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A Security Engineering Framework for Fraud Deterrence: Evidence from Indonesian Digital Governance

Koenta Adji Koerniawan[1], Hosam Alden Riyadh[1,2*], Asrarul Rahman[1,3], Baligh Ali Hasan Beshr[4]

[1] Accounting Study Program, School of Economics and Business, Telkom University, Bandung 40257, Indonesia
[2] Accounting and Finance Department, Faculty of Business, Curtin University Malaysia, Miri 98009, Malaysia
[3] Board of the Republic of Indonesia (BPK), Jakarta 10110, Indonesia
[4] Department of Administrative Sciences, College of Administrative and Financial Science, Gulf University, Sanad 9091, Bahrain

Corresponding Author Email: hussam_19860@yahoo.com

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ABSTRACT

This study investigates the influence of the Local Government Information System (SIPD) and the Government Internal Control System (SPIP) on the quality of local government financial statements and examines how these factors contribute to fraud deterrence. Additionally, the study explores the moderating role of Fraud Control Plans (FCP) in strengthening the relationship between financial management quality and fraud prevention efforts. Using secondary data from local governments in West Java Province, Indonesia, this study applies Partial Least Squares Structural Equation Modelling (PLS-SEM) to test direct, indirect, and moderating relationships among SIPD, SPIP, financial reporting quality, fraud deterrence, and FCP. The results indicate that SIPD and SPIP are positively associated with financial reporting quality, which in turn is positively associated with fraud deterrence indicators. The analysis also reveals positive statistical associations between SIPD, SPIP, and fraud deterrence. Furthermore, the interaction between SPIP and FCP_Index is significant, suggesting that stronger fraud-control-plan implementation is associated with a stronger relationship between internal control indicators and financial reporting quality. Given the use of secondary administrative indicators and a limited local-government-year sample, the findings should be interpreted as evidence of statistical associations rather than direct causal effects. This study contributes to the literature by integrating digital governance, internal control frameworks, and fraud prevention mechanisms within the context of emerging economies. It provides empirical evidence on the complementary roles of SIPD, SPIP, and FCP, offering practical insights for policymakers and audit authorities seeking to design more robust accountability and fraud-deterrence systems.

1. INTRODUCTION

Fraud in public sector entities remains a persistent concern because it weakens governance mechanisms, reduces accountability, and erodes public trust [1-3]. In Indonesia, local governments are mandated to adopt the Local Government Information System (SIPD) as a digital platform for financial management, and the Government Internal Control System (SPIP) as an internal control framework. Alongside these, the adoption of Fraud Control Plans (FCP) has been promoted to provide structured mechanisms for preventing and deterring fraud [4]. Despite these regulatory and technological frameworks, fraud cases in local governments continue to surface. In West Java, for instance, audit findings still reveal weaknesses in financial reporting quality and irregularities in expenditure accountability [5, 6]. This situation suggests that the existence of SIPD, SPIP, and FCP does not automatically translate into higher financial reporting quality or stronger fraud deterrence unless these instruments are effectively integrated.

Previous research has highlighted the importance of internal control systems and digital governance tools in strengthening fraud prevention. Studies have emphasised that internal controls, such as SPIP, are the backbone of organisational integrity and fraud risk mitigation [5, 7]. Fraud theories-including the Fraud Triangle and Fraud Hexagon-explain how opportunities for misconduct arise in environments with weak control mechanisms [1, 8]. In parallel, SIPD has been shown to improve transparency and standardisation in government financial reporting, although its success depends on compliance and alignment with internal control practices [9]. Meanwhile, FCPs have been conceptualised as organisational "propellers" that embed fraud deterrence processes into managerial practices [4, 10]. Yet, despite their growing importance, FCPs are rarely tested empirically in statistical models, especially in their potential role as moderators.

These prior studies reveal several critical research gaps. First, there is an integration gap because SIPD, SPIP, and FCP have often been studied in isolation rather than in an integrated framework assessing their combined impact on fraud

deterrence. Second, there is a moderation gap, as limited empirical evidence exists on whether FCP strengthens the relationship between internal control systems such as SPIP and financial reporting quality (Qual_FS). Third, there is an outcome gap because most research focuses on fraud risk or reporting quality, while fraud deterrence as a distinct construct remains underexplored in public sector contexts [10, 11].

Addressing these gaps, this study advances the state of the art by employing a Partial Least Squares Structural Equation Modelling (PLS-SEM) approach with bootstrapping to examine the relationships among SIPD, SPIP, Qual_FS, and fraud deterrence (FDeter), while explicitly modelling FCP as a moderator. By integrating digital governance (SIPD), internal control (SPIP), and managerial FCP in one empirical model, this research contributes to the literature on fraud deterrence in the public sector with methodological rigour and policy relevance [12, 13].

The novelty of this study lies in several contributions. It empirically demonstrates the moderating role of FCP on the effectiveness of SPIP in improving financial reporting quality, a relationship that has not previously been examined in Indonesian local government contexts. It also provides evidence of how SIPD and SPIP simultaneously influence fraud deterrence, offering insights into the combined role of digital governance and internal control in curbing fraudulent practices. Moreover, the use of secondary audit-based data from West Java ensures that the analysis reflects real-world implementation challenges and policy impacts.

Based on this foundation, the study seeks to answer the following overarching research question: how do SIPD, SPIP, and FCP jointly influence financial reporting quality and fraud deterrence in local governments? This question is unpacked into specific hypotheses that test the direct effects of SIPD and SPIP on Qual_FS, the subsequent impact of Qual_FS on fraud deterrence, and the potential moderating role of FCP in reinforcing the relationship between SPIP and financial reporting quality.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1 Fraud deterrence in the public sector

Fraud deterrence has long been recognised as a cornerstone of accountability in both private and public organisations. In the public sector, fraud not only generates financial losses but also erodes citizen trust and undermines policy implementation [1, 7]. Fraud theories, such as the Fraud Triangle and Fraud Hexagon, emphasize that weak internal control environments and limited transparency increase opportunities for fraud to occur [1, 8]. Deterrence mechanisms such as internal controls, governance reforms, and fraud prevention planning are therefore essential to reduce the likelihood of fraudulent behaviour [14]. Accordingly, this study conceptualises FDeter as the outcome of a multi-layered governance system involving digital government reform, internal control, and fraud-control planning.

2.2 Local Government Information System and financial reporting quality

The adoption of the SIPD represents Indonesia's digital governance initiative to improve consistency, transparency, and accountability in local government financial management. SIPD functions as a centralised digital platform that integrates budget planning, accounting, and reporting. Previous studies indicate that digitalisation can enhance the quality of financial reporting by reducing manual errors, ensuring timely submissions, and strengthening oversight [9, 15]. However, digital tools alone cannot guarantee better reporting quality unless they are adequately supported by internal control and managerial commitment. Building on this reasoning, the first hypothesis is proposed:

H1: SIPD is positively associated with the Qual_FS of local governments.

2.3 Government Internal Control System and financial reporting quality

The SPIP is mandated by Indonesian regulation as the backbone of public sector internal control. Effective SPIP implementation is expected to ensure reliable reporting, compliance with laws, and operational efficiency [5]. Prior research shows that stronger internal control systems correlate with higher reporting quality and lower fraud risks [16]. However, SPIP effectiveness often depends on local government capacity, commitment, and the integration of fraud prevention measures [7]. Thus, the second hypothesis is formulated:

H2: SPIP is positively associated with the Qual_FS of local governments.

2.4 Financial reporting quality and fraud deterrence

High-quality financial reporting contributes to fraud deterrence by reducing information asymmetry, limiting managerial discretion, and increasing transparency. Empirical studies suggest that organisations with more reliable reporting systems are better able to prevent misstatements and manipulation [17, 18]. In the public sector, reliable reports provide audit trails that can discourage fraudulent practices by raising the likelihood of detection [10]. Accordingly, the third hypothesis is proposed:

H3: Qual_FS is positively associated with FDeter.

2.5 Direct effects of the Local Government Information System and the Government Internal Control System on fraud deterrence

Beyond their impact on reporting quality, SIPD and SPIP may also directly influence fraud deterrence. SIPD enhances transparency by enabling public and interagency scrutiny of budget execution, which can reduce opportunities for misappropriation. Meanwhile, SPIP embeds monitoring and risk management mechanisms within local governments, increasing the perceived costs of engaging in fraud [5, 8]. Thus, the following hypotheses are tested:

H4: SIPD is a positively associated with FDeter.

H5: SPIP is positively associated with FDeter.

2.6 Fraud Control Plans as a moderating mechanism

FCP serves as structured managerial strategies that combine risk assessment, fraud awareness, and reporting mechanisms. Recent scholarship emphasises that FCP acts as "Fraud Deterrence Propellers" that can amplify the effectiveness of existing internal controls [5, 7]. While SPIP provides a formal

internal control framework, its implementation effectiveness may vary across local governments. An FCP can enhance the impact of SPIP by embedding fraud risk management into daily operations, promoting a culture of integrity, and ensuring that corrective actions are taken [19]. Yet, empirical evidence on this moderating role is still scarce, especially in Indonesian local governments. Therefore, the final hypothesis is proposed:

H6: FCP positively moderates the effect of SPIP on Qual_FS.

2.7 Conceptual framework

Based on the literature review and hypothesis development, the conceptual framework of this study is presented in Figure 1. The model integrates digital governance (SIPD), internal control (SPIP), Qual_FS, FDeter, and FCP as a moderating variable. SIPD and SPIP are posited to directly influence the quality of financial reporting, which in turn is expected to affect fraud deterrence. Both SIPD and SPIP are also hypothesised to have direct effects on fraud deterrence, reflecting their role in enhancing transparency and internal monitoring. Finally, FCP is included as a moderator that strengthens the relationship between SPIP and financial reporting quality, capturing its role as a Fraud Deterrence Propeller within local government contexts [4, 7].

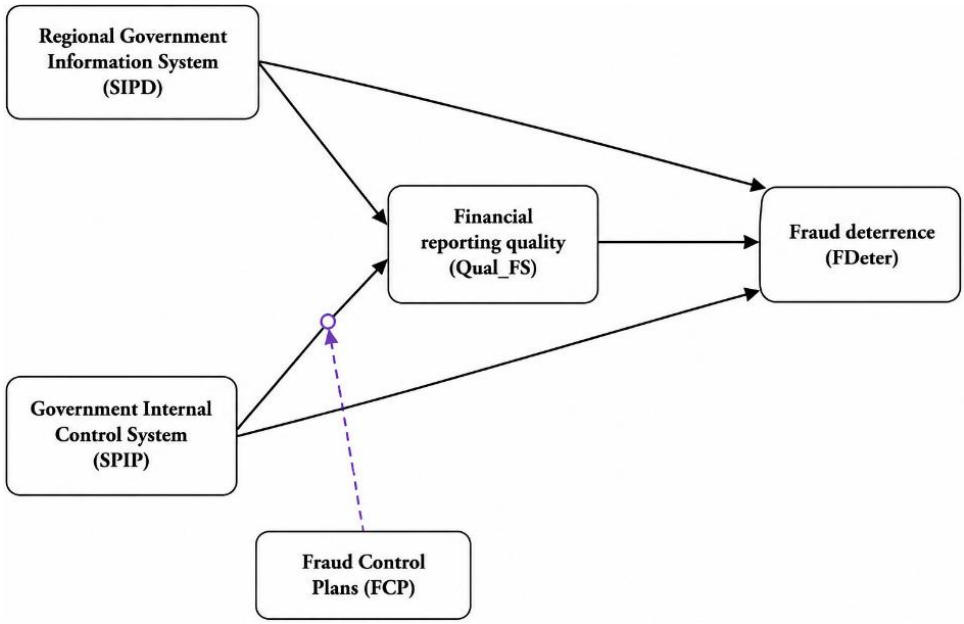

Figure 1. Framework of the study

3. RESEARCH METHODOLOGY

3.1 Research design

This study adopts a quantitative research design using the PLS-SEM approach. PLS-SEM is particularly suitable for exploratory studies, models with complex relationships, and situations where the primary objective is prediction rather than theory confirmation [12, 13]. It was chosen because the model integrates multiple latent constructs, moderation effects, and requires robust estimation despite the relatively limited sample size.

3.2 Population and sample

The population of this study consists of all regencies and city governments in West Java Province, Indonesia. West Java comprises 27 local governments, consisting of 18 regencies and 9 cities. The unit of analysis is the local-government-year observation, because each observation represents one local government observed in one fiscal year.

Although the regulatory background of SIPD implementation began with the issuance of Minister of Home Affairs Regulation No. 70 of 2019, the empirical analysis uses the period 2021–2023, when the required SIPD, SPIP, financial reporting, and fraud-control monitoring data were available in a comparable format across local governments. Therefore, the final dataset consists of a balanced short panel of 81 local-government-year observations: 27 local governments × 3 fiscal years. The dataset is therefore characterised as a balanced short panel rather than as a cross-sectional sample of 81 fully independent observations. Because each local government is observed in three consecutive fiscal years, annual observations from the same government may share persistent institutional, administrative, fiscal, and governance characteristics. The observations were pooled because each construct was measured separately for each local government in each fiscal year, allowing the analysis to retain both cross-government variation and year-to-year variation. Accordingly, the pooled PLS-SEM estimates represent average associations across local-government-year observations and should not be interpreted as estimates based on 81 unrelated entities.

The data were obtained from secondary documentary sources, including audit reports, SIPD implementation records, SPIP/internal-control monitoring documents, financial-reporting evaluation records, and fraud-control documentation. Observations from the earlier transition period were not included in the statistical model because the relevant indicators were not consistently available or comparable across all local governments. The exclusion of 2019–2020 was based on data comparability rather than statistical trimming,

because the required SIPD, SPIP, financial reporting, and fraud-control indicators were not consistently available across all local governments during the transition period [12, 20].

3.3 Measurement of variables

The constructs were measured using five-point ordinal archival scores derived from official audit reports, monitoring records, and internal government documentation. These scores represent document-based assessments of the extent to which each local government demonstrated the relevant governance, control, reporting, or fraud-deterrence attributes in a given fiscal year. A score of 1 indicates very weak evidence or non-implementation, while a score of 5 indicates very strong evidence. Where the source document already provided an official level or rating, the original rating was retained. Where the source document provided qualitative evidence, audit findings, checklist results, or monitoring records, the evidence was transformed into a five-point ordinal score using a predefined coding rubric. Higher scores indicate stronger implementation. SIPD was measured using indicators capturing system integration, data consistency, transparency, and timeliness. SPIP was measured using indicators reflecting the internal control environment, compliance, and monitoring/follow-up. Financial reporting quality was measured using audit-based indicators. Fraud deterrence was measured using documented fraud-prevention and monitoring mechanisms. FCP was measured using fraud-control-plan documentation and monitoring evidence [21], see Table 1.

Qual_FS was measured using three indicators: Qual1, Qual2, and Qual3. Qual1 captures audit opinion quality, Qual2 captures the timeliness and completeness of financial statement submission, and Qual3 captures the materiality and frequency of audit findings affecting reporting quality. All three indicators were retained because they met the minimum loading threshold and collectively capture the audit-based quality of local government financial reporting. Because this study uses secondary documentary data rather than survey responses, each indicator was coded using a predefined document-based scoring rubric. The indicators were derived from audit reports, SIPD implementation/monitoring records, SPIP/internal-control monitoring documents, financial reporting evaluation records, and fraud-control documentation. Each indicator was coded on a five-point ordinal archival scale, where 1 = very weak/no evidence, 2 = weak/limited evidence, 3 = moderate/partial evidence, 4 = strong/substantial evidence, and 5 = very strong/full evidence.

The coding was conducted at the local government level. Each score represents the condition of a local government in a given fiscal year. Where an official score, rating, or maturity level was available in the source document, the official score was used. Where the source document provided qualitative findings, checklist results, audit comments, or monitoring descriptions, the information was transformed into a five-point ordinal score using the coding criteria presented in Table 2.

To ensure coding consistency, the documentary evidence was reviewed using a structured coding sheet. Each indicator was coded according to the predefined rules in Table 2. When documentary evidence was ambiguous, the score was assigned based on the most conservative interpretation to avoid overstating implementation quality. The coding process focused on observable evidence in official documents rather than subjective perceptions. Therefore, the resulting scores are treated as archival ordinal indicators suitable for PLS-SEM analysis.

3.4 Data analysis technique

Data were analysed using SmartPLS 4, following a two-step approach: measurement model evaluation and structural model evaluation [12]. The measurement model was assessed through convergent validity (outer loadings > 0.70 and Average Variance Extracted (AVE) > 0.50), reliability (composite reliability > 0.70 and Cronbach's alpha > 0.60), and discriminant validity (Fornell–Larcker criterion and cross-loadings). The structural model was then tested using bootstrapping with 5,000 resamples to estimate the significance of path coefficients.

Moderation analysis was conducted by testing the interaction between SPIP and FCP. Because FCP was treated as a document-based composite index, the moderation term was calculated by multiplying the mean-centred SPIP score by the mean-centred FCP_Index score. The interaction term was labelled SPIP_FCP_Index_MC and specified as a predictor of financial reporting quality. A significant associated coefficient for SPIP_FCP_Index_MC → Qual_FS indicates that stronger fraud-control-plan implementation strengthens the effect of SPIP on financial reporting quality.

Table 1. Broad measurement-source table

Construct	Indicator Source	Type of Data	Scoring Explanation
SIPD	SIPD implementation/monitoring records	Archival ordinal score	1 = very weak implementation; 5 = full/comprehensive implementation
SPIP	SPIP/internal-control monitoring or maturity documents	Archival ordinal score	1 = weak control evidence; 5 = strong/advanced control evidence
Financial Reporting Quality	Audit reports and financial reporting evaluation records	Transformed audit indicator	A higher score reflects better reporting quality
Fraud Deterrence	Fraud prevention/deterrence documentation and monitoring records	Archival ordinal score	A higher score reflects stronger fraud-deterrence mechanisms
FCP	Fraud Control Plan documents/monitoring records	Document-based archival score	A higher score reflects stronger fraud-control-plan implementation

Note: Local Government Information System = SIPD; Government Internal Control System = SPIP; Fraud Control Plans = FCP.

Table 2. Measurement items, data sources, and coding rules

Construct	Code	Measurement Item	Main Data Source	Coding Rule
SIPD	SIPD1	Integration of SIPD with budgeting, accounting, and	SIPD implementation records; local government financial system	1 = not integrated/manual process dominant; 2 = limited integration; 3 = partial integration across key modules; 4 = substantial integration with minor gaps; 5 = fully integrated

		reporting processes	monitoring documents	across budgeting, accounting, and reporting
SIPD	SIPD2	Consistency and completeness of financial data recorded through SIPD	SIPD monitoring records; reconciliation documents; audit notes	1 = frequent inconsistencies/missing records; 2 = several inconsistencies; 3 = moderate consistency with correctable gaps; 4 = mostly consistent; 5 = complete and consistent records
SIPD	SIPD3	Transparency and traceability of financial transactions through SIPD	SIPD audit trail records; monitoring reports; audit reports	1 = no reliable audit trail; 2 = limited traceability; 3 = partial traceability; 4 = strong traceability with minor limitations; 5 = complete and transparent transaction trail
SIPD	SIPD4	Timeliness of SIPD-based financial processing and reporting	SIPD submission logs; financial reporting records; audit reports	1 = severely delayed; 2 = frequently delayed; 3 = moderately timely; 4 = mostly timely; 5 = consistently timely and within required deadlines
SPIP	SPIP1	Strength of the internal control environment	SPIP assessment/monitoring documents; internal government control reports	1 = weak/no documented control environment; 2 = limited control environment; 3 = moderate formal control environment; 4 = strong control environment; 5 = mature and consistently implemented control environment
SPIP	SPIP2	Compliance with internal control procedures and regulations	SPIP monitoring records; audit findings; compliance review documents	1 = major non-compliance; 2 = repeated non-compliance; 3 = partial compliance; 4 = substantial compliance; 5 = full compliance with documented evidence
SPIP	SPIP3	Monitoring and follow-up of internal control weaknesses	SPIP monitoring reports; audit recommendation follow-up records	1 = no follow-up; 2 = limited follow-up; 3 = partial follow-up; 4 = most findings followed up; 5 = systematic monitoring and complete/near-complete follow-up
Financial Reporting Quality	Qual1	Audit opinion quality on local government financial statements	BPK audit report on LKPD	1 = adverse opinion; 2 = disclaimer/no opinion; 3 = qualified opinion; 4 = unqualified opinion with significant findings; 5 = unqualified opinion with limited/minor findings
Financial Reporting Quality	Qual2	Timeliness and completeness of financial statement submission	LKPD submission records; audit reports; reporting evaluation documents	1 = not submitted/severely incomplete; 2 = late and incomplete; 3 = submitted with moderate deficiencies; 4 = timely with minor deficiencies; 5 = timely and complete
Financial Reporting Quality	Qual3	Materiality and frequency of audit findings affecting reporting quality	BPK audit findings; internal reporting evaluation records	1 = pervasive/material findings; 2 = significant findings; 3 = moderate findings; 4 = minor findings; 5 = no or immaterial findings
Fraud Deterrence	FD1	Existence of formal anti-fraud policies and sanctions	Fraud prevention policy documents; internal government documents	1 = no formal policy; 2 = policy exists but incomplete; 3 = policy partially implemented; 4 = policy substantially implemented; 5 = comprehensive and enforced anti-fraud policy
Fraud Deterrence	FD2	Availability of fraud reporting or whistleblowing mechanisms	Whistleblowing system records, monitoring reports and fraud-control documents	1 = no reporting mechanism; 2 = informal/limited mechanism; 3 = formal mechanism exists but limited use; 4 = formal and functioning mechanism; 5 = formal, accessible, monitored, and documented mechanism
Fraud Deterrence	FD3	Follow-up on suspected fraud, irregularities, or audit recommendations	Audit recommendation follow-up records; inspectorate reports; monitoring records	1 = no follow-up; 2 = weak follow-up; 3 = partial follow-up; 4 = substantial follow-up; 5 = complete and documented follow-up
Fraud Deterrence	FD4	Preventive monitoring to reduce opportunities for fraud	Internal monitoring reports, audit reports and fraud risk documents	1 = no preventive monitoring; 2 = limited/ad hoc monitoring; 3 = periodic but partial monitoring; 4 = regular monitoring; 5 = systematic risk-based monitoring
Fraud Control Plan	FCP1	Availability of a documented Fraud Control Plan	FCP documents; internal government documents	1 = no FCP; 2 = draft/incomplete FCP; 3 = formal FCP exists but limited implementation; 4 = implemented FCP with minor gaps; 5 = comprehensive and implemented FCP
Fraud Control Plan	FCP2	Fraud risk identification and assessment procedures	FCP documents, risk assessment reports and monitoring records	1 = no fraud risk assessment; 2 = limited/ad hoc assessment; 3 = partial assessment; 4 = regular assessment; 5 = systematic and documented fraud risk assessment
Fraud Control Plan	FCP3	Fraud prevention activities embedded in operational procedures	FCP implementation records; internal control documents; monitoring records	1 = no prevention activities; 2 = limited activities; 3 = partial implementation; 4 = substantial implementation; 5 = comprehensive prevention activities embedded in operations
Fraud Control Plan	FCP4	Fraud awareness, training, and communication activities	Training records, socialisation documents, FCP monitoring records	1 = no awareness activity; 2 = limited/ad hoc activity; 3 = occasional activity; 4 = regular activity; 5 = systematic and documented awareness program
Fraud Control Plan	FCP5	Evaluation and updating of the Fraud Control Plan	FCP review reports, monitoring records and internal evaluation documents	1 = never evaluated; 2 = rarely evaluated; 3 = occasionally evaluated; 4 = regularly evaluated; 5 = regularly evaluated and updated based on findings

Note: Local Government Information System = SIPD; Government Internal Control System = SPIP; Fraud Control Plans = FCP.

3.5 Ethical considerations

The study uses secondary data from publicly available government audit and reporting sources. No direct human participation was involved, ensuring that confidentiality and ethical research standards were maintained.

4. RESULTS AND DISCUSSION

4.1 Descriptive statistics

The descriptive analysis provides an overview of the observed indicators for SIPD, SPIP, financial reporting quality, fraud deterrence, and the composite FCP_Index. Because the data were coded using five-point ordinal archival scores, the descriptive statistics should be interpreted as evidence of documented implementation rather than respondent perceptions [4, 5]. Overall, the SIPD and SPIP indicators show relatively strong documentary evidence of digital governance and internal control implementation across West Java local governments. The financial reporting quality and fraud deterrence indicators also show relatively high values, suggesting that audit-based reporting quality and documented fraud-deterrence mechanisms were generally present during the observation period. The FCP indicators showed restricted variance, suggesting relatively homogeneous formal adoption of fraud-control-plan components across local governments. Because FCP represents a multi-component governance mechanism, the study used a composite FCP_Index based on FCP1–FCP5 rather than relying on a single indicator. This preserves the theoretical coverage of the FCP construct while reducing instability caused by highly overlapping documentary indicators.

This descriptive evidence indicates generally strong implementation of SIPD, SPIP, financial reporting quality, and fraud-deterrence mechanisms. The restricted variance of the FCP indicators supports the use of a composite FCP_Index to preserve construct coverage while reducing instability from overlapping documentary indicators [12, 20].

The descriptive statistics for all study variables are presented in Table 3.

Table 3. Descriptive statistics of indicators

Variable	N	Mean	Median	Min	Max	SD	Skewness	Kurtosis
SIPD1	81	4.025	4	3	5	0.670	−0.028	−0.718
SIPD2	81	4.420	5	3	5	0.668	−0.729	−0.534
SIPD3	81	3.728	4	2	5	0.592	−1.332	1.907
SIPD4	81	4.037	4	3	5	0.679	−0.045	−0.780
SPIP1	81	2.753	3	1	4	0.734	−0.158	−0.180
SPIP2	81	3.728	4	2	5	0.613	−1.444	2.061
SPIP3	81	3.975	4	2	5	0.806	−1.277	1.826
Qual1	81	4.037	4	3	5	0.660	−0.039	−0.648
Qual2	81	4.395	4	3	5	0.665	−0.650	−0.601
Qual3	81	4.877	5	4	5	0.331	−2.333	3.528
FD1	81	3.654	4	2	5	0.655	−1.417	1.224
FD2	81	3.679	4	2	5	0.649	−1.546	1.610
FD3	81	4.852	5	4	5	0.357	−2.018	2.126
FD4	81	4.037	4	4	5	0.190	4.996	23.540
FCP1	81	4.160	4	4	5	0.369	1.885	1.592
FCP2	81	4.877	5	4	5	0.331	−2.333	3.528
FCP3	81	4.086	4	4	5	0.283	3.000	7.174
FCP4	81	4.395	4	4	5	0.492	0.437	−1.855
FCP5	81	4.037	3	3	5	0.660	−0.039	−0.648
FCP_Index	81	4.311	4.200	3.800	5.000	0.335	0.541	−0.210

Note: Local Government Information System = SIPD; Government Internal Control System = SPIP; Fraud Control Plans = FCP.

4.2 Measurement model assessment

4.2.1 Convergent validity

Convergent validity is assessed using outer loadings and AVE. Indicators with loadings greater than 0.70 are considered valid, while constructs are valid when AVE exceeds 0.50 [12]. The outer loading results are presented in Table 4.

All indicators exceed the 0.70 threshold, except SPIP1, which is slightly below but retained because it is theoretically essential for capturing the SPIP construct [12]. The AVE values are presented in Table 5.

All constructs demonstrate AVE values above 0.50, confirming convergent validity [22].

4.2.2 Reliability

Reliability is evaluated using Composite Reliability (CR) and Cronbach's Alpha. The minimum thresholds are CR > 0.70 and alpha > 0.60 [20]. The reliability results are presented in Table 6.

Table 4. Outer loadings

Construct	Indicator	Outer Loading
SIPD	SIPD1	0.842
SIPD	SIPD2	0.877
SIPD	SIPD3	0.861
SIPD	SIPD4	0.811
SPIP	SPIP1	0.692
SPIP	SPIP2	0.841
SPIP	SPIP3	0.857
Qual_FS	Qual1	0.835
Qual_FS	Qual2	0.889
Qual_FS	Qual3	0.873
FDeter	FD1	0.829
FDeter	FD2	0.802
FDeter	FD3	0.846
FDeter	FD4	0.818

Note: Local Government Information System = SIPD; Government Internal Control System = SPIP; Fraud Deterrence = FDeter; Financial Reporting Quality = Qual_FS.

Table 5. Average Variance Extracted (AVE)

Construct	AVE
SIPD	0.717
SPIP	0.678
Qual_FS	0.774
FDeter	0.689

Note: Local Government Information System = SIPD; Government Internal Control System = SPIP; Fraud Deterrence = FDeter; Financial Reporting Quality = Qual_FS.

Table 6. Composite reliability and Cronbach's alpha

Construct	Cronbach's Alpha	Composite Reliability
SIPD	0.872	0.911
SPIP	0.742	0.865
Qual_FS	0.853	0.911
FDeter	0.837	0.895

Note: Local Government Information System = SIPD; Government Internal Control System = SPIP; Fraud Deterrence = FDeter; Financial Reporting Quality = Qual_FS.

All constructs meet the recommended reliability thresholds, indicating satisfactory internal consistency and measurement reliability.

4.2.3 Discriminant validity

Discriminant validity is assessed using the Fornell–Larcker Criterion and Cross Loadings. The Fornell–Larcker results are presented in Table 7.

The square roots of the AVE (diagonal values) are greater than the corresponding inter-construct correlations, indicating satisfactory discriminant validity.

The cross-loading results are presented in Table 8. It shows that all indicators load more strongly on their respective constructs than on other constructs, providing additional evidence of discriminant validity.

Table 7. Fornell–Larcker criterion

Construct	SIPD	SPIP	Qual_FS	FDeter
SIPD	0.847			
SPIP	0.611	0.823		
Qual_FS	0.642	0.588	0.880	
FDeter	0.595	0.562	0.633	0.830

Note: Local Government Information System = SIPD; Government Internal Control System = SPIP; Fraud Deterrence = FDeter; Financial Reporting Quality = Qual_FS.

Table 8. Cross loadings (only partial shown due to length)

Indicator	SIPD	SPIP	Qual_FS	FDeter
SIPD1	0.842	0.513	0.527	0.488
SIPD2	0.877	0.525	0.534	0.498
SIPD3	0.861	0.497	0.523	0.471
SIPD4	0.811	0.478	0.506	0.454
SPIP2	0.508	0.841	0.502	0.468
Qual2	0.546	0.532	0.889	0.544
FD3	0.521	0.497	0.546	0.846

Note: Local Government Information System = SIPD; Government Internal Control System = SPIP; Fraud Deterrence = FDeter; Financial Reporting Quality = Qual_FS.

4.3 Structural model assessment

The predictive ability of the model is assessed using R^2, f^2, and Q^2. The structural model assessment results are presented in Table 9. According to Hair et al. [12], R^2 values of 0.25, 0.50, and 0.75 indicate weak, moderate, and substantial explanatory power, respectively. The Qual_FS (R^2 = 0.487) and FDeter (R^2 = 0.521) constructs therefore demonstrate moderate explanatory power. Furthermore, all Q^2 values are greater than zero, indicating that the structural model possesses predictive relevance.

Table 9. R^2 and Q^2 values

Endogenous Construct	R^2	Q^2
Qual_FS	0.487	0.312
FDeter	0.521	0.337

Note: Fraud Deterrence = FDeter; Financial Reporting Quality = Qual_FS.

4.4 Hypothesis testing

The hypotheses were tested using bootstrapping (5000 resamples) in SmartPLS. The hypothesis testing results are presented in Table 10.

All six hypotheses are statistically supported ($p < 0.05$). SIPD and SPIP have significant positive effects on both Financial Reporting Quality (Qual_FS) and Fraud Deterrence (FDeter). In addition, Qual_FS has a significant positive effect on FDeter. Furthermore, Fraud Control Plans (FCP) significantly moderate the relationship between SPIP and Qual_FS, supporting their role as a managerial mechanism that strengthens the effectiveness of internal control in improving financial reporting quality [4, 7].

Table 10. Hypothesis testing results

Code	Hypothesis	Path Coefficient	t-Statistic	p-Value	Result
H1	SIPD → Qual_FS	0.378	4.216	0.000	Supported
H2	SPIP → Qual_FS	0.291	2.912	0.004	Supported
H3	Qual_FS → FDeter	0.321	2.819	0.005	Supported
H4	SIPD → FDeter	0.204	2.367	0.018	Supported
H5	SPIP → FDeter	0.230	2.822	0.004	Supported
H6	SPIP × FCP_Index → Qual_FS	0.218	2.455	0.015	Supported

Note: Local Government Information System = SIPD; Government Internal Control System = SPIP; Fraud Deterrence = FDeter; Financial Reporting Quality = Qual_FS; Fraud Control Plans = FCP.

4.5 Discussion

The findings provide several theoretical and practical implications. First, the positive association of SIPD on both Qual_FS and FDeter highlights the critical role of digital governance in enhancing transparency, accountability, and oversight in local governments. SIPD as a centralised information system minimises human intervention in accounting processes, thereby reducing errors and opportunities for manipulation [9]. This aligns with broader e-government literature emphasising that digital platforms may be associated with lower opportunities for discretionary behaviour [15]. Moreover, the result underscores that digitalization is not merely a technical upgrade but a

governance reform that directly influences fraud prevention outcomes [23, 24]. Comparable evidence in Indonesia confirms that technology integration is significantly associated with reporting reliability, particularly when moderated by human resource competence [25].

The findings provide evidence of statistically significant associations among SIPD, SPIP, financial reporting quality, fraud deterrence, and FCP_Index. Because the study uses secondary administrative indicators and a limited panel of 81 local-government-year observations, the results should be interpreted cautiously. The PLS-SEM results identify patterned relationships among the constructs, but they do not establish positive associations. Accordingly, the discussion interprets the results as associations between governance, internal control, reporting quality, and fraud-deterrence indicators rather than as definitive evidence that SIPD or SPIP directly causes stronger fraud deterrence.

Second, SPIP contributes to both reporting quality and fraud deterrence, although its coefficients are weaker than those of SIPD. This reflects the persistent challenge of ensuring that internal control systems are not merely formalistic but substantively embedded in local bureaucracies. Prior studies show that the effectiveness of government internal control frameworks depends on managerial competence, organisational culture, and available resources [5, 16]. Similar patterns are observed in other contexts, such as Ghana, where internal controls affect reporting quality but require strong institutional support for effective implementation [26]. The weaker impact of SPIP may also be related to limitations in auditor competence and task complexity, which have been shown to reduce audit quality in public entities [27]. These findings resonate with the study [7], which argues that internal controls in Indonesian local governments often remain compliance-oriented rather than performance-oriented, thereby limiting their deterrent capacity.

Third, financial reporting quality is positively associated with fraud-deterrence indicators. This finding suggests that local governments with stronger audit-based reporting quality also tend to have stronger documented fraud-deterrence mechanisms. This association is theoretically plausible because reliable financial reporting can improve transparency and auditability. However, the cross-sectional panel structure and administrative scoring approach do not allow the study to claim that reporting quality directly causes fraud deterrence. The result should therefore be read as evidence of alignment between reporting quality and fraud-deterrence indicators. However, High-quality reporting reduces information asymmetry, restricts managerial discretion, and creates reliable audit trails that raise the likelihood of fraud detection [17, 18]. In Indonesian local governments, this suggests that transparent and reliable financial statements not only serve accountability purposes but also function as preventive mechanisms against fraudulent practices. This is consistent with fraud theories such as the Fraud Triangle and Hexagon, which emphasise transparency and accountability as core deterrence factors [1, 8]. Recent evidence further shows that quality reporting mediates the relationship between audit findings and service delivery, reinforcing its importance as both an accountability and deterrence mechanism [28].

Fourth, the significant interaction term between SPIP and FCP_Index suggests that fraud-control-plan implementation conditions the relationship between SPIP and financial reporting quality. In practical terms, local governments with stronger FCP_Index scores appear to show an association between internal-control indicators and financial reporting quality. This finding supports the theoretical argument that fraud-control planning may complement internal control systems. Nevertheless, because FCP_Index is based on documentary indicators and the sample is limited, the moderation result should be interpreted as a conditional statistical association rather than conclusive causal evidence. However, the moderating role of FCP is both theoretically and practically significant. The results demonstrate that FCP strengthens the relationship between SPIP and reporting quality, validating its conceptualisation as a "fraud deterrence propeller" [4, 7]. In practice, this means that structured fraud prevention policies provide operational detail that makes internal controls more effective. The study [29] emphasises that ethics and integrity plans embed norms into daily routines, thereby enhancing the credibility of internal controls. This study confirms such mechanisms, though it also notes that in some local governments, FCPs remain formalistic, limiting their moderating strength. Similar arguments are found in accountability studies that highlight the importance of organisational commitment, resources, and leadership support for strengthening the deterrence role of fraud prevention measures [30].

Overall, the integration of SIPD, SPIP, and FCP forms a multi-layered governance system that enhances fraud deterrence in Indonesian local governments. Theoretically, this study contributes to fraud deterrence literature by empirically demonstrating how digital governance, internal controls, and fraud prevention planning interact as complementary mechanisms. Practically, the findings emphasise that fraud deterrence cannot be achieved by relying solely on compliance-based internal control systems. Instead, it requires a holistic approach that combines technological integration (SIPD), regulatory frameworks (SPIP), and managerial strategies (FCP). This approach reflects recent calls for multi-dimensional fraud risk management in the public sector [14, 31].

In summary, SIPD emerges as a relatively associated driver of fraud deterrence compared to SPIP, suggesting that digital transformation may be a more immediate lever for reform in local governments. Yet, the enduring importance of SPIP and the moderating role of FCP indicate that sustainable fraud deterrence requires synergy between systems, controls, and managerial commitment. These results also align with recent scholarship emphasizing that fraud deterrence depends not only on regulatory compliance but also on effective governance, competent auditors, and inclusive oversight structures such as gender-diverse boards [32-34].

5. CONCLUSIONS AND IMPLICATIONS

This study examined the role of digital governance (SIPD), internal control systems (SPIP), and FCP in enhancing Qual_FS and FDeter in Indonesian local governments. The empirical results demonstrate several key findings. First, SIPD is significantly associated with both financial reporting quality and fraud deterrence, highlighting the importance of digital transformation in strengthening accountability and oversight. Second, while SPIP contributes to reporting quality and fraud deterrence, its impact is weaker than SIPD, indicating that internal control systems remain constrained by implementation capacity and organisational commitment at the local level. Third, financial reporting quality is associated

with fraud deterrence, confirming its critical role as a preventive mechanism against fraudulent practices. Finally, FCP moderates the relationship between SPIP and financial reporting quality, validating its function as a practical tool for strengthening the effectiveness of internal controls.

Theoretically, these findings contribute to the fraud deterrence literature by integrating digital governance, internal control, and managerial fraud prevention strategies into a unified framework. The study provides empirical evidence on how these elements interact as complementary mechanisms, offering new insights into the design of public sector governance systems.

From a practical perspective, the results emphasise that sustainable fraud deterrence requires more than compliance with regulations. Local governments need to ensure effective implementation of SPIP, strengthen organisational commitment, and integrate FCPs into daily operations. Digital platforms such as SIPD should be further optimised to improve transparency and reporting reliability. At the same time, FCP should move beyond formality to become actionable strategies that reinforce internal control practices. In conclusion, the synergy of SIPD, SPIP, and FCP establishes a multi-layered governance structure that enhances financial integrity and fraud deterrence in Indonesian local governments. Policymakers, auditors, and managers are encouraged to leverage this integrated approach to strengthen accountability, build public trust, and ensure more effective financial governance.

Several limitations should be acknowledged. First, the study relies on secondary administrative and audit-based indicators rather than primary survey or experimental data. Consequently, the findings represent statistical associations among documented governance, internal-control, reporting-quality, and fraud-deterrence indicators rather than direct causal effects. Second, the dataset comprises 27 local governments in West Java observed over three fiscal years, resulting in 81 local-government-year observations. Because each local government contributes three annual observations, observations within the same government may be correlated due to persistent institutional, administrative, fiscal, and governance characteristics. Although the observations were pooled to retain both cross-government and annual variation, the PLS-SEM analysis does not explicitly account for local-government clustering, serial correlation, or unobserved government-specific heterogeneity. Therefore, the reported significance levels should be interpreted cautiously. Third, the short three-year period and geographical concentration in West Java limit the temporal and geographical generalisability of the findings. Future research should employ longer multi-province panel datasets and estimators that explicitly account for clustered observations, serial dependence, year effects, and local-government-specific heterogeneity.

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REFERENCES

[1] Albrecht, W.S., Albrecht, C.O., Albrecht, C.C., Zimbelman, M.F. (2019). Fraud Examination (6th ed.). Boston: Cengage Learning. https://www.cengage.com/c/fraud-examination-6e-albrecht-albrecht-albrecht-zimbelman/9781337619677/.

[2] Kristanti, F.T., Febrianta, M.Y., Salim, D.F., Riyadh, H.A., Beshr, B.A.H. (2024). Predicting financial distress in Indonesian companies using Machine Learning. Engineering, Technology & Applied Science Research, 14(6): 17644-17649. https://doi.org/10.48084/etasr.8520

[3] Singleton, T.W., Singleton, A.J., Bologna, G.J., Lindquist, R.J. (2010). Fraud auditing and forensic accounting (4th ed.). Hoboken, NJ: John Wiley & Sons. https://onlinelibrary.wiley.com/doi/book/10.1002/9781118269183.

[4] Koerniawan, K.A., Afiah, N.N., Sueb, M., Suprijadi, J. (2022). Fraud deterrence: The management's intention in using FCP. Quality - Access to Success, 23(190): 292-301. https://doi.org/10.47750/QAS/23.190.31

[5] Nadirsyah, Indriani, M., Mulyany, R. (2024). Enhancing fraud prevention and internal control: The key role of internal audit in public sector governance. Cogent Business & Management, 11(1): 2382389. https://doi.org/10.1080/23311975.2024.2382389

[6] Online, T. (2022). Kasus ACT, ini fakta-fakta dugaan penyelewengan dana masyarakat. TEMPO. https://www.tempo.co/politik/kasus-act-ini-fakta-fakta-dugaan-penyelewengan-dana-masyarakat-327875.

[7] Koerniawan, K.A., Triyanto, D.N., Wahyuni, D., Farida, A.L. (2024). Fraud deterrence propellers for internal control quality improvement. Quality-Access to Success, 25(203): 69-82. https://doi.org/10.47750/QAS/25.203.08

[8] Koerniawan, K.A. (2024). Fraud Theories & Fraud Deterrence Propeller. Kab. Bandung: TEL-U Press. https://telupress.telkomuniversity.ac.id/public/product/fraud-theories-%26-fraud-deterrence-propeller/18/151.

[9] Tarjo, T., Vidyantha, H.V., Anggono, A., Yuliana, R., Musyarofah, S. (2022). The effect of enterprise risk management on prevention and detection fraud in Indonesia's local government. Cogent Economics & Finance, 10(1): 2101222. https://doi.org/10.1080/23322039.2022.2101222

[10] Koerniawan, K.A., Murti, G.T., Saraswati, R.S., Hilda, H. (2024). Assessing fraud deterrence in private health clinics: Policy implications from West Java. Jurnal Reviu Akuntansi dan Keuangan, 14(2): 350-379. https://doi.org/10.22219/jrak.v14i2.32903

[11] Riyadh, H.A., Garad, A., Al-Ansi, A.M., Beshr, B.A.H. (2026). Synergistic governance, integrating financial and IT governance for enhanced institutional performance: Systematic review for future path. Social Sciences & Humanities Open, 13: 102449.

https://doi.org/10.1016/j.ssaho.2026.102449
[12] Hair, J., Alamer, A. (2022). Partial Least Squares Structural Equation Modeling (PLS-SEM) in second language and education research: Guidelines using an applied example. Research Methods in Applied Linguistics, 1(3): 100027. https://doi.org/10.1016/j.rmal.2022.100027
[13] Ghozali, I. (2021). SEM Dengan Metode Alternatif Partial Least Squares (5th ed.). Semarang: Badan Penerbit Universitas Diponegoro. https://penerbit.undip.ac.id/.
[14] Mabel, S.N., Payamta, P., Winarna, J. (2025). The development of fraud prevention policies in the public sector: A bibliometric analysis. Jurnal Akuntansi & Auditing Indonesia, 119-133. https://doi.org/10.20885/jaai.vol29.iss1.art10
[15] Koreff, J., Weisner, M., Sutton, S.G. (2021). Data analytics (AB) use in healthcare fraud audits. International Journal of Accounting Information Systems, 42: 100523. https://doi.org/10.1016/j.accinf.2021.100523
[16] Shanikat, M., Aldabbas, M.M. (2025). Perception of Corporate governance factors in mitigating financial statement fraud in emerging markets: Jordan experience. Journal of Risk and Financial Management, 18(8): 430. https://doi.org/10.3390/jrfm18080430
[17] Beneish, M.D. (1999). The detection of earnings manipulation. Financial Analysts Journal, 55(5): 24-36. https://doi.org/10.2469/faj.v55.n5.2296
[18] Dechow, P.M., Ge, W., Larson, C.R., Sloan, R.G. (2011). Predicting material accounting misstatements. Contemporary Accounting Research, 28(1): 17-82. https://doi.org/10.1111/j.1911-3846.2010.01041.x
[19] Al-Khoury, A.F., Alastal, A.Y.M., Samara, H., Alslaibi, N.A., Abdulmuhsin, A.A., Alqudah, M.Z. (2025). The bibliometric landscape of emerging technology in the accounting information systems field. Cogent Business & Management, 12(1): 2573191. https://doi.org/10.1080/23311975.2025.2573191
[20] Nunnally, J.C. (1978). Psychometric Theory (2nd ed.). New York: McGraw-Hill. https://www.mheducation.com/.
[21] Chin, W.W., Marcolin, B.L., Newsted, P.R. (2003). A partial least squares latent variable modeling approach for measuring interaction effects: Results from a Monte Carlo simulation study and an electronic-mail emotion/adoption study. Information Systems Research, 14(2): 189-217. https://doi.org/10.1287/isre.14.2.189.16018
[22] Fornell, C., Larcker, D.F. (1981). Structural Equation models with unobservable variables and measurement error: Algebra and statistics. Journal of Marketing Research, 18(3): 382-388. https://doi.org/10.1177/002224378101800313
[23] Heeks, R. (2006). Understanding and measuring e-government: International benchmarking studies. UNDESA Workshop on E-Participation and E-Government, 27-28. https://www.un.org/development/desa/.
[24] Riskiyadi, M. (2024). Detecting future financial statement fraud using a machine learning model in Indonesia: A comparative study. Asian Review of Accounting, 32(3): 394-422. https://doi.org/10.1108/ARA-02-2023-0062
[25] Naida, N., Amir, A.M., Din, M., A, M.I., Karim, F. (2023). The effect of implementing local government information system on the quality of local government financial reports moderated by human resource competence. Journal of World Science, 2(8): 1123-1129. https://doi.org/10.58344/jws.v2i8.390
[26] Agbenyo, W., Jiang, Y., Cobblah, P.K. (2018). Assessment of government internal control systems on financial reporting quality in Ghana: A case study of Ghana Revenue Authority. International Journal of Economics and Finance, 10(11): 40-50. https://doi.org/10.5539/ijef.v10n11p40
[27] Lubis, H.Z., Sari, M., Ramadhany, A.A., Ovami, D.C., Brutu, I.R. (2024). Effect of internal audit, internal control, and audit quality on fraud prevention: Evidence from the public sector in Indonesia. Problems and Perspectives in Management, 22(2): 40-50. https://businessperspectives.org/journals/problems-and-perspectives-in-management/issue-455/effect-of-internal-audit-internal-control-and-audit-quality-on-fraud-prevention-evidence-from-the-public-sector-in-indonesia.
[28] Furqan, A.C., Wardhani, R., Martani, D., Setyaningrum, D. (2020). The effect of audit findings and audit recommendation follow-up on the financial report and public service quality in Indonesia. International Journal of Public Sector Management, 33(5): 535-559. https://doi.org/10.1108/IJPSM-06-2019-0173
[29] Geraldo, J.E. (2025). The role of internal audit in promoting organisational ethics and integrity. Journal of Business Management and Accounting, 15(2): 209-217. https://doi.org/10.32890/jbma2025.15.2.7
[30] Nadirsyah, Indriani, M., Mulyany, R. (2024). Enhancing fraud prevention and internal control: The key role of internal audit in public sector governance. Cogent Business & Management, 11(1): 2382389. https://doi.org/10.1080/23311975.2024.2382389.
[31] Liu, W., Wang, Z., Zhang, X. (2025). Research on financial fraud detection by integrating latent semantic features of annual report text with accounting indicators. Journal of Accounting & Organizational Change, 21(5): 841-866. https://doi.org/10.1108/JAOC-06-2024-0199
[32] Arifin, A.L., Koerniawan, K.A. (2025). Gender-diverse boards, liquidity, and financial distress: Pathways to fraud deterrence in auditor judgments. Edelweiss Applied Science and Technology, 9(5): 2549-2564. https://doi.org/10.55214/25768484.v9i5.7517
[33] Guo, Y., Delaney, D., Ahmed, A. (2020). Is an auditor's propensity to issue going concern opinions a valid measure of audit quality? Australian Accounting Review, 30(2): 144-153. https://doi.org/10.1111/auar.12300
[34] Hakami, T.A., Rahmat, M.M., Yaacob, M.H., Saleh, N.M. (2020). Fraud detection gap between auditor and fraud detection models: Evidence from Gulf Cooperation Council. Asian Journal of Accounting & Governance, 13: 1-13. https://doi.org/10.17576/AJAG-2020-13-01