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The Evolution of Fraud Theory: Theoretical Frameworks and Technological Integration

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ABSTRACT

This study explores the evolution of fraud theories by integrating classical principles with cutting-edge technological advancements. Through a comprehensive qualitative analysis of peer-reviewed literature in Scopus, informed by theoretical synthesis, the study examines predominant fraud models and the influence of modern tools such as artificial intelligence (AI) and data analytics. The findings reveal a significant shift from traditional, static models focused on individual misconduct to more dynamic, multi-level frameworks that incorporate factors like capability, collusion, and organizational integrity. Drawing from criminological and sociological perspectives, the research underscores that fraud is a systemic issue influenced by organizational culture and social structures. It highlights how AI enhances fraud detection capabilities and challenges existing theoretical assumptions by framing fraud as an adaptive, network-based phenomenon. The study underscores the importance of incorporating ethical and social dimensions into fraud models to improve their relevance and effectiveness. In practice, the research advocates for the development of more sophisticated and proactive fraud-prevention strategies that leverage technological advances. This study's originality lies in its innovative integration of classical fraud theories with modern technological practices, offering a holistic approach that bridges theoretical development and practical application through interdisciplinary insights, thereby providing a comprehensive framework for understanding and combating fraud in the digital age and contributing valuable perspectives to both academic and professional fields.

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1. INTRODUCTION

Fraud theory has been a prominent model for explaining fraudulent activities at the individual, organisational, and societal levels. One of the earliest techniques, Cressey's Fraud Triangle, which examines pressure, opportunity, and rationalisation as key drivers of fraud, has had widespread appeal in the academic literature and regulatory policy (Homer, 2020). These and other core models have subsequently been extended to incorporate additional dimensions such as capability, ego, and integrity, thereby enabling the development of frameworks, including the Fraud Diamond, Fraud Pentagon, and Integrity-based (Saluja et al., 2022; Vousinas, 2019). Modern fraud research increasingly adopts an interdisciplinary perspective, drawing on fields such as criminology, psychology, accounting, organisational science, and information systems to address the complex, evolving nature of fraud in the current economic context (Ramzan and Lokanan, 2025). In addition, the predictive model has been empirically tested beyond the fraud triangle across sectors in subsequent research, providing evidence of its strengths and limitations (Homer, 2020; Suryandari et al., 2023). These findings have led to the development of enhanced models, including the Fraud Diamond and Pentagon, which focus on the lack of competence or inability, and the level of dominance in personal behaviour (Devi et al., 2021; Nugroho, 2022; Vousinas, 2019).

The development of fraud theory has been primarily shaped by regulatory initiatives and high-profile corporate failures that revealed the deficiencies inherent in traditional models. Incidents such as Enron and Parmalat, coupled with regulatory frameworks – the Sarbanes–Oxley Act, for example – have led to investigations into governance mechanisms, organisational culture and system-level determinants that go beyond individual predisposition. Consequently, theories of fraud have increasingly turned to more dynamic and multifaceted accounts that recognise the interplay between specific acts, on the one hand, and broader organisational order and wider socio-economic processes, on the other (Freeman, 2025; Messner and Rosenfeld, 2009). Recent systematic reviews indicate that there is an increasingly emerging movement from individual strategies to organisational and societal levels of analysis, which underscore the quality of governance, ethical values and organisational culture as the prime sources of fraud risk (Beaulieu and Reinstein, 2020; Said, Asry, et al., 2018; Saluja et al., 2022). Furthermore, criminological theories such as strain theory and institutional anomie theory have more recently been incorporated into the accounting and fraud literature, demonstrating a search for multilevel determinants of fraudulent behaviour (Ramzan and Lokanan, 2025).

However, many gaps remain in the literature. First, many fraud theories continue to evolve despite rapid technological advances, including the growing use of artificial intelligence (AI) and machine learning (Prakash and Deokar, 2024; Thakkar et al., 2025). Second, empirical studies are heavily focused on developed countries and specific industries (Kassem, 2024; Saikhu et al., 2025). Third, while the need for such integrated, complexity-oriented frameworks has been voiced in several publications, there is little synthesis that addresses the well-knit integration of traditional fraud-based theorising, speculative interdisciplinary theoretical inventions, and techno-social integrity across an evolutionary arch. While existing research in the field of fraud theory or technology often focuses solely on either fraud theories or applications, extant reviews lack an integrative view that systematically brings together the historical development of fraud theory and interdisciplinary theoretical extensions, as well as technological integration with a focus on AI-driven approaches (Freeman, 2025; Thakkar et al., 2025). This fragmentation alludes to a significant blind spot in our understanding of fraud as a dynamic rather than a static system.

Thus, this study aims to provide an exhaustive summary of the development of fraud theory. The originality of this work lies in the extended theoretical frameworks and new technology-oriented dimensions, especially AI-based methods, into a consolidated conceptual framework. In contrast to earlier studies that pursue theoretical development and instrumental application in isolation, this

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study links classical fraud theories and technological applications into a single function that illustrates how fraud theory has evolved into an ecologically-like, forked system that responds to regulatory, organisational, and digital stimuli.

Thus, the purpose of this study is to investigate the evolution of fraud theory to date by (1) examining the origins and classical foundations of fraud and (2) applying current technologies, namely artificial intelligence and data analytics, into existing theories. From this vantage point, the paper's follow-up purpose is to promote a holistic interpretation of fraud theory and to develop a conceptual map to guide empirical and technological research on prevention and detection programs.

2. METHODS

This study employs a qualitative, document-based research design focused on theoretical synthesis. It aims to identify, categorize, and integrate key theories of fraud. Peer-reviewed articles indexed in Scopus are regarded as authoritative sources of validated academic insights into fraud theory. This approach aligns with the study's goal of critically analyzing the evolution of theories, shifts in concepts, and development of themes in fraud research over time, rather than quantifying effect sizes or creating bibliometric maps. By concentrating on academic papers through this methodological lens, the study facilitates a detailed theoretical synthesis and contextual historical interpretation.

The data for this study consist solely of peer-reviewed journal articles indexed in the Scopus database. Scopus was chosen for its coverage of high-impact journals in accounting, criminology, and management, as well as in information systems and the interdisciplinary social sciences; thus, it is especially relevant for capturing the diversity of fraud theory development. Only English-language articles from academic journals were selected. Conference papers, book chapters, working papers, and non-peer-reviewed material were excluded to ensure academic rigour.

The selection of documents was purposive, guided by the focus criteria. Articles were accepted if they: (1) explicitly mentioned fraud theory or conceptual models of fraud; (2) included empirical testing of a fraud framework (e.g., Fraud Triangle, Fraud Diamond, Fraud Pentagon, integrity-based approaches); or 3) discussed the theoretical implications for the role of technological tools such as artificial intelligence/machine learning and data analytics in detecting and preventing fraud. Articles were disqualified if they presented only the technical side of fraud without a theoretical discussion, treated fraud exclusively from a legal or compliance perspective, or appeared not to have conceptual relevance. Such a purposive approach is consistent with qualitative document analysis, which seeks theoretical depth rather than exhaustive counting (Creswell and Poth, 2016).

In line with previous accounting research that used a similar qualitative approach, studies such as Saluja et al. (2022) has employed qualitative literature reviews to integrate fraud theories and identify evolving accounting frameworks. These studies sought to merge theoretical insights with empirical findings to provide a broader understanding of fraud in accounting and finance. Following a similar approach, this study aims to provide a comprehensive theoretical integration of fraud theory development while also addressing the growing role of technology in fraud detection and prevention.

Qualitative thematic analysis was used to interpret the selected documents. All articles were read word-for-word and inductively coded to identify emergent themes, theoretical premises, and patterns of argumentation regarding the development of fraud theory. Codes were subsequently organised into broader themes, representing the theoretical underpinning and the technological enactment. The positioning of technological perspectives, such as artificial intelligence and data analytics, within existing or parallel theories was highlighted, thereby promoting the construction of an integrative theoretical knowledge. This synthesis, which involves analysis at the thematic and

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historical levels of abstraction, provides a storyline that foregrounds continuity and change in fraud theory.

3. RESULTS AND DISCUSSION

The theory of fraud has evolved from static models focused on the individual to dynamic systems that integrate psychological, organisational, and societal factors. Empirical evidence also increasingly favours integrating integrity, ethics, and situational factors, reflecting a more complex understanding of contemporary fraud. **Figure 1** illustrates that fraud is no longer just an individual act but a complex, adaptive system involving social, cultural, psychological, and technological dynamics.

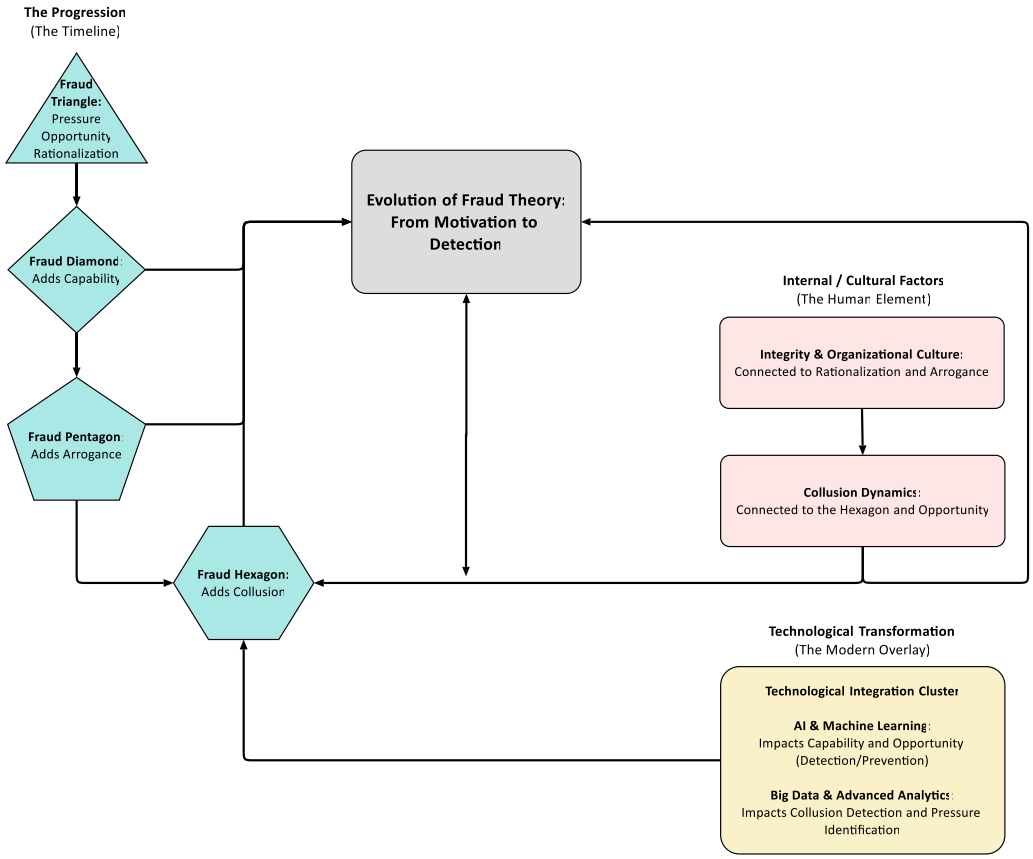

Figure 1. Conceptual Framework

3.1. The Fraud Triangle and Its Extensions

The Fraud Triangle is a widely used conceptual model that explains the factors that motivate fraud. Criminologist Donald Cressey conceptualised it and posited that three factors must be present for fraud to occur: pressure, opportunity, and rationalisation (Lederman et al., 2021; Persulessy et al., 2022; Suryandari et al., 2023). Pressure relates to the reason or justification for fraud. It is commonly associated with financial pressures, such as personal debt or financial hardship, but it may also involve other sources of pressure, including job dissatisfaction or unrealistic performance expectations (Homer, 2020; Lederman et al., 2021; Suryandari et al., 2023). For instance, at the academic level, pressure can be generated by the requirement to succeed or to meet academic requirements (Persulessy et al., 2022).

Opportunity is your perceived chance to commit theft without detection. This factor encompasses the strength of internal controls and oversight within an entity (Oktavia and Rinaldo,

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2023). Poor internal control systems or a lack of monitoring are the reasons for fraudulent activities (Homer, 2020; Lederman et al., 2021; Suryandari et al., 2023). In an online learning environment, opportunities for academic cheating may increase without direct observation (Persulessy et al., 2022).

Rationalisation is the cognitive process by which individuals justify their fraudulent actions. It allows fraudsters to align their behaviour with their personal values, making it easier to commit fraud without feeling guilty (Homer, 2020; Lederman et al., 2021; Suryandari et al., 2023). However, some studies suggest that rationalisation may not always play a significant role in academic fraud, as individuals may still feel guilt despite their justifications (Persulessy et al., 2022). The table is shown in **Table 1**.

Table 1. Criticism of fraud triangle theory

Dimension of Criticism	Key Arguments	References
Incompleteness in Explaining Motivations	Does not cover all motivations, such as psychological gratification and personal characteristics	Ayu Suryandari et al. (2023); Homer (2020); Ramzan and Lokanan (2025); Roffia and Poffo (2025)
Limited Applicability Across Contexts	Insufficient in contexts like tax compliance, academic fraud, and government procurement fraud	Lederman et al. (2021); Saesarea and Rahman (2025)
Practical Limitations	Not all elements are necessary; this approach presents a restricted view of fraud.	Contreras-Pacheco (2025); Ramzan and Lokanan (2025); Tickner (2021)
Contextual and Cultural Variations	Varies across cultural and organisational contexts; factors like religiosity and social incentives.	Said, Omar, et al. (2018); Zuberi (2019)

Source: Processed Data (2025)

Although the Fraud Triangle is a classic model, it has been criticised for oversimplifying and failing to encompass a broader spectrum of fraud-related motives. A significant criticism of this model is that it fails to consider psychological characteristics, self-satisfaction, and environmental factors that can motivate fraudulent behaviour, regardless of fraud type (Homer, 2020; Ramzan and Lokanan, 2025; Suryandari et al., 2023). Empirical evidence shows that paying off high debt pressure is not the sole reason for an individual to engage in fraud; persons might also be driven by hedonistic values such as pleasure and excitement, or a thrill-seeking attitude or even ego satisfaction, leading to expanded forms of models known as Fraud Polygon encompassing enjoyment and risk-willing desire (Roffia and Poffo, 2025).

Furthermore, the Fraud Triangle has limited applicability across diverse contexts, including tax compliance, academic misconduct, and public-sector fraud. In these settings, additional factors such as ex ante anxiety, Machiavellianism, perceived behavioural control, and the quality of governance structures play a critical role in shaping fraudulent behaviour yet remain unaddressed by the traditional framework (Lederman et al., 2021; Saesarea and Rahman, 2025). These situational limitations suggest a broader social theory of fraud in which it is not just something that drives fraudsters, but also "something to be explained".

From an empirical standpoint, other researchers have challenged the cross-cultural generalizability and operational relevance of the Fraud Triangle. The presence of all three is not an absolute requirement for fraud to occur (this is particularly the case when all three are weak); in such cases, rationalisation alone mediates the opportunity-action relationship, making the model's prediction counterproductive (Ramzan and Lokanan, 2025). As a result, modern-day risk professionals and fraud investigators decry the Fraud Triangle for providing a simplistic, overly linear

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view of fraud that fails to represent or inform about the complex, multifaceted forms in which fraud is perpetrated today (Contreras-Pacheco, 2025; Tickner, 2021). Furthermore, the model is not invariant across cultural and institutional contexts (Al-Zubaidi et al., 2019; Said, Asry, et al., 2018; Zuberi, 2019). In developing economies, religiosity, social incentives, and ethical norms strongly influence aspects of fraud behaviour but are not included in the framework itself.

In light of such criticisms, the Fraud Triangle has evolved, giving rise to newer and more comprehensive models. The Fraud Diamond brings the skill and authority to exploit opportunities (Boyle, 2015) into view of a model, while both the Fraud Pentagon and Hexagon extend it by deviating on components like arrogance, collusion or social nature that point out at fraud dynamics' complexity within organisational frameworks (Roffia and Poffo, 2025). Extensions to the model have been proposed to overcome these limitations, as summarised in **Table 2**.

Table 2. Evolution model of fraud theory

Theory	Components	Introduced By	Year
Triangle	Pressure, Opportunity, Rationalisation	Donald Cressey	1953
Diamond	Triangle + Capability	Wolfe and Hermanson	2004
Pentagon	Diamond + Arrogance	Crowe Horwath	2011
Hexagon	Pentagon + Collusion	Georgios Vousinas	2019

Source: Processed Data (2025)

Then, the Fraud Diamond Theory was developed to address conceptual limitations of the traditional Fraud Triangle by introducing a fourth element, capability, which captures the personal traits and competencies required to commit fraud. Whereas the Fraud Triangle implies that there is sufficient pressure, opportunity, and rationalisation to lead to fraud (Cressey, 1953), Empirical and theoretical work indicate that these are not present in everyone, nor are they exploitable by everyone in similar situations (Boyle, 2015; Wolfe and Hermanson, 2004)—Opportunity Factors. Opportunity factors represent knowledge, the ability, pressure, rationalisation, and experience that allow perpetrators to identify fraud opportunities, override internal controls, and perpetrate fraud over time. By adding capability, the Fraud Diamond offers a more nuanced and practical model of fraud, especially in complex organisational contexts where differences in access, authority, and ability matter. Further studies have demonstrated the benefits of incorporating capability with respect to predictive and explanatory strength in fraud models, confirming that this phenomenon is not merely situational but also depends on individual ability and corporate orientation (Suryandari et al., 2023; Vousinas, 2019).

The Fraud Pentagon Theory further develops existing fraud frameworks by building on the Fraud Triangle and, subsequently, the Fraud Diamond, to incorporate two additional components: arrogance (crap/ego) and competence, alongside pressure, opportunity, and rationalisation. Designed to accommodate the heightening complexity of corporate and financial fraud, the model asserts that fraudulent conduct is motivated by more than situational pressures and opportunities, but must have high levels of behavioural dominance, overconfidence, and a sense of entitlement that will cause individuals to override internal controls and ethical norms (Crowe, 2011; Vousinas, 2019). Arrogance reflects the perpetrator's belief that rules do not apply to them, while competence captures the technical ability and organisational knowledge required to execute and conceal fraud. Empirical research, particularly in the contexts of financial reporting and corporate governance, shows that incorporating behavioural dimensions improves fraud models' ability to explain leadership characteristics, managerial power, and control override—characteristics often present in major corporate scandals (Devi et al., 2021; Saluja et al., 2022). As a result, the Fraud Pentagon provides a more behaviourally grounded model that connects individual psychology and organisational control systems to understand the phenomenon of fraud. Consequently, the Fraud

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Pentagon offers a more behaviourally informed framework that bridges individual psychology and organisational power structures to explain the occurrence of fraud.

The Fraud Pentagon Theory further expands the theory of fraud by positing collusion as an independent and crucial factor alongside pressure, opportunity, rationalisation, ability/competency, and ego. This is in response to increasing evidence that many grand frauds, and sophisticated frauds (even more so), particularly those found in the corporate (business) sector, public, and/or procurement sectors, are seldom committed by single actors on their own but result from collusion involving numerous perpetrators inside an organisation or across organisations (Roffia and Poffo, 2025; Vousinas, 2019). By explicitly acknowledging collusion, the Fraud Hexagon overcomes one of the key limitations of previous models, which implicitly assume individual agency and hence underestimate the importance of social interaction, networks of power, and shared rationalisations as supportive contexts for fraud. Collusion impairs the efficiency of internal controls, promotes concealment, and collectively justifies deviant acts, thereby increasing the likelihood of fraud and the concealment of related activities. In turn, the Fraud Hexagon offers a more structurally rich framework for understanding contemporary fraud than the Fraud Triangle. It better encapsulates the systemic and relational aspects of contemporary fraud (aligning theory with practice within today's organisations, which are complex, interconnected entities operating under distributed decision-making).

3.2. Criminological and Sociological Theories

Criminological and sociological perspectives have also significantly contributed to the development and expansion of fraud theory beyond individual-based accounts. In contrast to traditional fraud models, which focus on personal incentives and contextually defined opportunities, criminological understandings ground most forms of fraud within broader social patterns, learned practices, and institutional environments. **Table 3** presents the major theories that were found to be discussed in the reviewed studies, such as strain theory, differential association theory, institutional anomie theory, and routine activity theory – all of which demonstrate that fraudulent behaviour is nurtured by social context and organisational cultures rather than merely stemming from individual moral transgressions (Messner and Rosenfeld, 2009; Ramzan and Lokanan, 2025).

Regarding outcomes, the findings indicate that social pressure and strain play a significant role in explaining fraudulent behaviour. Strain theory, for example, discusses fraud as a coping strategy in response to the gap between culturally expected goals (e.g., economic success or performance objectives) and the socially accepted means of attaining them (Messner and Rosenfeld, 2009). Indeed, empirical evidence from corporate and public-sector settings suggests that fraud is associated with high-performance-pressure environments in which both inequality and weak norm systems prevail, even in the presence of abundant formal controls. These findings imply that fraud is not solely a matter of individual pressure, as the Fraud Triangle theory suggests, but also involves systemic and institutional pressures.

The theory of differential association becomes a still richer contribution to fraud theory by stressing that fraud is a learned behaviour developed through contact with peers, superiors, or organisational networks. Two studies reviewed suggest that exposure to fraudulent norms, means, and reasons in professional settings intensifies fraud enablement, with a greater effect in environments where unethical conduct is habitual or tacitly reinforced (Ramzan and Lokanan, 2025). By doing so, this conclusion defies the prevailing proposition that rationalisation is simply an internal cognitive function around which we construct a narrative of action; instead, it recognises it as a social phenomenon constructed through these group processes and their narratives. Criminological perspectives propose that fraud rationalisation is collective rather than individual;

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therefore, subsequent models, such as the Fraud Hexagon, which explicitly incorporate collusion, may be more relevant.

Table 3. Theories from criminology and sociology applied to fraud studies

Theory	Level of Analysis	Core Assumptions	Key Contribution to Fraud Theory	References
Strain Theory	Institutional	Fraud arises from pressure due to blocked legitimate means.	Explains systemic pressure beyond individual financial need	Messner and Rosenfeld (2009)
Differential Association	Social	Fraud is acquired via social interaction and societal norms.	Positions rationalisation as socially constructed	Ramzan and Lokanan (2025)
Institutional Anomie	Societal	Economic dominance undermines social norms.	Describes variation across countries and organisations	Messner and Rosenfeld (2009)
Routine Activity Theory	Situational	Fraud occurs when a motivated offender encounters an opportunity without guardianship.	Links social structure to opportunity creation	Ramzan and Lokanan (2025)

Source: Processed Data (2025)

Sociological theories also emphasise the role of institutions and governance settings in explaining fraud risk. The theory of institutional anomie emphasises that economic goals have become so dominant within the social order that moral restraints are impaired, especially in market-based societies, where the bottom line tends to be a singular focus (Messner and Rosenfeld, 2009). International and organisational research demonstrates that enabling conditions arising from poor governance, regulatory lacunae, and cultural permissiveness of rule-skirting constitute a cradle for fraud, irrespective of individual ethical predisposition. This is consistent with evidence that fraud incidence systematically varies across institutional factors, underscoring the importance of accounting for context-dependent characteristics in fraud research (Wulandari and Maulana, 2022).

The implications of these findings are that criminological or sociological theory must situate fraud as a systemic and relational form of conduct. Traditional fraud models offer important micro-level explanations but often understate the roles of socialisation, power, and institutional norms. The integration of criminological views lends depth and explanatory power to fraud theory, especially in the context of complex organisations, where fraud is sustained by social interaction, imitation, and structural incentives as much as by rational choice. This theoretical shift supports the evolution of fraud theory toward multi-level, integrated frameworks that bridge individual motivations with organisational culture and societal context.

Taken overall, the results and discussion of this paper argue that criminological and sociological theories do not supplant, but supplement, classic fraud models, providing a macro- and meso-level lens that views the embeddedness of fraud within wider social systems. Their introduction bolsters fraud theory's ability to account for enduring and systemic forms of fraud, paving the way for richer conceptualisation in contemporary models that foreground complexity, collusion, and institutional dynamics within an era of digitalisation and globalisation.

3.3. Empirical Evidence Backing Integrity and Ethical Principles

Empirical evidence supports an emerging consensus that character and ethical values are key elements in understanding (and reducing) deviant behaviour, beyond the classical predictors used in fraud models. Whereas theoretical perspectives on fraud have traditionally emphasised "situational" and motivational factors (e.g., pressure, opportunity, rationalisation), empirical studies have increasingly found that ethical orientation and integrity act as moderating forces—and, to

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some extent, preventive ones—across individual-, organisational-, and institutional- levels in the manner in which they affect propensities for committing fraud (Saluja et al., 2022). These findings add to claims that external pressures or cognitive rationalisations do not drive fraud, but rather that fundamental moral principles and ethical beliefs do.

Positive, significant empirical findings across sectors such as banking, the public sector, and manufacturing support the theory that individuals working in high-integrity settings would demonstrate low levels of fraud rationalisation despite exposure to pressures or opportunities (Said, Asry, et al., 2018). This suggests that integrity weakens the rationalisation process central to the Fraud Triangle, thereby disrupting the cognitive pathway that enables fraudulent acts. Theoretically, the results question the theory that rationalisation occurs automatically under pressure and, if given the opportunity, rather than being a value-dependent process conditioned by ethical norms and moral reasoning.

At the organisational level, evidence indicates that ethical leadership, organisational culture, and integrity systems are significant factors in reducing fraud risk. Organisations with strong ethical climates, open governance systems, and value-driven leadership exhibit far less resistance to fraud because ethical beliefs constitute informal controls that serve a confirmatory function for the formal internal control system (Beaulieu and Reinstein, 2020; Said, Omar, et al., 2018). This is consistent with sociological perspectives that highlight normative boundaries and socialisation mechanisms, further supporting the idea that fraud prevention can be defined as a cultural and moral challenge rather than purely a technical or regulatory one.

Table 4. Empirical evidence on integrity and ethical values and their theoretical implications

Empirical Findings	Context / Sector	Key Evidence	Theoretical Implications	References
Integrity reduces fraud rationalisation.	Banking, public sector	High-integrity individuals are less likely to justify fraud, even when the opportunity exists.	Integrity moderates the rationalisation element in the Fraud Triangle	Said, Asry, et al. (2018)
Ethical leadership lowers fraud incidence.	Organisations, government	Ethical leadership strengthens informal controls	Fraud prevention extends beyond formal controls to ethical culture	Beaulieu and Reinstein (2020)
Organisational culture shapes fraud behaviour.	Corporate settings	Substantial ethical culture buffers fraud risk	Fraud is embedded in social and normative systems	Beaulieu and Reinstein (2020)
Religiosity is negatively correlated with fraud.	Developing economies	Moral and religious principles limit unethical actions	Value-based dimensions should be incorporated into fraud theory	Said, Asry, et al. (2018); Tarjo et al. (2024)
Ethical values explain cross-contextual variation.	Cross-country studies	Similar pressures can lead to different fraud outcomes	Fraud detection models need to be sensitive to cultural and contextual differences	Saluja et al. (2022); Zuberi (2019)
Integrity-based models show higher explanatory power.	Multi-sector empirical studies	Integrity strengthens the predictive capability of fraud models	Supports the transition to the Integrity Model and broader frameworks	Saluja et al. (2022)

Source: Processed Data (2025)

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In addition, cross-cultural and situational evidence suggests that the perceived importance of honesty and ethical concern varies by culture. In emergent markets, these cultural values (such as religiosity) and local moral standards were found to collectively affect fraud-loss behaviour in ways that may compensate for the lesser presence of formal control institutions and regulatory implementation (Said, Asry, et al., 2018; Tarjo et al., 2024; Zuberi, 2019). This result highlights a potential issue with universal fraud models, which often assume value-neutral actors by default. It supports integrating ethical and cultural dimensions into fraud theory to enhance contextual relevance and explanatory power. **Table 4** summarises the Empirical Evidence on Integrity and Ethical Values and Their Theoretical Implications for Fraud Theory.

These results imply that integrity and ethical values, rather than peripheral constructs, should be classified as central theoretical concepts within modern fraud models. Theoretical advancement is evident in models such as the Integrity Model and its Fraud Triangle variants, which incorporate ethical values directly (Saluja et al., 2022). Integrating integrity into fraud theory strengthens its capacity to explain why similar levels of pressure and opportunity may yield divergent outcomes across individuals and organisations. As a result, the evidence base is shifting toward value-based, ethics-focused fraud theories to enhance the traditional structural/technological perspective and to develop an integrated view of fraud behaviour within contemporary organisations.

3.4. Technological Integration: AI and Data Analytics

Artificial intelligence (AI) and data analytics now play a pivotal role in modern research on fraud, undergoing significant development in both fraud detection practice and fraud behaviour theory. **Table 5**: Summary of AI and Data Analysis Technology and Theoretical Implications. Studies such as those described in Ali and Ali Hagag (2024) and Thakkar et al. (2025) have consistently documented that machine learning algorithms, neural networks, and sophisticated data analytics outperform the rule-based approach employed by market auditors in detecting noncompliance patterns with abnormal actuarial properties or in predicting whether a given set of policyholders is more likely to be fraudulent based on traditional risk-influencing factors for large, complex datasets. These results illustrate a transformation from retrospective detection in traditional banking practices to proactive and predictive fraud management enabled by technological capabilities.

In theoretical terms, the results indicate that technological assimilation extends fraud theory beyond static models and linear logic. The three elements in classical versions of the Fraud Triangle are assumed to be relatively static, mutually reinforcing components over time. On the other hand, AI-enabled systems portray fraud as a dynamic, adaptive process, marked by varying patterns of feedback loops and network interactions (Prakash and Deokar, 2024). "Data analytics allows the discovery of hidden relationships between actors, transactions, and environmental (contextual) variables, which can be used to bridge the gap with respect to fraud theory and systems-based/complexity approaches. This is consistent with recent suggestions that fraud should be framed as an emergent property of complex sociotechnical systems rather than as a discrete, isolated act of individual misconduct.

Empirical evidhence further demonstrates that AI-driven fraud detection captures dimensions traditionally underrepresented in classical theories, particularly collusion and network-based fraud. Graph analytics and social network analysis enable researchers and professionals to identify concerted acts and concealed companionship among fraudulent transgressor(s), thereby enhancing the theoretical contribution of extended models such as Fraud Hexagon (Narayan et al., 2024; Tariq, 2025). These findings show technological facilitation beyond mere increases in detection accuracy and provide empirical grounding for specific theoretical constructs regarding collective behaviour and structural complexity.

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Table 5. Artificial intelligence and data analytics techniques and theoretical implications

AI / Analytics Technique	Primary Function in Fraud Detection	Key Empirical Insights	Theoretical Implications for Fraud Theory	References
Machine Learning (Supervised and Unsupervised)	Fraud detection and anomaly identification	Detects non-linear patterns that go beyond rule-based controls	Challenges the static nature of classical fraud models; promotes a dynamic and adaptable understanding of fraud	Ali and Ali Hagag (2024); Thakkar et al. (2025)
Neural Networks and Deep Learning	Recognising patterns in high-dimensional data	Enhances detection precision for complex datasets.	Highlights how capability and opportunity are developed as evolving constructs influenced by technology	Bao et al. (2022)
Graph Analytics and Social Network Analysis	Detection of collusion and coordinated fraud	Displays concealed connections between actors	Provides empirical evidence supporting collusion within the Fraud Hexagon and network-based fraud theories	Narayan et al. (2024); Tariq (2025)
Big Data Analytics	Real-time monitoring with ongoing auditing	Facilitates early detection of fraud	Reorients fraud theory from detecting after the fact to predicting and preventing fraud beforehand	Prakash and Deokar (2024)
Explainable AI (XAI)	Transparency and interpretability	Builds trust and accountability in AI systems	Incorporates ethical principles and integrity into technology-based fraud theory	Bao et al. (2022); Prakash and Deokar (2024)
AI-Powered Risk Scoring Systems	Prioritising fraud risk	Facilitates decision-making in uncertain situations.	Reframes fraud risk as a probabilistic and systemic issue instead of a binary one	Thakkar et al. (2025)

Source: Processed Data (2025)

Nevertheless, the literature also suggests significant limitations and theoretical barriers to technology. Explainability, algorithmic bias, data quality, and ethical factors such as privacy and accountability pose severe limitations to the unreflective adoption of AI in fraud prevention (Bao et al., 2022; Prakash and Deokar, 2024). From a theoretical perspective, these constraints underscore the importance of incorporating ethical precepts and integrity concerns into technology-facilitated fraud models. Without ethical oversight and transparency, AI can perpetuate existing biases or obscure accountability, thereby weakening the legitimacy of its use in fraud prevention.

These results are discussed, and consideration is also given to the implications of AI and data analytics, not as purely operational tools but as theoretical extensions of fraud models. Discrete technologies reconfigure the baselines of opportunity, capacity, and perception through the materialisation of real-time monitoring, programmable learning, and predictive foresight. As such, modern research into fraud theory needs to move towards more integrated models that account for both behavioural, ethical, organisational, and technical aspects. The integration of the four fraud theories increases explanatory and actionable power, particularly in digital and data-rich contexts where traditional fraud theories are insufficient to address the complexity of fraudulent behaviour.

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4. CONCLUSION

This paper offers a synthesised overview of the development of fraud theory, confirming that models of fraud have evolved from static, individual-centred approaches to dynamic, multi-level, integrated processes. The results suggest that long-established theories, such as the Fraud Triangle, remain deeply rooted; they have reduced explanatory influence in modern fraud environments marked by organisational complexity, social interaction, ethical diversity, and technological evolution. The evolution of these extended constructs — namely, the Fraud Diamond, Pentagon, and Hexagon — is illustrative of an increased awareness of the importance of capability, arrogance, collusion, and social embeddedness in incentivising fraud. Moreover, the combined criminological and sociological theories demonstrate that fraud is not an individual deviant act but a systemic and relational phenomenon influenced by institutional conditions, organisational culture, and social learning. Empirical evidence on integrity and ethical values further confirms that moral orientation and ethical climates play a critical moderating role in fraud behaviour, undermining value-neutral assumptions inherent in early fraud theories.

The originality of this article lies in its integrative and evolutionary approach, which systematically combines classical theories of fraud, interdisciplinary theoretical extensions, and technological convergence (especially artificial intelligence [AI] and data analytics) into a single conceptual storyline. In contrast to existing research that treats fraud theory and technology in isolation, this article shows that AI and data analytics not only improve fraud detection but also transform basic theoretical assumptions by depicting fraud as adaptive, networked, and probabilistic. By positioning fraud theory as an evolving socio-technical system, this study provides a stronger theoretical foundation for future empirical research and practical fraud-prevention strategies. This article is grounded in the merits of this synthesis and in how it propels fraud theory toward hybrid perspectives that integrate the behavioural, ethical, organisational, and technological facets, resulting in greater explanatory depth and relevance—fit for the digital age.

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