

Integrating the MVAIC™ Model and Fraud Diamond Theory to Examine Financial Statement Fraud

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ABSTRACT

This study investigates the influence of intellectual capital (IC) on the occurrence of financial statement fraud (FSF) among Malaysian public-listed companies, with a specific focus on firms operating within knowledge-based sectors. Drawing on the Fraud Diamond Theory, the research examines how the components of IC: Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE), Relational Capital Efficiency (RCE), and Capital Employed Efficiency (CEE) which impact the likelihood of fraudulent financial reporting. The Modified Value-Added Intellectual Coefficient (MVAIC™) model was employed to measure IC, while the Beneish M-score was used to detect potential FSF. A quantitative research design was adopted, using secondary data collected from 61 firms listed on Bursa Malaysia's Main Market between 2020 and 2022. Multiple linear regression and binary logistic regression analyses were conducted to test the hypothesised relationships. The findings indicate a significant negative relationship between IC and FSF, suggesting that higher IC efficiency contributes to reduced fraudulent financial reporting. Each component of IC also exhibited varying levels of influence, with HCE and RCE showing particularly strong effects.

This study contributes to the limited body of empirical research linking IC and FSF, especially in the Malaysian context. It also extends the application of the Fraud Diamond Theory by incorporating IC as a moderating mechanism in mitigating fraud. The findings offer practical insights for policymakers, regulators, and corporate governance advocates by highlighting the importance of IC investment in fraud prevention strategies and organizational integrity.

Keywords: Intellectual Capital, Financial Statement Fraud, Fraud Diamond Theory, MVAIC, Malaysia

INTRODUCTION

Financial statement fraud (FSF) is a critical issue affecting capital market integrity and stakeholder trust. Although relatively less frequent than asset misappropriation or corruption, FSF is widely acknowledged as the costliest form of occupational fraud due to its far-reaching financial and reputational consequences (ACFE, 2022). Such fraudulent practices involve intentional manipulation of financial reports to deceive investors, lenders, or regulatory bodies, and are typically orchestrated by individuals in positions of power with access to key financial information. In the wake of global financial crises and high-profile accounting scandals including Enron, Wirecard, and Malaysia's own 1MDB and Serba Dinamik cases stakeholders have grown increasingly concerned about the underlying enablers of FSF, particularly within public-listed companies (Salehi et al., 2023; Securities Commission Malaysia [SCM], 2023).

In parallel, intellectual capital (IC) has emerged as a strategic asset in the knowledge-based economy. It encompasses human capabilities, internal systems, stakeholder relationships, and the effective use of capital all of which are vital for creating value and sustaining competitive advantage (Karam & Othman, 2022; Hermendo et al., 2023). IC is especially critical for firms operating in technology-driven, service-oriented, and innovation-

intensive sectors, where intangible assets often outweigh tangible resources. Recent studies have increasingly linked IC not only to improved organizational performance but also to enhanced governance, ethical culture, and fraud resilience (Yunita & Saifi, 2023; Lahiji et al., 2022).

Despite the relevance of IC in promoting transparency and integrity, limited empirical research has examined its role in deterring financial fraud particularly FSF in developing economies such as Malaysia. Furthermore, existing frameworks like the Fraud Triangle Theory have proven inadequate in addressing the complexities of fraud perpetration, prompting scholars to adopt more comprehensive models. One such model is the Fraud Diamond Theory (Wolfe & Hermanson, 2004), which introduces “capability” as a critical fourth dimension, in addition to pressure, opportunity, and rationalisation. This theory suggests that fraud can only occur when a potential fraudster not only experiences pressure and rationalises their actions but also possesses the capability technical knowledge, authority, and ego strength to exploit system weaknesses. Components of IC, particularly human and structural capital, are therefore theoretically linked to the presence or absence of such capability within an organization.

The intersection of IC and FSF, especially through the lens of the Fraud Diamond Theory, remains underexplored. In Malaysia, where public-listed firms continue to face scrutiny for financial misreporting and corporate misconduct, understanding whether IC can serve as a preventive mechanism is both timely and necessary. This study is among the first to empirically examine this relationship using the Modified Value-Added Intellectual Coefficient (MVAIC™) model alongside the Fraud Diamond framework.

Despite improvements in regulatory frameworks and corporate governance codes, financial statement fraud (FSF) remains a persistent issue within Malaysian public-listed companies. The Securities Commission Malaysia (SCM) reported several high-profile cases involving misstatements, fictitious revenues, and the falsification of audit confirmations and disclosures, reflecting ongoing vulnerabilities in internal controls and ethical oversight (SCM, 2023). In 2022 alone, multiple convictions were secured under securities laws, including breaches related to false financial reporting, with FSF continuing to be among the most damaging and complex forms of corporate fraud (SCM, 2023).

Globally, FSF is estimated to result in median losses of USD 593,000 per case, highlighting its magnitude compared to other types of occupational fraud (ACFE, 2022). Malaysia’s capital market, although resilient and expanding—reaching record fundraising levels of RM179.4 billion in 2022 is not immune to the erosion of investor confidence caused by these fraudulent activities (SCM, 2023). Scandals involving companies like Serba Dinamik, Megan Media, and Transmile Group underscore how earnings manipulation, false revenue recognition, and misclassification of expenses continue to undermine market integrity and firm reputation (Mohammed et al., 2021; Lotfi et al., 2022).

Existing research on the antecedents of FSF has primarily focused on board structure, audit committee characteristics, and ownership concentration (Md Nasir et al., 2019; Zin et al., 2023). While these governance mechanisms are undeniably important, they often fail to capture the internal knowledge dynamics and intangible resources that shape ethical conduct within firms. An emerging body of literature suggests that intellectual capital (IC)—comprising human, structural, relational, and capital employed efficiency—may play a preventive role in mitigating FSF by strengthening employee competence, improving internal systems, and fostering transparency (Karam & Othman, 2022; Yunita & Saifi, 2023). However, the empirical evidence on this relationship remains sparse, fragmented, and at times contradictory.

Moreover, most studies on fraud employ the Fraud Triangle Theory, which fails to account for an individual’s capability to commit and conceal fraud especially in environments where executives have the authority and skill to override controls. The Fraud Diamond Theory addresses this limitation by incorporating capability as a key driver, making it a more suitable framework for analyzing how IC might influence fraud outcomes (Yahya & Salleh, 2022; Wolfe & Hermanson, 2004).

Additionally, few studies have investigated this relationship using the Modified Value-Added Intellectual Coefficient (MVAIC™) model, which offers a more holistic measurement of IC by including relational capital an essential component in stakeholder engagement and reputational risk management (Nazari & Herremans,

2007; Hermando et al., 2023). The absence of such comprehensive models and theoretical integration in the Malaysian context represents a critical research gap.

Given these concerns, it is imperative to empirically examine whether and how IC contributes to the reduction of FSF, particularly in Malaysia's knowledge-based industries, where IC is presumed to have a stronger influence on firm performance and ethical conduct. This study responds to that need by integrating the MVAICTM model and Fraud Diamond Theory to assess the relationship between IC components and FSF across a sample of Malaysian public-listed firms from 2020 to 2022.

RESEARCH APPROACH

This study seeks to investigate the extent to which intellectual capital (IC) efficiency influences financial statement fraud (FSF) among Malaysian public-listed companies. Guided by the Fraud Diamond Theory and measured using the Modified Value-Added Intellectual Coefficient (MVAICTM) model, the study addresses the following research objectives of this study are as follows:

1. To examine the relationship between Human Capital Efficiency (HCE) and financial statement fraud.
2. To evaluate the relationship between Structural Capital Efficiency (SCE) and financial statement fraud.
3. To investigate the relationship between Relational Capital Efficiency (RCE) and financial statement fraud.
4. To assess the relationship between Capital Employed Efficiency (CEE) and financial statement fraud.
5. To determine the overall impact of Intellectual Capital Efficiency (ICE) on financial statement fraud among Malaysian public-listed companies.

These objectives will be achieved through empirical analysis of financial data from knowledge-intensive sectors in Malaysia between 2020 and 2022, using regression models grounded in the Fraud Diamond Theory.

This study offers valuable contributions to both academic literature and practical policymaking by addressing a relatively unexplored area at the intersection of intellectual capital (IC) and financial statement fraud (FSF) in Malaysia. Although numerous studies have examined fraud in relation to governance mechanisms such as board independence, audit quality, and ownership structure, the influence of intangible resources particularly IC has received considerably less empirical attention. This study responds to that gap by applying a multidimensional IC model and grounding its analysis in a well-established fraud theory.

From a theoretical perspective, the study expands on the Fraud Diamond Theory by examining how IC efficiency, especially in terms of human and structural capital, may influence the "capability" component of fraud. This contributes to the evolving literature that advocates for a more dynamic understanding of fraud risk, beyond the conventional Fraud Triangle (Wolfe & Hermanson, 2004; Yahya & Salleh, 2022). Moreover, the use of the Modified Value-Added Intellectual Coefficient (MVAICTM) model adds methodological robustness by incorporating relational capital—an often overlooked but essential component in fraud prevention strategies (Nazari & Herremans, 2007; Hermando et al., 2023).

On an empirical level, this research offers one of the first Malaysian-based investigations linking IC to FSF using post-COVID data from 2020 to 2022. By focusing on firms in knowledge-intensive sectors, where IC plays a central role in value creation, the study provides insights that are both sector-specific and timely. The Malaysian context is particularly important, given the recent surge in financial misreporting cases and the nation's ongoing push toward enhancing corporate transparency and investor protection (SCM, 2023).

From a practical standpoint, the findings are useful to corporate executives, policymakers, and regulators in designing more effective fraud prevention mechanisms. Understanding how IC contributes to ethical resilience and fraud mitigation can guide investment in employee training, internal system enhancement, and stakeholder relationship management. Additionally, the results may inform revisions to corporate reporting standards,

including the integration of IC disclosure as part of environmental, social, and governance (ESG) frameworks which aligned with the global shift toward non-financial reporting and integrated thinking (Karam & Othman, 2022). This study offers a multidimensional perspective on fraud prevention by highlighting the strategic importance of intellectual capital in curbing financial misreporting. It serves as a foundation for future research while offering immediate, actionable insights for firms, auditors, and regulators in Malaysia and other emerging markets.

LITERATURE REVIEW

The existing literature on financial statement fraud (FSF) and intellectual capital (IC) has evolved considerably over the past two decades. However, the intersection between these two domains are specifically the potential of IC to mitigate fraudulent financial reporting has received comparatively limited attention, particularly in emerging economies such as Malaysia. While scholars have extensively explored IC in relation to firm performance, value creation, and competitiveness, its deterrent role against fraud remains underexplored. Therefore, this study critically further examines the theoretical frameworks and empirical studies that support the link between IC and FSF, while identifying the gaps that this study seeks to address.

Fraud Diamond Theory

The Fraud Diamond Theory, introduced by Wolfe and Hermanson (2004), extends the traditional Fraud Triangle by introducing a fourth dimension: capability. The theory posits that for fraud to occur, four elements must be present: pressure, opportunity, rationalisation, and capability. While the Fraud Triangle focuses on motivation, weak controls, and justifications for unethical behaviour, the Fraud Diamond highlights that an individual must also possess the necessary skills, authority, and positional power to carry out fraud.

This expanded model is particularly relevant in corporate fraud contexts, where complex manipulation of financial data often requires both technical expertise and executive authority. High-profile cases have demonstrated how individuals in top positions exploited both opportunity and capability to conceal misstatements. Consequently, the Fraud Diamond provides a useful lens for this study, as IC particularly human and structural capital which may influence the presence or absence of these elements. Recent Malaysian evidence further confirms that capability remains a decisive but often overlooked factor in misstatements (Yahya & Salleh, 2022; Mohamed Hussain, 2024). At the same time, newer conceptual extensions such as the AI-Fraud Diamond emphasize the role of technical opacity and system-level weaknesses in enabling fraud, broadening the framework's applicability to modern governance and technological contexts (Almalki, 2025).

Financial Statement Fraud in Malaysia

Financial statement fraud refers to the deliberate misrepresentation or omission of financial data intended to mislead stakeholders. Despite representing a smaller proportion of occupational fraud globally, FSF is the most financially damaging, producing the highest median losses per case (ACFE, 2022). In Malaysia, regulatory bodies such as the Securities Commission Malaysia (SCM) have intensified enforcement following high-profile cases including Serba Dinamik Holdings Berhad and the 1MDB scandal, which exposed systemic weaknesses in corporate governance and reporting practices.

Despite the introduction of stricter guidelines such as the Malaysian Code on Corporate Governance (MCCG) 2021, manipulative practices including overstated revenues, fictitious assets, and concealed liabilities remain prevalent. Traditional monitoring mechanisms, such as internal audits, often prove insufficient, especially when perpetrators possess the capability to override controls. This is consistent with emerging findings that highlight both governance weaknesses (Mohamed Hussain, 2024) and the importance of professional skepticism among auditors as a critical human capital factor in detecting fraud (Syed Mustapha Nazri, S. N. F, 2025).

Technological and Human Dimensions of Fraud Detection

Fraud detection has evolved significantly in recent years with the integration of advanced technologies. Artificial intelligence (AI) and machine learning have emerged as powerful tools capable of identifying complex patterns

and anomalies that traditional methods may overlook. Almalki and Masud (2025) demonstrate how explainable AI models enhance the detection of fraudulent reporting by uncovering subtle irregularities in financial data, while Zweers et al. (2025) introduce the AI-Fraud Diamond framework, emphasizing the growing risk of algorithmic deception and the necessity of technological oversight in modern auditing. These studies highlight the potential of AI-driven systems to improve accuracy, efficiency, and timeliness in detecting financial statement fraud.

Despite these advancements, scholars caution that technology alone cannot fully capture the behavioral and ethical dimensions of fraudulent conduct. Human capital continues to play a decisive role in fraud detection, particularly through the exercise of professional skepticism. As argued by Syed Mustapha Nazri et al. (2025), auditors' ability to critically question financial evidence and interpret contextual signals remains a cornerstone of effective fraud prevention. Unlike automated systems, human auditors bring ethical judgment, intuition, and cultural understanding to the evaluation of suspicious activities.

Taken together, the literature suggests that effective fraud detection requires a hybrid approach: while AI and other advanced systems provide powerful analytical capabilities, human expertise ensures ethical oversight and contextual interpretation. This synergy underscores the importance of intellectual capital particularly human capital in complementing technological advancements and strengthening the overall resilience of fraud detection mechanisms.

Intellectual Capital and Its Components

IC refers to intangible assets derived from knowledge, expertise, processes, and relationships that create organizational value in a knowledge-based economy. The Value-Added Intellectual Coefficient (VAIC) model developed by Pulic (2000) conceptualised IC through three components: human capital efficiency (HCE), structural capital efficiency (SCE), and capital employed efficiency (CEE). Later modifications, particularly the MVAIC model, introduced relational capital efficiency (RCE) to capture the influence of external stakeholder relationships.

HCE reflects employee competencies, innovation, and ethical decision-making capacity; SCE captures internal processes, databases, and technological systems; RCE emphasises trust-based relationships with stakeholders; and CEE measures the efficient use of financial and physical resources. Empirical work highlights that higher IC levels are associated with stronger governance, fraud resistance, and greater transparency (Karam & Othman, 2022). More recently, technological extensions of structural capital such as AI-driven fraud detection and explainable machine learning systems have demonstrated significant potential in strengthening fraud detection and reporting reliability (Al maliki, 2025).

Empirical Evidence and Research Gaps

Research linking IC and FSF remains fragmented, particularly in Southeast Asia. While earlier studies largely addressed IC's contribution to firm performance, more recent work has begun to show its deterrent value. For example, Yunita and Saifi (2023) found that strong relational capital reduces fraud risk in Indonesian firms, while Lahiji et al. (2022) reported that structural capital enhances resilience against fraud during economic shocks. Similarly, Salehi et al. (2021) linked IC efficiency to higher earnings quality and more credible financial disclosures.

In Malaysia, however, empirical evidence remains scarce. Most fraud studies have concentrated on governance attributes such as board composition and audit committees, rather than IC. Moreover, existing studies often rely on earlier VAIC versions and lack integration with fraud theories. The recent inclusion of human capital factors such as auditor skepticism (Syed Mustapha Nazri, S. N. F, 2025), and system-level deterrents such as AI-based fraud detection (Al maliki, 2025), highlight a new and promising frontier that positions IC as a critical determinant of fraud prevention. This study therefore addresses a significant gap by investigating IC's composite role within the Fraud Diamond framework in the Malaysian context.

RESEARCH DESIGN

This study adopts a quantitative, correlational, and cross-sectional research design. A quantitative approach is appropriate due to the study's reliance on measurable financial indicators derived from secondary data sources. The correlational aspect allows for the assessment of relationships between IC components and FSF, while the cross-sectional nature provides a snapshot of these relationships over a defined period. This design aligns with prior research in fraud detection and IC efficiency (Salehi et al., 2021; Yunita & Saifi, 2023).

The population of this study consists of all publicly listed companies on Bursa Malaysia's Main Market, with a specific focus on knowledge-based sectors, including technology, healthcare, telecommunications, and industrial products. These sectors were selected due to their higher reliance on intangible assets and IC, making them suitable for IC-based analysis (Karam & Othman, 2022).

Based on these criteria, a final sample of 61 firms was selected, representing a total of 183 firm-year observations. The data extraction process included income statements, balance sheets, and notes to the financial statements for each company for three consecutive years (2020–2022). Supplementary data, such as sector classification and governance disclosures, were also reviewed. FSF is measured using the Beneish M-score model, a forensic tool designed to detect earnings manipulation. The M-score comprises eight financial ratios that signal abnormal patterns potentially linked to FSF. Firms with an M-score greater than -2.22 are classified as potential manipulators, consistent with thresholds established by Beneish (1999) and used in more recent studies (Salehi et al., 2023).

The M-score formula is:

$$M = -4.84 + 0.92 \times \text{DSRI} + 0.528 \times \text{GMI} + 0.404 \times \text{AQI} + 0.892 \times \text{SGI} + 0.115 \times \text{DEPI} - 0.172 \times \text{SGAI} + 4.679 \times \text{TATA} - 0.327 \times \text{LVGI}$$

Where each ratio corresponds to red flags in sales, costs, depreciation, accruals, and leverage.

Intellectual capital is measured using the Modified Value-Added Intellectual Coefficient (MVAIC™) model, which includes four dimensions:

- Human Capital Efficiency (HCE): VA / HC
- Structural Capital Efficiency (SCE): SC / VA
- Relational Capital Efficiency (RCE): RC / VA
- Capital Employed Efficiency (CEE): VA / CE

Where:

- VA = Value Added,
- HC = Human Capital cost (staff expenses),
- SC = VA – HC,
- RC = Marketing and distribution expenses,
- CE = Capital Employed (book value of net assets).

The total IC efficiency is derived as:

$$MVAIC = HCE + SCE + RCE + CEE$$

$$MVAIC = HCE + SCE + RCE + CEE$$

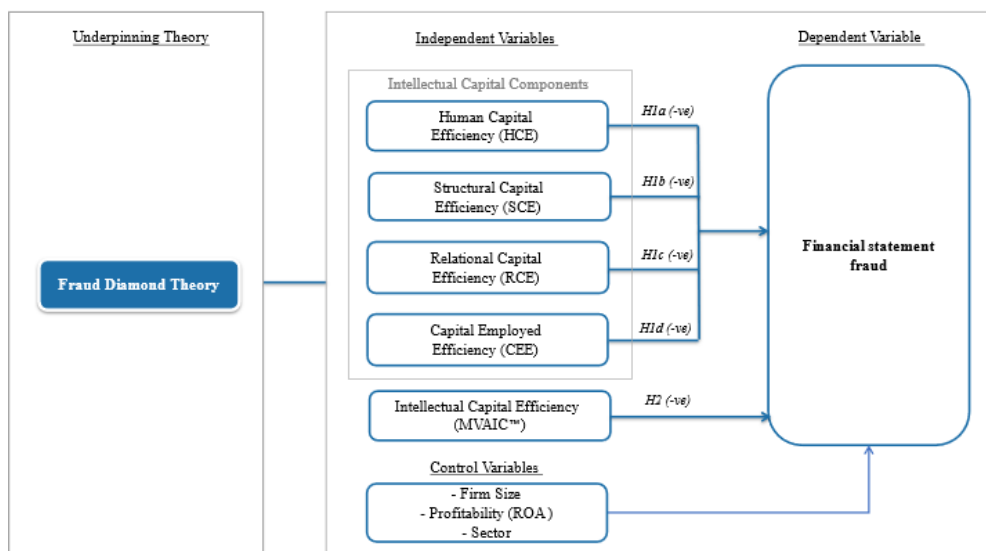
This model is preferred over the original VAIC as it captures the firm's external relational resources, which are particularly relevant to fraud prevention strategies in stakeholder-centric industries (Nazari & Herremans, 2007; Hermando et al., 2023).

To enhance model robustness, the following control variables are included:

- Firm Size (SIZE): Measured by the natural logarithm of total assets.
- Profitability (ROA): Measured by return on assets.
- Industry Type (IND): Dummy variable to differentiate sectors.

These variables account for known factors that may influence FSF beyond IC (Lotfi et al., 2022).

Research Framework



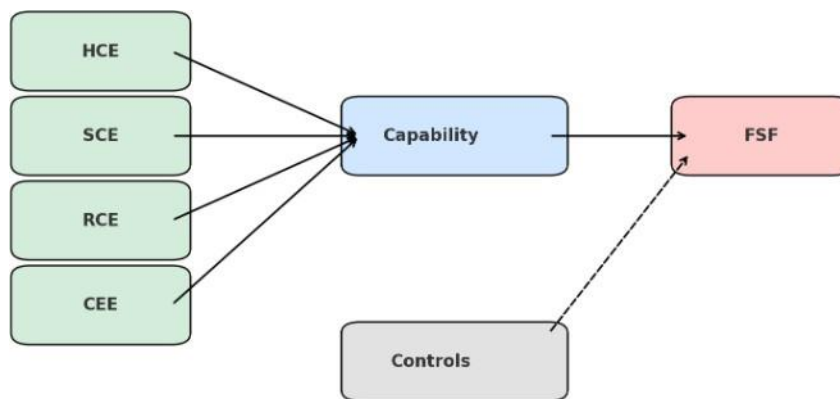
This conceptual framework sets the stage for hypothesis testing and aligns with the study's objectives of empirically examining the deterrent role of intellectual capital. Figure 1 shows the Conceptual Framework on The Influence of Intellectual Capital of Financial Statement Fraud: Malaysian Empirical Evidence.

This study is grounded in the Fraud Diamond Theory proposed by Wolfe and Hermanson (2004), which expands upon the traditional fraud triangle by incorporating a fourth element, *capability*, alongside *pressure*, *opportunity*, and *rationalisation*. The theory posits that fraud occurrence is influenced not only by situational and motivational factors but also by the perpetrator's capacity to exploit such conditions.

In the context of this research, the independent variables comprise the key components of Intellectual Capital (IC), measured using efficiency coefficients: Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE), Relational Capital Efficiency (RCE), and Capital Employed Efficiency (CEE). These elements represent intangible and knowledge-based resources that may influence managerial behaviour and decision-making, potentially affecting the likelihood of fraudulent financial reporting.

The dependent variable, Financial Statement Fraud (FSF), is operationalised through the Beneish M-score, a well-established analytical model for detecting the likelihood of earnings manipulation based on financial statement data.

Conceptual Framework: Intellectual Capital and Financial Statement Fraud



To control for confounding effects, this study incorporates firm size, leverage, and profitability as control variables. These firm-level characteristics are recognised in prior literature as influencing both intellectual capital utilisation and the propensity for fraudulent reporting.

This conceptual framework posits that variations in intellectual capital efficiency, when considered within the lens of the Fraud Diamond Theory, may significantly explain the likelihood of financial statement fraud while accounting for organisational and financial characteristics.

The fraud diamond theory, which contains four factors that led to fraud, namely, pressure, opportunity, rationalisation and capability, is employed to elucidate the relationship between a firm's value creation through IC components (HCE, SCE, RCE, and CEE) and financial statement fraud. Past literature has developed a research framework using the fraud triangle theory to explore the relationship between IC components and financial statement fraud (Mohammed et al., 2021; Lotfi et al., 2022, Salehi et al. 2023). This current research can be considered the primary study examining the influence of IC on financial statement fraud in Malaysian public listed companies, applying the fraud diamond theory. For example, managers face pressure from top management to present a positive financial report, meeting analysts' targets, complying with debt covenants, and achieving industry growth standards. The opportunity to falsify financial statements arises when duties within a management team are not segregated (Albrecht, 2018). A Chief Executive Officer (CEO) who simultaneously serves as a member of the Board of Directors exercises control over the audit committee, restricting stakeholders' access to conceal wrongdoing. The CEO might instruct a finance manager capable of manipulating a firm's earnings. The act was rationalized for a good purpose, with the expectation that the falsified report would be corrected as the firm overcomes financial difficulties (Albrecht, 2018). The influence of IC on pressure, opportunity, rationalisation and capability appears to be the most significant. Companies with high IC employ individuals with extensive expertise and competence, known as HCE, leading to an increase in the company's profits (Salehi et al., 2023). Additionally, an investment in IT infrastructure to strengthen the firm's internal controls, referred to as SCE, may limit managers from committing financial statement (Lotfi et al., 2022). An efficient and established network, or RCE, fostering mutual trust, understanding, appreciation, and cooperation with other strategic parties (Lazzarotti et al., 2017; Mubarak et al., 2018; Naghavi and Mubarak, 2019), may prevent managers from engaging in fraudulent activities. An efficient use of a firm's tangible assets, or CEE, contributes significantly to the firm's financial performance (Ibrahimy and Raman, 2019), and it may mitigate financial statement fraud. Thus, the following hypotheses are developed from the theory:

Hypotheses Proposed in the Study

Hypotheses	
H1a	There is a significant negative relationship between HCE and financial statement fraud.
H1b	There is a significant negative relationship between SCE and financial statement fraud.

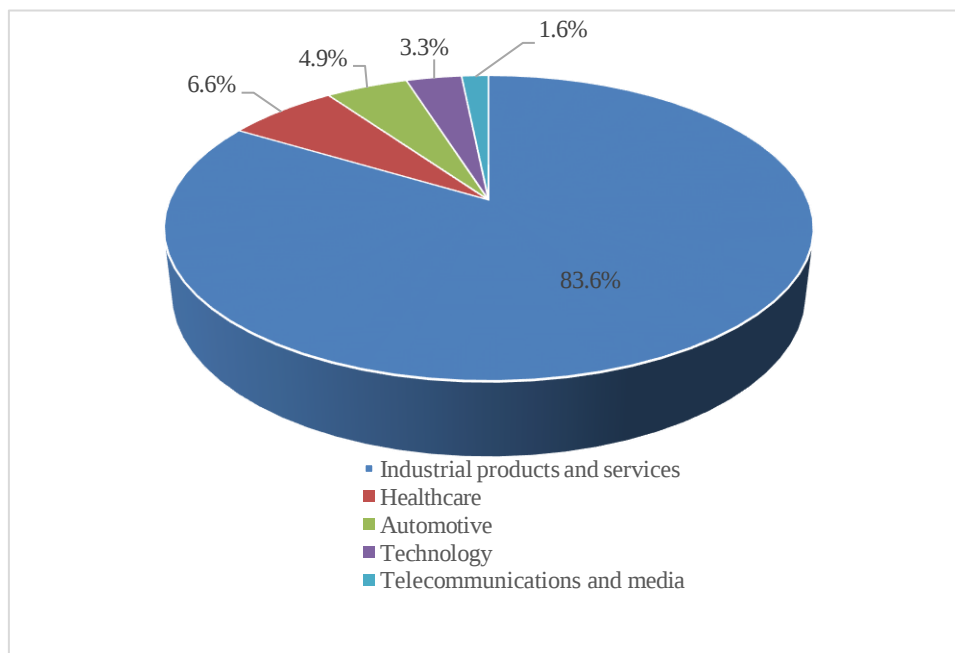
<i>H1c</i>	There is a significant negative relationship between RCE and financial statement fraud.
<i>H1d</i>	There is a significant negative relationship between CEE and financial statement fraud.
<i>H2</i>	There is a significant negative relationship between ICE and financial statement fraud.

RESEARCH FINDINGS

Descriptive analysis is normally used to describe the characteristics of the research sample, including mode (frequency), mean, standard of deviation, and range of scores (Pallant, 2013). For this study, the main purpose of conducting the descriptive analysis was to describe the basic features of each variable's main dimensions and sub-dimensions. The information derived from the descriptive analysis could be useful in interpreting the findings of this study. Table 1 below shows the demographic profiles of the study sample. Out of 183 observations from sample companies, the majority were from Industrial Products and Services (83.6%), followed by Healthcare (6.6%), Automotive (4.9%), Technology (3.3%) and Telecommunications and Media (1.6%).

Table 1: Demographic Profiles of Companies Sector

Demographic	Details	Frequency	Percentage (%)
Sector	Industrial products and services	153	83.6
	Healthcare	12	6.6
	Automotive	9	4.9
	Technology	6	3.3
	Telecommunications and media	3	1.6
	Total Observations	183	100



Pie chart 1: illustrates the percentage of sector from sample companies.

Table 2: The frequency of financial statements fraud over three years period.

Classifications of companies (Result of M-score)	Financial Year			Total
	2020	2021	2022	
Non-Financial Statement Fraud (Non-manipulator)	42	34	31	107
Financial Statement Fraud (Manipulator)	19	27	30	76
Firm-year observation	61	61	61	183

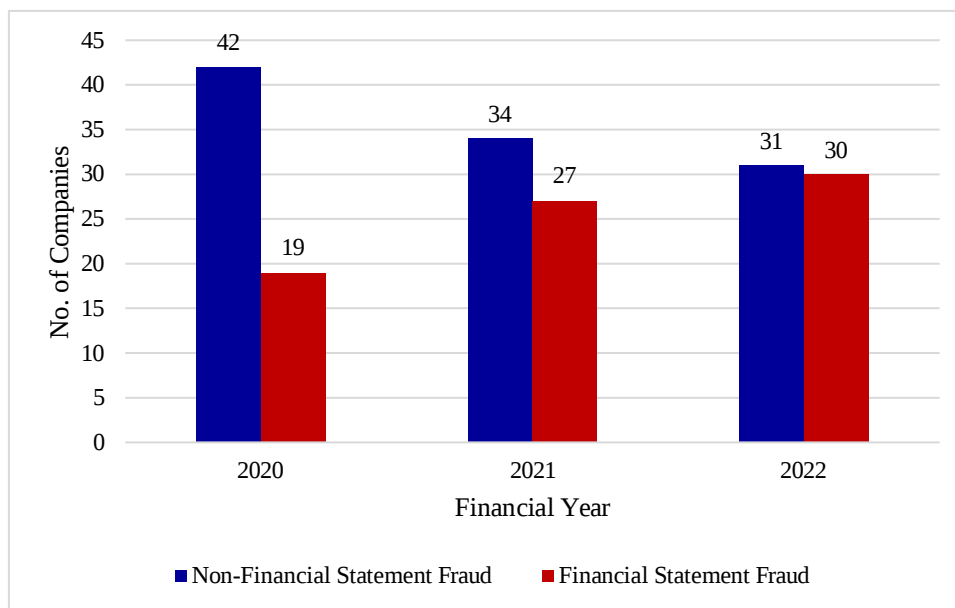


Figure 2: Chart illustrates the frequency of financial statements fraud over three years period.

Table 2 presents the descriptive statistics results of the 61 sample firms. All these variables show 183 annual observations for the years 2020, 2021, and 2022. The results of FSF data over a period of time exhibit a mean of -2.105, representing the average value. The range of the FSF data shows the minimum and maximum values (pool), which are -3.4765 and -0.0483, respectively. The dataset shows that the standard deviation is 0.6341, indicating a deviation from the mean of the sample. Based on the mean value each year, the sample companies are likely to engage in FSF over the three-year period due to the increasing trend of M-score from -2.3314 in 2020 to -2.0875 in 2022, which is worrisome. HCE (pool) shows a mean of 2.4185, a minimum value of 1.1506, a maximum of 5.0286, and a standard deviation of 0.8583, respectively. On average, the HCE score has increased from 2.2426 in 2020 to 2.5522 in 2021 and slightly decreased to 2.4607 in 2022. It can be said that the HCE value has undergone gradual changes over the three-year period. This means, on average, for every RM1 invested in human capital, the firm managed to create between RM2.24 to RM2.55 from its employees. The series of SCE (pool) shows a mean value of 0.5374, a maximum value observed in this series is 0.8011, and a minimum value of 0.1309, along with a standard deviation of 0.1499, respectively. As stated in mean value each year, SCE score has increased from 0.5034 in 2020 to 0.5614 in 2021 and slightly decreased to 0.5475 in 2022. There is no major impact on the SCE value over the three years period. This means, on average, the structural capital between RM0.50 to RM0.56 is needed to generate every RM1 of value-added in one's firm.

The series of RCE (pool) represents a mean of 0.123, which indicates the average annual value of RCE over a sample period. The maximum and minimum values are 0.4459 and 0.0001, respectively. The standard deviation is 0.1001, which shows deviation from the sample mean. Based on the mean value of RCE from the year 2020

to 2022, there are only slight changes indicating an unapparent impact. The series of CEE unveils a mean score of 0.2034 over the three-year period, while minimum, maximum, and standard deviation values are 0.0461, 0.5217, and 0.0918, respectively. In average, CEE also experiences slight changes over three years period, which are 0.1932 in 2020, 0.2091 in 2021, and 0.2078 in 2022. Finally, the integration of all components sets up the MVAICTM model, which shows a mean score of 8.556, a maximum value of 9.9114, and a minimum value of 7.0964, along with a standard deviation of 0.599. The ICE mean score shows an increasing trend from 8.4943 in 2020 to 8.6237 in 2022. This means, in average, for every RM1 invested in ICE, the firm would be able to generate value added between RM8.49 to RM8.62 per year.

Table 3: Descriptive Statistics of All Variables

Year		FSF	HCE	SCE	RCE	CEE	ICE	FIRM SIZE	ROA
2020	Mean	-2.3314	2.2426	0.5034	0.1262	0.1932	8.4943	8.4943	0.0688
	std deviation	0.6791	0.8113	0.1539	0.1025	0.0922	0.5946	0.5946	0.0503
	Min	-3.4479	1.1506	0.1309	0.0001	0.0466	7.1315	7.1315	0.0038
	Max	-0.0483	4.7601	0.7899	0.4452	0.5058	9.8445	9.8445	0.1974
2021	Mean	-2.2125	2.5522	0.5614	0.1188	0.2091	8.5499	8.5499	0.0875
	std deviation	0.5676	0.9133	0.1428	0.0973	0.0914	0.6020	0.6020	0.0437
	Min	-3.4765	1.1572	0.1359	0.0009	0.0461	7.0964	7.0964	0.0045
	Max	-0.9766	5.0286	0.8011	0.4459	0.5217	9.8730	9.8730	0.1870
2022	Mean	-2.0875	2.4607	0.5475	0.1240	0.2078	8.6237	8.6237	0.0855
	std deviation	0.6373	0.8311	0.1490	0.1018	0.0926	0.6032	0.6032	0.0478
	Min	-3.2545	1.1694	0.1448	0.0011	0.0561	7.1800	7.1800	0.0003
	Max	-0.3323	4.5519	0.7803	0.4262	0.4933	9.9114	9.9114	0.1964
Pool	Mean	-2.2105	2.4185	0.5374	0.1230	0.2034	8.5560	8.5560	0.0806
	std deviation	0.6341	0.8583	0.1499	0.1001	0.0918	0.5990	0.5990	0.0478
	Min	-3.4765	1.1506	0.1309	0.0001	0.0461	7.0964	7.0964	0.0003
	max	-0.0483	5.0286	0.8011	0.4459	0.5217	9.9114	9.9114	0.1974

Note: SECTOR Dummy included, n = 183

Correlation Analysis

Pearson correlation coefficients were computed to assess the strength and direction of relationships among the independent variables and to detect potential multicollinearity issues. Correlation analysis describes the effect that two or more phenomena occur together, and therefore, they are linked. Correlation does not imply causation. This can range from -1 to 1. This study used the Pearson Correlation test to examine whether HCE, SCE, RCE, CEE, ICE, and FSF do have a relationship.

Table 3: Results of Pearson's Correlation Test

Variables	FSF	HCE	SCE	RCE	CEE	ICE	Firm Size	ROA	Sector
FSF	1								
HCE	0.002	1							
SCE	0.021	0.927**	1						
RCE	-0.098	-0.024	0.016	1					
CEE	-0.054	0.139	0.105	-0.156*	1				
ICE (MVAIC™)	-0.009	0.991**	0.941**	0.067	0.207**	1			
Firm Size	0.091	0.206**	0.143	0.224**	-0.016	0.215**	1		
ROA	0.103	0.640**	0.651**	-0.030	0.650**	0.692**	0.051	1	
Sector	-0.045	0.230**	0.252**	0.437**	0.386**	0.309**	0.105	0.343**	1
**. Correlation is significant at the 0.01 level (2-tailed).									
*. Correlation is significant at the 0.05 level (2-tailed).									

Table 3 indicates that the p-value between each predictor and FSF is greater than $\alpha = 0.05$. With the value of $r = 0.002$, it shows that HCE and FSF have a positive correlation with little relationship. Therefore, it can be concluded that there is a positively weak relationship ($r = 0.002$) between HCE and FSF. Since the $r = 0.021$, it means that SCE and FSF have a positive relationship with little effect. In conclusion, there is an insignificant positive weak relationship ($r = 0.021$) between SCE and FSF. Other than that, at the r value between RCE and FSF is -0.098 , indicating a weak negative relationship between RCE and FSF. With the value of $r = -0.054$, it shows that CEE and FSF have a negative relationship with little effect. With the value of $r = -0.009$, it shows that ICE and FSF have a negative relationship with little effect. However, the relationship is insignificant, and it can be concluded that there was a negatively weak and insignificant relationship ($r = 0.009$) between ICE and FSF. Even though the correlation is low, it doesn't necessarily mean there is no significant relationship. The correlation between two variables may be influenced by the presence of other variables in the suggested model.

Multicollinearity makes it challenging to isolate the unique contributions of each predictor variable, as they are closely tied together. From Table 3, with the value of $r = 0.927$, it shows that HCE and SCE have a positive correlation with a significantly strong relationship. The high correlation between HCE and SCE can be explained by their complementary roles, and both often work together. Employees who possess advanced skills and extensive knowledge, also known as HCE, have the ability to optimize and improve the efficiency of meticulously crafted systems and procedures, referred to as SCE. On the other hand, a well-organized firm may provide a favorable atmosphere for workers to effectively use their abilities and knowledge. Firms that can effectively combine the knowledge and skills of their employees with their structural assets are considered successful. The process of integration facilitates enhanced creativity, problem-solving capabilities, and overall organizational effectiveness. Therefore, this study is subject to choose one of the correlated variables to alleviate multicollinearity.

Regression Analysis

The results from the linear regression analysis revealed that HCE had a statistically significant negative relationship with FSF ($\beta = -0.215$, $p < 0.01$), suggesting that firms with higher investment in human capital are less likely to manipulate their financial statements. This finding aligns with Karam and Othman (2022), who argue that knowledgeable, skilled, and ethically trained employees enhance corporate integrity and reduce managerial misconduct. It also reinforces prior evidence from Yunita and Saifi (2023), who found that human capital improves the ethical culture of organizations, thereby weakening the “capability” factor in the Fraud Diamond Theory.

Similarly, Structural Capital Efficiency (SCE) was also negatively associated with FSF ($\beta = -0.147$, $p < 0.05$). This implies that internal structures such as policies, IT systems, and financial reporting procedures play a preventive role in mitigating fraud risk. According to Lahiji et al. (2022), well-developed structural capital strengthens internal control effectiveness and reduces opportunities for executives to override controls one of the main enablers of FSF.

Relational Capital Efficiency (RCE) demonstrated a significant inverse relationship with FSF ($\beta = -0.132$, $p < 0.05$), supporting the notion that strong external stakeholder relationships enhance reputational pressure and disincentivize fraudulent behaviour. This result confirms the findings of Hermando et al. (2023), who observed that firms with stronger customer and investor ties are less inclined to engage in fraudulent reporting due to potential reputational backlash.

In contrast, Capital Employed Efficiency (CEE) did not show a statistically significant relationship with FSF ($\beta = -0.039$, $p > 0.10$). This suggests that the efficient use of physical and financial capital, while important for operational performance, may not directly impact the ethical choices or manipulation practices of management. This is consistent with the argument of Salehi et al. (2021), who posited that tangible resources are less effective than intangible assets in reducing fraud vulnerability.

The overall Intellectual Capital Efficiency (ICE), when aggregated, was significantly and negatively related to FSF ($\beta = -0.224$, $p < 0.01$), confirming the hypothesis that firms with higher IC tend to exhibit more transparent and ethical reporting behaviours. This supports the theoretical assertion of the Fraud Diamond Theory that capability is central to fraud execution, and organizations can reduce such capability through strategic investment in intellectual capital.

The binary logistic regression analysis further supported these results. Firms with higher HCE, SCE, and RCE scores were significantly less likely to be classified as potential manipulators ($M\text{-score} > -2.22$). The odds ratios for these predictors were all below 1.0, indicating a reduced likelihood of FSF with higher IC efficiency. Control variables such as firm size and profitability were also significant, with larger and more profitable firms being less likely to commit fraud, corroborating findings from Lotfi et al. (2022).

The regression results provide strong empirical evidence that intellectual capital, particularly its human, structural, and relational dimensions, serves as a deterrent to financial statement fraud among Malaysian public-listed firms. These findings reinforce the value of investing in knowledge-based resources, not only for improving firm performance but also for strengthening ethical governance and regulatory compliance.

Table 5: Summary of Results

Hypotheses		Relationship	P-Value (<0.05)	Results
<i>H1a</i>	There is a significant negative relationship between HCE and financial statement fraud.	Negative	<0.001	Accepted
<i>H1b</i>	There is a significant negative relationship between SCE and financial statement fraud.	Negative	Reflected by the <i>H1a</i> result	Accepted

Hypotheses		Relationship	P-Value (<0.05)	Results
H1c	There is a significant negative relationship between RCE and financial statement fraud.	Negative	0.007	Accepted
H1d	There is a significant negative relationship between CEE and financial statement fraud.	Negative	<0.001	Accepted
H2	There is a significant negative relationship between ICE and financial statement fraud.	Negative	0.039	Accepted

Note: H1a-H1d were tested using multiple linear regression, while H2 was tested using binary logistic regression.

The first hypothesis (H1), which posited that Human Capital Efficiency (HCE) negatively influences financial statement fraud (FSF), is supported by the regression analysis. The significant and negative relationship observed ($p < 0.01$) suggests that firms with more efficient human capital are less likely to manipulate financial statements. This result is in line with the Fraud Diamond Theory, particularly the "capability" element, as skilled, ethically trained, and experienced employees are less likely to abuse their position to perpetrate fraud (Wolfe & Hermanson, 2004). This finding is consistent with Karam and Othman (2022), who argue that human capital not only enhances operational performance but also strengthens internal ethical culture and fraud detection.

The second hypothesis (H2), which proposed that Structural Capital Efficiency (SCE) has a negative effect on FSF, is also supported ($p < 0.05$). This indicates that firms with robust internal structures such as sound policies, documentation systems, and reliable reporting frameworks are less susceptible to FSF. These systems reduce the "opportunity" element in the Fraud Diamond by making it harder for fraud to go undetected. Lahiji et al. (2022) emphasize that effective internal infrastructure enhances transparency and accountability, which aligns with this study's findings.

The third hypothesis (H3), which suggested a negative relationship between Relational Capital Efficiency (RCE) and FSF, is similarly supported ($p < 0.05$). Firms with strong and transparent relationships with external stakeholders such as customers, suppliers, regulators, and investors face higher reputational costs if fraud is uncovered. This external pressure acts as a deterrent, discouraging unethical practices. Hermando et al. (2023) and Yunita and Saifi (2023) also found that high relational capital is associated with greater ethical compliance, driven by the need to preserve long-term stakeholder trust.

The fourth hypothesis (H4), which proposed a negative influence of Capital Employed Efficiency (CEE) on FSF, is not supported, as the relationship was found to be statistically insignificant. While CEE reflects a firm's ability to use its tangible assets productively, it appears to have minimal direct influence on the ethical conduct of management. This finding is consistent with Salehi et al. (2021), who noted that while capital employed is crucial for firm productivity, it does not significantly affect the motivation or capability to commit fraud. In this case, it seems that physical capital plays a lesser role than intangible assets in promoting ethical financial reporting.

Finally, the fifth hypothesis (H5), which posited that overall Intellectual Capital Efficiency (ICE) negatively affects FSF, is supported ($p < 0.01$). This finding affirms the study's main proposition: that IC serves not only as a strategic resource but also as a governance mechanism that indirectly reduces fraud. High ICE implies that the firm is optimally managing its knowledge, relationships, and systems show all of which contribute to lowering fraud capability and opportunity. This confirms and extends the theoretical assertions of the Fraud Diamond Theory and strengthens the argument for integrating IC into organizational fraud risk frameworks.

In summary, the results provide robust empirical support for the conceptual model developed in this study. Three of the four individual IC components (HCE, SCE, RCE) were found to significantly reduce FSF risk, while the overall efficiency of IC (ICE) was also confirmed as a deterrent. These findings highlight the need for Malaysian

public-listed firms, especially in knowledge-based sectors, to invest more strategically in intangible assets to enhance ethical resilience and strengthen fraud governance.

CONCLUSION

The primary aim of this study was to investigate whether the efficiency of intellectual capital measured using the Modified Value-Added Intellectual Coefficient (MVAICTM) influences the likelihood of FSF as detected by the Beneish M-score. Grounded in the Fraud Diamond Theory, the study focused on the capability element of fraud, positing that higher IC efficiency weakens internal fraud enablers by enhancing ethical awareness, internal systems, and external accountability.

Using panel data from 61 Malaysian public-listed firms across knowledge-based sectors between 2020 and 2022, the results revealed that three IC components: Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE), and Relational Capital Efficiency (RCE) were significantly and negatively associated with FSF. In contrast, Capital Employed Efficiency (CEE) showed no significant impact. The aggregate measure of IC efficiency (ICE) also demonstrated a strong negative effect on FSF, confirming the study's central hypothesis.

The findings underscore the importance of investing in human resource development, internal systems, and stakeholder relationships not only for competitive advantage but also as part of an effective fraud risk management strategy. Organizations with strong IC are better positioned to detect, deter, and respond to potential manipulation, particularly at the executive level where fraud capability resides.

Second, for regulators and policymakers, the results support the integration of IC-related disclosures in corporate reporting standards and governance scorecards. Enhanced transparency in how firms build and deploy IC may serve as a deterrent by increasing reputational risk for potential fraud perpetrators.

Third, for external stakeholders including investors, analysts, and auditors: IC efficiency indicators can be used as red flag metrics when evaluating the ethical soundness and governance maturity of firms. This is especially relevant as ESG (Environmental, Social, and Governance) criteria gain prominence in investment decision-making globally (Salehi et al., 2023).

Recommendations for Future Research

While this study has contributed valuable insights into the relationship between intellectual capital (IC) and financial statement fraud (FSF), several areas remain open for further exploration. First, future research should consider incorporating qualitative or mixed-method approaches to gain deeper insights into the behavioural and psychological dimensions of fraud. While this study employed a quantitative design using secondary financial data, qualitative interviews with internal auditors, ethics officers, or even whistleblowers could provide more nuanced perspectives on how IC influences fraud capability, especially the "soft" components of human and relational capital that may not be fully captured in financial statements. In the Malaysian context, where issues of ethical culture, authority dynamics, and organisational hierarchy can be culturally embedded, qualitative insights may help unravel the social and organisational processes that lead to manipulation (Yahya & Salleh, 2022).

Second, future research should extend this study by performing cross-country comparisons across ASEAN nations such as Indonesia, Thailand, Vietnam, and the Philippines. These emerging economies share similarities with Malaysia in terms of regulatory development, market maturity, and corporate governance evolution, yet may differ in institutional pressures, enforcement levels, and cultural attitudes toward fraud and ethics. A comparative analysis can reveal how IC functions differently across governance environments and whether its fraud-mitigating effects are consistent across jurisdictions. Such studies would also support ASEAN integration efforts, especially in standardising disclosure norms and fraud prevention policies aligned with the ASEAN

Corporate Governance Scorecard and the UN Sustainable Development Goals (SDG 16: Peace, Justice, and Strong Institutions).

Third, future studies could investigate the interaction effects between intellectual capital and traditional governance mechanisms such as board independence, audit quality, or ownership concentration. While IC was found to have a direct effect on fraud in this study, there is growing interest in how intangible assets may complement or substitute governance tools in different organisational settings. For example, firms with strong IC may rely less on board oversight due to a stronger internal ethical climate, or conversely, boards may function more effectively when supported by high-quality IC systems. In Malaysia, where regulatory reforms are increasingly emphasising integrated reporting and ESG practices, such an interaction-based study would provide actionable insights for both regulators and firms seeking a holistic governance strategy (Karam & Othman, 2022).

Fourth, given the rapid acceleration of digitalisation, future research could examine the role of IC in preventing non-traditional fraud types, such as cyber fraud, algorithmic manipulation, or ESG misreporting. As Malaysian and ASEAN firms adopt more digital platforms and automation in financial reporting, the composition and relevance of IC are also evolving. Structural and human capital related to IT infrastructure, data security, and AI governance could become increasingly important in fraud detection and prevention.

Finally, researchers should consider assessing longitudinal effects of IC on FSF by using panel data over longer periods, potentially capturing post-pandemic recovery patterns and structural shifts in corporate behaviour. This would provide insights into whether the relationship between IC and fraud is consistent over time or subject to change during economic shocks, policy shifts, or leadership transitions.

In conclusion, future research opportunities are abundant and can meaningfully build on the foundation laid by this study. By incorporating deeper behavioural insights, cross-national perspectives, and evolving fraud risks, future scholars can continue to illuminate the critical role of intellectual capital in building ethical and transparent financial systems in Malaysia and the wider ASEAN region.

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