2018
(Nor Azhari et al., 2020)	Managerial overconfidence, Audit committee characteristics, CEO duality, Audit quality, Financial distress	Accounting misstatements	Logistic regression analysis	Detection	237 Malaysian Listed Companies, with 79 companies with a restatement
(Perols & Lougee, 2011)	Aggregated Prior Discretionary Accruals	Fraud	Logistic regression analysis	Detection	First, select firms that commit fraud by keyword search and reading the SEC fraud investigations reported in SEC Accounting and Auditing Enforcement Releases (AAERs) from 1999 to 2005; final data: 54 fraud firms, and non-fraud firms are selected based on reporting year, industry, age, and size.
(Lofli et al., 2022)	Intellectual capital (IC), Human Capital (HC), Structural Capital (SC), Rational Capital (RC), Customer Capital (CC)	Fraud in financial statements	Logistic regression model	Detection	187 listed firms at Tehran Stock Exchange from 2011 to 2018
(Lenard et al., 2017)	Gender of business leaders	Incidence of fraud litigation	Logistic regression model	Detection	We compare a list of companies from the Stanford Securities Class Action Clearinghouse database for 2007-2013 with companies listed in the Compustat database.

Reference	Independent Variable	Dependent Variable	Method	Area	Data
(Saleh et al., 2021)	Financial stability, External Pressure, Financial target, industry nature	False Financial Statements		Detection	53 manufacturing firms listed on the Amman Stock Exchange (ASE) for the year 2015-19
(Eutsler et al., 2016)	Fraud risk awareness	Likelihood of audit enforcement action	Experimental research	Prevention	Auditing and Accounting Enforcement Releases (AAERs) issued by the Securities and Exchange Commission (SEC) for alleged financial reporting fraud between 1995 and 2012
(Bell & Carcello, 2000)	Weak internal control environment, rapid company growth, inadequate or inconsistent relative probability, management placing undue emphasis on meeting earnings projections, management lying to auditors or being overly evasive, the ownership status of the entity, and the interaction term between a weak control environment and an aggressive management attitude towards financial reporting	Likelihood of FFR	Logistic regression model	Prevention	77 fraud engagements and 305 non-fraud engagements
(Brazel et al., 2015)	Investor perceptions of FSF	Use of red flags in detecting FSF	The study uses a mixed-methods approach	Prevention	194 experiences, nonprofessional investors
(Ben Youssef & Khan, 2017)		Identification of FSF using restatement information	Case study approach	Detection	Audit analytic database for a sample of 254 US companies that announced restatement during 2009 - 2010

Reference	Independent Variable	Dependent Variable	Method	Area	Data
(Mason & Williams, 2022)	IRS monitoring	Manager's likelihood of committing accounting fraud	Logistic regression	Prevention	Tax enforcement data from the IRS
(Li, 2023)	Groupthink tendencies in top management teams	Financial reporting fraud	Meta-analysis	Detection	113 publicly listed companies in China from 2011 to 2017. The data was collected from the China Stock Market and Accounting Research (CSMAR) database.
(Md Nasir et al., 2018)	Real earnings management	FSF	Logistic regression analysis	Detection	65 fraud and 65 non-fraud firms in Malaysia
(Kalbers, 2009)	Corporate governance and ethics	FFR	Logistic regression analysis	Detection	NR

### 5.2.3 *Measurement of FSFs*

In terms of the measurement of FSF, there are certain similarities among clusters in the measurement of FSF. Still, there are specific dynamic measurements, such as the likelihood of audit enforcement (Eutsler et al., 2016) and the possibility of FFR (Bell & Carcello, 2000). Brazel et al. (2015) used red flags to measure FSFs, while Nor Azhari et al. (2020) used restatements as a proxy for financial statement misappropriations. They used a qualitative approach by searching for the keywords “restatement,” “restate,” “comparative figure,” “restated,” or “prior year adjustment.” As a result, the binary variable was set to “1” to indicate a restatement and “0” to indicate no restatement. Lenard et al. (2017) also used a binary variable indicating whether firms faced fraud litigation, assigning it a value of “1” for those that did and “0” otherwise. Saleh et al. (2021) determine the false financial statements with the help of the Altman Z score and Dechow f-score. Restatement of financial reports is also a core source of reporting irregularities in financial information. BenYoussef and Khan (2017) indicated that a restatement is considered fraudulent if a relevant form or press release suggests the words “irregularity” or “fraud.” The accounting and auditing enforcement action was initiated by the SEC due to a restatement or independent investigation undertaken by the company as a result of the misstatement.

### 5.2.4 *Major Attribute of Cluster 2*

Cluster 2 indicated that most studies provide a detection model of FSF after analysing the highly impactful and centralised article. It emphasised the importance of fraud risk awareness to prevent FSF and to enhance litigation against auditors following fraud (Eutsler et al., 2016). The studies are related to changes in FSF in response to corporate ethical values and audit committee actions (Nugraheni et al., 2022), management entrenchment (Seifzadeh et al., 2022), governance structure, practices (Nor Azhari et al., 2020), and earnings management (Md Nasir et al., 2018). Some studies report the area for FSF prevention by analysing the likelihood of fraud from a weak internal control environment (Bell & Carcello, 2000), fraud risk assessment with red flags (Brazel et al., 2015), and internal review service monitoring and managers’ likelihood to commit fraud (Mason & Williams, 2022). Among the core publications, the study in the outcomes area proposes that the impact of fraud awareness directly affects the likelihood of implementing audit enforcement action.

### 5.3 Cluster 3: Data Analytics, ML, AI, and Fraud Detection

Cluster 3 focuses on implementing data analytics and ML approaches to predict fraud related to financial statements (See Figure 5). It is based on the dynamic models of ML and AI. Most studies select several financial statement features and employ an ML or AI tool to identify significant differences between fraud and non-fraud firms (Gepp et al., 2021; Kim et al., 2016). Perols et al. (2017) considered data analytics a significant component of a financial fraud prediction model and reported superior results compared to traditional fraud prediction models. Zhou and Kapoor (2011) employed data mining techniques, including decision trees, Bayesian networks, neural networks, and regression, to predict fraud. They suggested that an automated, computer-assisted fraud detection mechanism would be an effective and efficient source of knowledge. Unlike other clusters, the studies lack a theoretical basis for the relationships and comparisons of various variables. This study led to the design of a diagram that not only examines the connections among multiple features or variables and financial misappropriation but also illustrates these relationships using methodological tools to describe them.

#### 5.3.1 Underpinning Theories

The focus of the study is to assess the accuracy of detecting fraudulent firms using ML and AI models, with minimal emphasis on the underlying theories of the relationships among variables, as shown in Table 8. There are specific theories that the core publications of cluster 3 have presented. The primary factors providing the theoretical underpinning for this cluster are the fraud triangle factors: pressure, opportunity, and rationalisation/attitude. The fraud triangle is the source of the studies' deductions, and the relevant studies use the latest ML techniques to identify the significant pressure, opportunity, and rationalisation factors that predict FSF. Agency cost theory is the driving force that compels managers to misappropriate the financial statements to satisfy or deceive the principal shareholders. The misappropriated financial reporting falsely reduces the agency's cost. Singh et al. (2019) derived a data-driven model based on agency cost theory and binary logistic regression to predict fraud in the company's purchase transactions. The cost-sensitive learning theory is used to proxy for fraud intention and classify FSF (Kim et al., 2016). Zhou and Kapoor (2011) used the deductions of Razaee's 3C FSF model to explain financial shenanigans. They predict financial misappropriation using data

mining techniques and test their effectiveness. Self-organising map theories are used to map financial statement integrity.

**Table 8: Theoretical Framework: Stratification of Cluster 3**

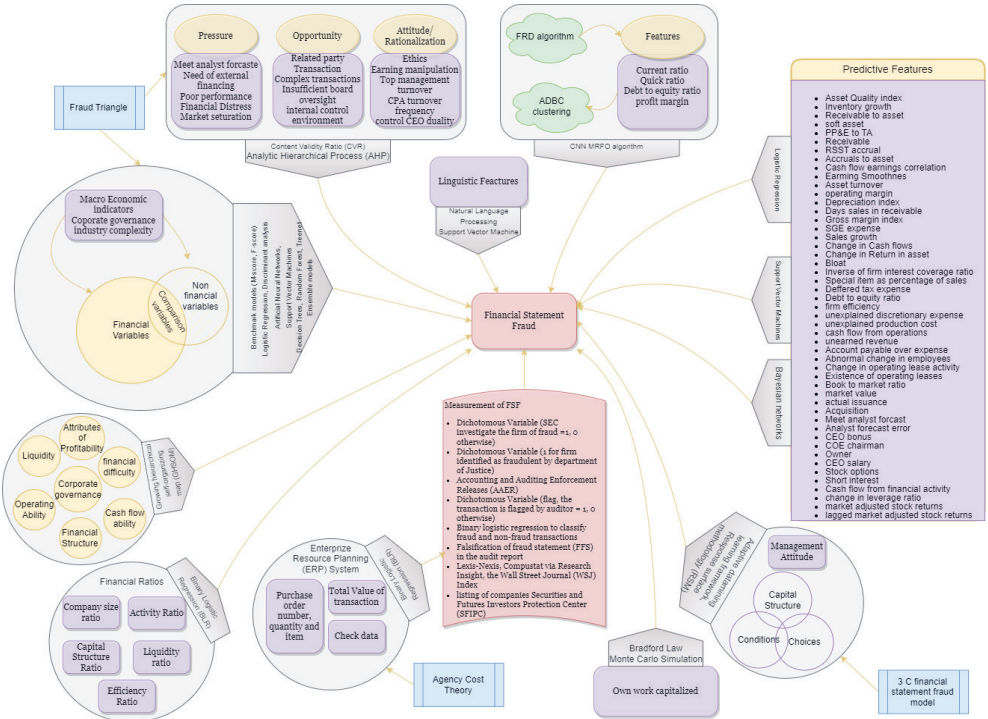
<b>Underpinning Theory</b>	<b>Supported Studies</b>	<b>Core Objectives Covered</b>
Theory of cost-sensitive learning	(Kim et al., 2016)	<ul style="list-style-type: none"> <li>• Develop a multi-class predictive model and a cost-sensitive learning approach to classify financial misstatements by fraud intention.</li> </ul>
Principal agency theory	(Singh et al., 2019)	<ul style="list-style-type: none"> <li>• Develop a data-driven approach to detect and classify fraud.</li> </ul>
Fraud Triangle	(Gepp et al., 2021)	<ul style="list-style-type: none"> <li>• Identify the key input variables and the best-performing model for detecting FSF</li> <li>• Investigating the effectiveness of the fraud triangle in detecting FSF</li> </ul>
Rezaee’s 3C FSF model	(Zhou & Kapoor, 2011)	<ul style="list-style-type: none"> <li>• Consider the existing detection technique based on data mining, provide an overview of financial shenanigans and see their trends, and suggest a new framework to predict FSFs</li> </ul>
Self-Organising Map (SOM) theories	(Huang et al., 2017)	<ul style="list-style-type: none"> <li>• Proposing ways to explore FFR concerning hierarchical self-organising maps to evaluate the integrity of financial statements.</li> </ul>

*5.3.2 Determinants of Fraud Reporting*

Cluster 3 primarily focuses on AI and ML tools rather than the critical determinants of FSF prediction. Most studies select a significant number of variables from the company’s financial statements and utilise various ML or AI tools to estimate the likelihood of FSF. These studies suggest the accuracy and efficiency of predictive tools by comparing them. Gepp et al. (2021) used AI tools to predict the FSF model. They included 50 input variables based on the fraud triangle. They have used benchmark models (M-score, F-score), discriminant and logistic regression, artificial neural networks, SVM, random forest, tenets, and ensemble models to estimate FSF. Financial and non-financial variables are statistically significant, and one ensemble model outperforms all. More corporate governance reduces the likelihood of fraud, while a higher debt-to-equity ratio minimises

it. Additionally, accrual increases the Financial Stability Fund (FSF) percentage. They are adding to the ML approaches to identify the factors that contribute to fraud and predict FSF.

Figure 5: Cluster 3 Representation of Core Publications



Huang et al. (2017) employed the content validity ratio and the analytic hierarchy process to identify significant fraud risk factors based on the pressure, opportunity, and rationalisation components of the fraud triangle. Kim et al. (2016) employed SVM, multinomial logistic regression, and Bayesian models to develop a detection model that identifies firms with fraudulent intentions. Perols et al. (2017) developed a model that addresses significant challenges, including the rarity of fraud observations, the relative abundance of determinants identified in past literature, and the broad, perceptive definition of fraud. Huang et al. (2017) developed a two-stage hierarchical approach to identify unusual financial reporting patterns that differentiate fraud firms from non-fraud firms. (2020) developed a modified random forest model, aiming to provide a classification

model for predicting FSF. Yadav and Sora (2022) improved accuracy while minimising processing time to predict FSF by introducing the unsupervised hybrid learning model CNN-MRFO.

Goel et al. (2010) identified innovative determinants of FSF and suggested that linguistic cues can be exploited to detect fraud. Singh et al. (2019) predicted fraud in purchase transactions using a data-driven Binary Logistic Regression model. Decisions of fraud and non-fraud transactions were based on good receipt notes, purchase orders, purchase requisitions, and general ledgers. Zhou and Kapoor (2011) deduce the Rezaee 3C model, which suggests that FSF is the function of firm condition, choice, and capital structure. These three Cs then shape management's attitude towards fraud motivation. They extract external and internal variables related to management attitude, condition, choice, and capital structure, and predict FSFs using an adaptive data-mining learning framework and response surface methodology.

### *5.3.3 Measurement of FSF*

The studies in Cluster 3 primarily focus on predicting FSF using various AI and ML tools and comparing these tools. The focus on the dynamics of measuring and defining financial misappropriations is minimal. Goel et al. (2010) analysed how linguistic predictors detect FSF. SEC reinforcements are the primary source for identifying fraudulent firms in the cluster (Gepp et al., 2021; Perols et al., 2017). Much focus is on the lists provided by the Securities and Futures Investors Protection Center, which identify fraudulent firms.

### *5.3.4 Attributes of Cluster 3*

Most studies in Cluster 3 focus on the detection area, using ML and AI tools to predict financial statement misappropriations (Yadav & Sora, 2022). At the same time, few studies use qualitative methods to examine perceptions of fraud (Rashid et al., 2023). A lack of studies available on outcomes provides a significant gap. Studies should use ML or AI tools to estimate the potential consequences for companies, regulators, the economy, and other fields arising from financial misappropriations. All the major countries are part of this cluster (see Table 9). Developed and developing countries have conducted studies in this field with large amounts of secondary data. Overall, it provides insightful findings on financial statement detection models that utilise advanced data analytics, including ML and AI. This cluster shows strong potential to detect and prevent financial statement misappropriations.

**Table 9: Dynamics of Core Publications of Cluster 3**

Independent Variable	Dependent Variable	Method	Area	Data	Reference
Macroeconomic variables, corporate governance, industry complexity, financial, non-financial, and comparison indicators.	FSF	Best-performing model identification	Detection	Companies listed on the USA stock exchange	(Gepp et al., 2021)
Nature and prevalence of financial shenanigans	Auditors' Perspectives	Qualitative research	Prevention	50 auditors in Pakistan	(Rashid et al., 2023)
Fraud triangle risk factors	Fraud detection	ML technique	Detection	Experts from academia, industry, analysis, and related fields	(Huang et al., 2017)
Financial data attributes	Financial statement misstatements	Multinomial logistic regression, SVM, and Bayesian Networks	Detection	788 instances (214 instances of irregularities, 355 cases as errors) from 1992 to 2005.	(Kim et al., 2016)
Accounting data in the purchase process	Fraud detection and classification	Logistic Regression	Detection	32117 purchase process transactions from the firm's ERP system	(Singh et al., 2019)
Financial statement ratios, audit, and governance variables	Probability of FSF	Logistic regression and ML techniques	Detection	51 fraud firms and 15934 non-fraud firms	(Perols et al., 2017)
Condition choice, capital structure, and management attitude	Presence/absence of FSF	Response surface methodology	Detection	Not reported	(Zhou & Kapoor, 2011)
Financial statement data	Understanding FFR	ML technique	Detection	Fraud samples issued by regulatory authorities in Taiwan from 1992 to 2006 were used.	(Huang et al., 2017)
Financial ratios	Detection of FFS	Financial ratio analysis	Detection	23 companies from the Athens stock exchange from 2008-18	(Kydros et al., 2022)
Linguistic predictors	Fraudulent financial filings detection	ML technique	Detection	126 fraud companies and 405 fraud years from 1993 to 2006	(Goel et al., 2010)
Financial statement data	Fraud detection	ML technique	Detection	Textual and Numeric data from the financial statements	(Yadav & Sora, 2022)
Financial statement data	FSF	ML technique	Detection	1591 fraud and 31628 non-fraud instances from the Korean stock exchange	(An & Suh, 2020)
Financial statement attributes	FFS	ML technique	Detection	457 fraudulent quarterly statements of 56 companies from 2008-16	(Cheng et al., 2021)

## 5.4 Cluster 4: Primary Study-Focused Behavioural Determinants of FSF

Cluster 4 is markedly different from the other clusters, indicating a grasp of the behavioural factors that shape the concept and perception of FSF. It is based on studies that measure various forms of misappropriation in financial statements, whereas most reported studies are primary. Several studies used survey methods, which provided a better understanding of the respondents' perspectives and behaviours. In most studies, respondents include auditors and management involved in fraudulent cases, which helps determine the behaviour and intentions behind FSF. Figure 6 offers essential insight into the cluster, with the grey structure representing the primary variable influencing financial statement misappropriations. Cluster 4 also reports that the dynamic theories in the blue format differ significantly from those in other clusters. Surveys are standard tools for conducting exploratory research on FSF. In contrast to the various clusters in the study, the emerging independent variables comprise client narcissism, C-suite executive immersion, the whistleblowing triangle, adherence to Islamic professional ethics, and the role of the Sharia supervisory board. The measurement of financial statement misappropriation also involves a dynamic approach that encompasses fraud symptoms, the rationalisation of misreporting, the intention behind FSF, the effectiveness of regulators, and the auditor's perception of fraud attitude risk, among other factors. Identifying significant gaps and emerging topics would make a substantial contribution to the literature on fraud.

### 5.4.1 Underpinning Theories

The fraud triangle is crucial in cluster 4. It asserts that a person engages in fraud for three reasons: pressure, opportunity, and rationalisation (Marshall & Cali, 2015). Scholars utilised it to examine how these factors influence attitudes, Machiavellianism, and the rationalisation of misreporting (Murphy, 2012). It primarily focuses on identifying fraudsters' behaviours, so the main theories used in this cluster are the Theory of Planned Behaviour and the Reasoned Action Theory (Awang & Ismail, 2018). Both theories are commonly employed to understand individuals' intentions and behaviours. Prospect theory is also a key concept in the behavioural economics literature, used to investigate the determinants of FSF among accounting practitioners. Furthermore, the theories and their primary objectives are presented in Table 10.

**Table 10: Theoretical Framework: Stratification of Cluster 4**

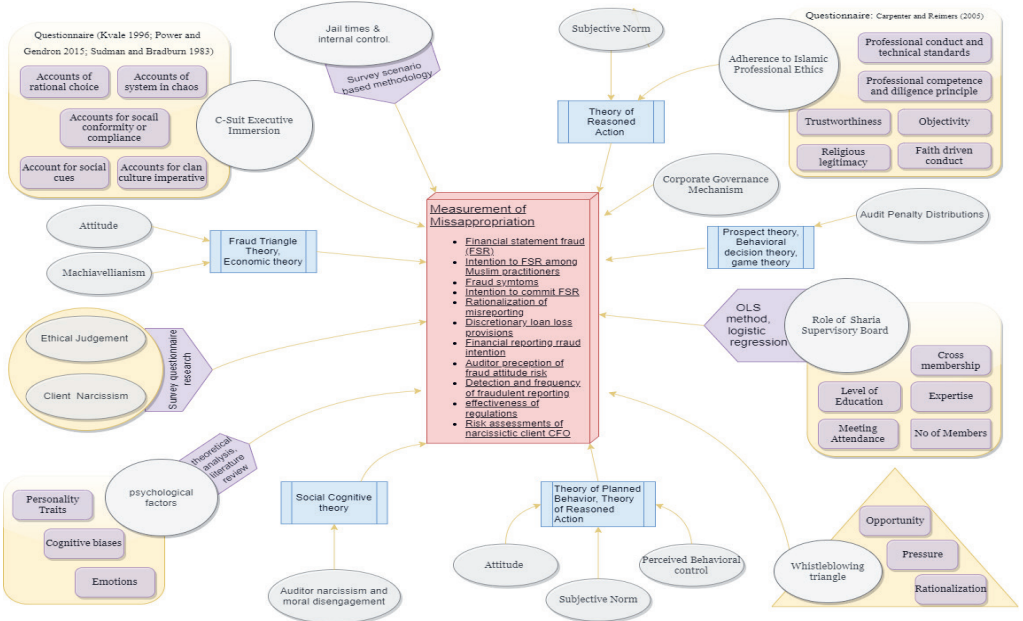
Underpinning Theory	Supported Studies	Core Objectives Covered
Fraud Triangle	(Marshall & Cali, 2015; Murphy, 2012)	<ul style="list-style-type: none"> <li>Analysing the FFR.</li> <li>Examining the relationship between attitudes, Machiavellianism, and the rationalisation of misreporting.</li> </ul>
Socialisation Theory	(Suh et al., 2020)	<ul style="list-style-type: none"> <li>Examining the psychological and social mechanisms that lead to fraudulent behaviour among C-Suite financial executives.</li> </ul>
Theory of Planned Behaviour & Theory of Reasoned Action	(Awang, 2019; Carpenter & Reimers, 2005)	<ul style="list-style-type: none"> <li>Understanding the factors that lead to unethical and FFR.</li> <li>Examining the impact of attitude, subjective norm, and adherence to Islamic professional ethics on fraud intention in</li> <li>Financial reporting.</li> <li>Investigating the determinants of financial reporting fraud intention among accounting practitioners in the banking sector in Malaysia.</li> </ul>
Organisational Theory, Agency Theory, Prospect Theory, Theory of Motivated Reasoning, Self-affirmation Theory, Neutralisation Theory, Moral Disengagement Theory	(Murphy & Dacin, 2011) (Smaili & Arroyo, 2019)	<ul style="list-style-type: none"> <li>Developing a categorisation of whistleblowers based on the whistleblowing triangle framework.</li> <li>Examining the impact of Sharia supervisory board attributes on reducing FSF in Islamic banks.</li> <li>Investigating the determinants of financial reporting fraud intention among accounting practitioners in the banking sector in Malaysia.</li> </ul>
General Deterrence Theory, Social Projection Theory	(Ugrin & Odom, 2010)	<ul style="list-style-type: none"> <li>Examine the effects of the Sarbanes-Oxley Act on individuals' attitudes, norms, and intentions to commit FSF.</li> </ul>
Classical Accounting Measurement theory, Reliability Theory	(Smieliauskas, 2008)	<ul style="list-style-type: none"> <li>Propose a framework for identifying and avoiding FFR.</li> </ul>
Prospect Theory, Behavioural Decision Theory, Game Theory	(Burton et al., 2011)	<ul style="list-style-type: none"> <li>Examine the impact of audit penalty distributions on the detection and frequency of fraudulent reporting.</li> </ul>
Institutional Theory, Social Exchange Theory, Social Identity Theory, Path-Dependence Theory	(Lee et al., 2020)	<ul style="list-style-type: none"> <li>Examine the influence of auditor narcissism and moral disengagement on risk assessments of a narcissistic client CFO.</li> </ul>
Social Cognitive Theory	(Johnson et al., 2021)	<ul style="list-style-type: none"> <li>Examine the influence of auditor narcissism and moral disengagement on risk assessments of a narcissistic client CFO.</li> </ul>

#### 5.4.2 *Determinants of Misappropriation in Financial Statements*

According to the FTT, three factors are essential for a person involved in fraud. However, there remains a need to clarify how rationalisation and attitude drive someone to misreport and commit fraud in financial statements (See Table 11). Murphy (2012) examined it using surveys and experiments and found that attitudes and Machiavellianism are essential determinants of the rationalisation of misreporting. The theory of planned behaviour posits that attitude, subjective norms, and perceived behavioural control are the primary factors influencing a person's intention to act. The primary focus of this cluster is understanding fraudsters' behaviour. Such as accountants, auditors, or management engaged in fraud, and their attitudes, subjective norms, and perceived behavioural control as intentional factors in FSF (Carpenter & Reimers, 2005). (2019) further finds that adherence to Islamic professional ethics could also play a significant role in the intentions of fraud while investigating the behaviour of Muslim accounting practitioners. Internal control and whistleblowing systems are crucial in preventing and detecting fraud within any organisation (Lee et al., 2020). In Muslim countries, multiple Shariah-compliant boards and committees within banks and organisations ensure compliance with Shariah and Islamic rules and regulations. So, the presence of the Sharia supervisory board and its attributes are also significant factors in controlling FSF (Anisykurlillah et al., 2020).

Psychological factors (personality traits, cognitive biases, and emotions) are essential factors for a person involved in FSF (Murphy & Dacin, 2011). The Sarbanes-Oxley Act, general deterrence factors, jail time, and internal control factors significantly impact attitudes and intentions toward fraud (Ugrin & Odom, 2010). While investigating fraudsters' behaviour directly through surveys or questionnaires, studies found that, in addition to attitudes and subjective norms, a person's ethical behaviour also plays a significant role in the intentions and behaviour of individuals involved in FSF (Awang & Ismail, 2018). Johnson et al. (2021) found that auditor narcissism and moral disengagement play a significant role in risk assessments of a narcissistic client CFO. Strong internal control within a company helps prevent fraud by management and accountants. For this purpose, the company's auditors must be accurate and fair in their conduct and capable of reporting fraud. Burton et al. (2011) found that the distribution of audit penalties plays a vital role in the detection and frequency of fraudulent reporting by auditors. Client narcissism is also a significant factor influencing the auditor's perception of fraud attitude risk.

**Figure 6: Cluster 4 Representation of Core Publications**



### 5.4.3 Measurement of FSF

Cluster 4 mainly focused on the behavioural determinants of FSF. Therefore, the primary measurement tools are surveys and questionnaires. Murphy (2012) examines how attitudes and Machiavellianism influence the rationalisation of misreporting through a survey. Additionally, the effects of attitudes, subjective norms, and perceived behavioural control on the intention to commit FFR are also evaluated. (Carpenter & Reimers, 2005). Muslim accounting practitioners also conduct surveys to examine the impact of adhering to Islamic professional ethics, attitudes, and subjective norms on their practices, and to determine whether there is a significant difference in the intentions behind fraud based on religion (Awang, 2019). Johnson et al. (2013) examine the impact of client narcissism on auditor perceptions of fraud attitude risk. Suh et al. (2020) reported on the narrative behind the fraud. Additionally, in this cluster, the importance of whistleblower categorisation (Smali & Arroyo, 2019) and the attributes of Sharia supervisory boards to FSF (Anisykurlillah et al., 2020) are also discussed.

**Table 11: Top Centralised and Impactful Research Publications of Cluster 4**

<b>Independent Variable</b>	<b>Dependent Variable</b>	<b>Method</b>	<b>Area</b>	<b>Data</b>	<b>Reference</b>
Tone at the top, governance structure	Fraud symptoms	Case study	Prevention	Data from Safenet Inc	(Marshall & Cali, 2015)
Fraud	C-Suite financial executives	Face-to-face interviews	Outcomes	13 former C-Suite financial executives during 2000-2006	(Suh et al., 2020)
Attitude, Machiavellianism	Rationalisation of misreporting	Survey	Cause	119 pilot surveys	(Murphy, 2012)
Attitude, subjective norms, perceived behavioural control.	FFR detection	Survey	Cause	62 MBA students	(Carpenter & Reimers, 2005)
Attitude, subjective norm, adherence to Islamic professional ethics	Fraud intention in financial reporting	Survey	Cause	121 Muslim accounting practitioners	(Awang, 2019)
Whistleblower categorisation		Survey and Content Analysis	Dimensions	11 whistleblowing cases of	
Corporate FSF in Canada between 1995 and 2012	(Smaili & Arroyo, 2019)				
Sharia supervisory board attributes	FSF	Logistic Regression Analysis	Cause	11 Islamic commercial banks in Indonesia during 2014-2018	(Anisykurillah et al., 2020)
Psychological factors (such as personality traits, cognitive biases, and emotions)	Fraud in organisations		Cause	Not Reported	(Murphy & Dacin, 2011)

<b>Independent Variable</b>	<b>Dependent Variable</b>	<b>Method</b>	<b>Area</b>	<b>Data</b>	<b>Reference</b>
Attitude, subjective norms, and ethical judgment	Financial reporting fraud intention	Survey	Cause & Preliminary	121 participants in the financial reporting process in Malaysian banking institutions.	(Awang & Ismail, 2018)
General deterrence factors (severity, certainty, and swiftness of punishment), jail times, and internal control	Attitudes towards fraud, subjective norms, and intentions to commit FSF.	Scenario-based methodology	Outcomes	2 sets of participants: students and corporate executives.	(Ugrin & Odom, 2010)
Client narcissism	Auditor perception of fraud attitude risk	Survey questionnaire: Scenario-based	Cause	Quasi-experimental setting, practising auditors of the USA	(Johnson et al., 2013)
Audit penalty distributions	Detection and frequency of fraudulent reporting	Qualitative	Preliminary	Forty-nine students	(Burton et al., 2011)
Whistle-blowing regulation	Effectiveness of the regulation	Comparative Analysis	Outcomes	Survey data from 602 employees in the United States and 437 employees in Germany.	(Lee et al., 2020)
Auditor narcissism and moral disengagement	Risk assessments of a narcissistic client, CFO	Survey	Causes	Conduct a quasi-experiment with 118 auditors from three international audit firms.	(Johnson et al., 2021)

#### 5.4.4 *Attributes of Cluster 4*

Most studies in cluster 4 focus on predicting FSF in various ways, and most are primary studies. These studies employ various qualitative techniques, including surveys, content analysis, and interviews, to identify FSF. The primary focus of this cluster is to understand the behaviour of fraudsters, including accountants, auditors, and management, who are involved in fraud. That is why the primary literature focuses on attitude, subjective norms, and perceived behavioural control as motivational factors that can lead to committing fraud. It also suggests that religious beliefs, psychological traits, and a strong regulatory system are key factors in preventing fraud. This cluster suggests future research avenues to prospective scholars.

#### 5.5 *Comparative Synthesis Across Clusters*

The findings highlighted four clusters, each with unique characteristics, as explained in their respective section. While each cluster provides unique insights, a cross-cluster comparison reveals essential interconnections. Clusters 1 and 2 share a common theoretical foundation in agency and fraud theories but differ in their empirical focus. Cluster 1 emphasises traditional theoretical proxies, whereas Cluster 2 integrates corporate governance and earnings management dynamics. Cluster 3 extends these frameworks by operationalising them through AI- and ML-based detection models, representing a methodological evolution from theory-driven to data-driven approaches. Finally, Cluster 4 complements the prior clusters by addressing the behavioural and psychological determinants of fraud, offering human-context explanations that broaden the interpretive scope of FSF studies. This synthesis indicates that the intellectual structure of FSF research has shifted from static theoretical modelling to dynamic, interdisciplinary frameworks combining behavioural insights, governance mechanisms, and computational analytics. Such comparative insights highlight the progressive convergence of technological and behavioural approaches in fraud detection and prevention.

#### 5.6 *Underrepresented Regions, Themes, and Methodologies in FSF Literature*

The bibliometric coupling and TDMA mapping reveal that the geographical distribution of FSF research is highly concentrated in a few regions, particularly the United States, China, Malaysia,

and Indonesia. In contrast, Africa, the Middle East (excluding Gulf countries), and parts of Eastern Europe remain underrepresented in FSF scholarship. The lack of research from these regions may be attributed to limited access to corporate databases, inconsistent reporting standards, and weaker regulatory enforcement mechanisms. Future studies should therefore prioritise cross-country comparative analyses and regional case studies to uncover contextual differences in fraud determinants and prevention systems. Thematic analysis further indicates that the behavioural and psychological dimensions of fraud, such as ethical climate, cognitive biases, and leadership culture, are less explored than the governance and detection themes. While recent studies in Cluster 4 have begun addressing these areas, they remain limited in number. Expanding behavioural perspectives could enhance understanding of the human element in fraud motivation and rationalisation, offering complementary insights beyond quantitative detection models. From a methodological standpoint, most studies employ secondary quantitative data and statistical or ML models, whereas qualitative and mixed-method approaches are relatively scarce. Few studies triangulate survey-based insights with archival or experimental data. Additionally, emerging analytical techniques such as natural language processing (NLP), text mining, and network analysis are still underutilised in FSF research, despite their potential to identify subtle fraudulent patterns in disclosures and narratives. Addressing these gaps through regional diversification, thematic expansion, and methodological innovation will strengthen the global and interdisciplinary relevance of FSF research and contribute to a more comprehensive understanding of fraud detection and prevention.

## **6. Conclusions**

The study conducts bibliometric coupling to elaborate on clusters based on contemporary research streams. It focuses on core publications with high centrality and impact values. Its objective is to analyse the TDMA literature of the core publications in each cluster. Four significant clusters are identified, each with dynamic research streams. The first cluster is based on the traditional approach to FSF, which discusses traditional fraud theories such as the fraud triangle, diamond, pentagon, and hexagon. It also provides proxies of conventional views to detect the FSF. Cluster 2 relates to the FSF's responses to governance structures, ethical codes and conduct, and earnings management. Most of the studies focus on the detection model. The third cluster of FSF literature is based on a detection

model using contemporary, dynamic ML and AI tools. Cluster 4 includes primary studies that analyse and estimate financial statement misappropriations and perceptions. All four clusters are unique and offer a dynamic approach to assessing the FSF.

### *6.1 Theoretical and Practical Contributions*

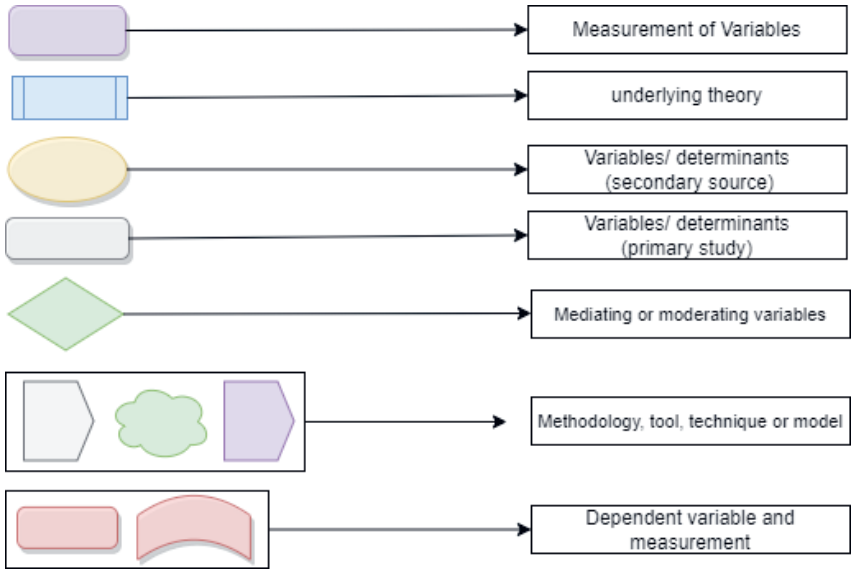
FSF has recently become an area of immense importance to stakeholders, as they seek to validate the reliability, transparency, and uniformity of the reported data before making investment decisions. The increasing number of accounting scandals raises questions about the credibility of financial statements, corporate governance, and audit reporting. That is why the study's findings make several theoretical and empirical contributions to the field of FSF. First, it advances FSF literature by integrating bibliometric coupling into the TDMA framework, unlike traditional keyword, citation, and co-occurrence analyses. It provides a comprehensive framework for analysing the intellectual structure of FSF. Second, the clustering analysis reveals a progressive evolution of the FSF literature from traditional theory-driven models (Clusters 1-2) to data-driven and behaviorally informed approaches (Clusters 3-4), thereby contributing to theory building on the dynamic and multidisciplinary nature of financial fraud research. Third, it will guide practitioners in developing corporate governance and internal control frameworks and implementing them to mitigate anticipated fraud opportunities. Fourth, it will guide the authors to include advanced AI and ML-based analytics for FSF detection at the initial stage. It can help them minimise the risk of fraud. Fifth, the findings have highlighted the significance of implementing a whistleblowing mechanism, ethical leadership, and moral values within the organisational culture to better address the FSF determinants.

### *6.2 Limitations and Future Direction*

The study has certain limitations. First, it utilises 576 documents, including articles, conference papers, and review articles, yet much more literature is available on FSF. However, researchers do not cover all the literature using bibliographic techniques. Therefore, further studies can focus on the remaining literature and articles from different impact factors. Second, it employs bibliometric analysis to examine the literature on the FSF. Nevertheless, systematic approaches can offer a better understanding and scope while exploring the literature's objectivity. Third, Scopus was chosen

exclusively because of its comprehensive multidisciplinary coverage, high-quality indexing standards, and robust citation metadata, which are essential for bibliometric coupling analysis. Although Scopus provides broader coverage than Web of Science or Google Scholar, the exclusive use of a single database may omit some relevant sources that are indexed elsewhere. This limitation is acknowledged, and future research may expand to include Web of Science or Dimensions. ai databases to validate and enrich the results. Fourth, it includes only publications in English. Future studies may also consider conducting a bibliometric analysis using literature from different languages. Fifth, ML and AI play a significant role in developing many fields of life. Cluster 3 primarily predicts and detects FSF using various types of corporate data. A lack of studies in that cluster persists, along with the use of ML and AI models to enhance and develop outcomes from the FSF. This gap needs to be addressed in future research studies.

**Appendix A: Meaning of Common Structures and Colours Used in Figures**



## Appendix B: Table of Acronyms

Acronyms	Description
FSF	Financial Statement Frauds
FFD	Financial Fraud Detection
FFR	Fraudulent Financial Reporting
FTT	Fraud Triangle Theory
AI	Artificial Intelligence
ML	Machine Learning
SVM	Support Vector Machine

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