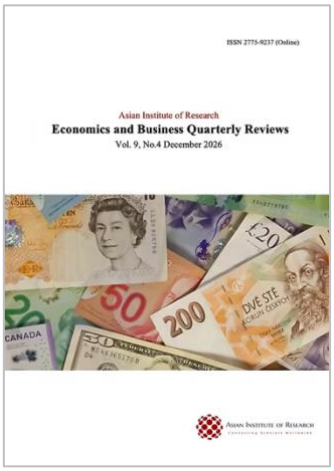



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# Fraud Detection Beyond Technology: The Role of Auditor Agility

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**Abstract**
This research was conducted to analyze the impact of information systems, whistleblower systems, and professional skepticism on fraud detection, as well as explore the role of auditor agility moderation. The approach used in this study is a quantitative approach, data that was successfully collected by 197 internal auditor respondents in Indonesia and analyzed through Partial Least Squares–Structural Equation Modeling (PLS-SEM). The results of this study revealed that information systems and whistleblower systems did not significantly affect fraud detection, suggesting that both mechanisms tended to function primarily as operational and compliance support tools rather than strategic fraud detection instruments. Conversely, professional skepticism and auditor agility significantly increase the effectiveness of fraud detection. In the role of moderation, the agility of auditors strengthens the relationship between information systems and fraud detection, but does not moderate the relationship involving the whistleblower system and professional skepticism. These findings highlight that the effectiveness of fraud detection is not only determined by the existence of formal systems or technological infrastructure, but is highly dependent on auditors' adaptive and cognitive abilities. This study contributes to the fraud detection and audit literature by expanding on Dynamic Capability Theory and demonstrating that auditor agility serves as a selective dynamic capability that enhances the effectiveness of technology-based mechanisms in audits.

**Keywords:** Auditor Agility, Information System, Whistleblowing, Professional Skepticism, Fraud Detection

## 1. Introduction

Fraud refers to illegal actions committed by individuals or groups for personal gain at the expense of other parties (Khofidah Pujilestari & Nera Marinda Machdar, 2024). Fraud has become a major challenge for both public and private organizations because it not only causes financial losses but also damages organizational reputation and reduces stakeholder trust, which in some cases may threaten organizational sustainability (Rahmawati et al., 2021).

As a result, fraud detection has become increasingly important for organizations and companies. The Report to the Nations 2026 published by the Association of Certified Fraud Examiners (ACFE) (ACFE, 2026) shows that asset misappropriation remains the most common type of fraud, accounting for 53% of reported cases, followed by corruption at 8%. Although financial statement fraud represents only 1% of cases, it results in the highest financial

losses. The report also reveals that 38% of perpetrators commit more than one type of fraud simultaneously, indicating that fraud schemes are becoming more complex and require more adaptive detection approaches.

The same ACFE report also shows that Indonesia ranked third in the highest number of reported fraud cases by country/territory in the Asia-Pacific region, with 20 cases (13.99%) out of a total of 143 cases, following Australia and China. This finding suggests that existing fraud prevention and detection mechanisms have not yet been fully effective. In addition, the ACFE reported that only 15% of organizations were able to recover their losses in full, while 29% recovered only part of the losses, and 56% were unable to recover any losses at all. These findings underscore the importance of effective fraud detection in minimizing organizational losses and preventing further damage.

Several major cases in Indonesia further highlight this urgency. In late 2024, e-Fishery was reported to have manipulated its financial statements through a dual reporting system that allegedly inflated revenue by nearly USD 600 million, with around 75% of the reported figures suspected to be invalid. In another case, early 2025 investigations revealed alleged corruption related to crude oil import governance involving subsidiaries of Pertamina, with estimated state losses reaching IDR 193.7 trillion. These cases demonstrate that weak fraud detection systems and ineffective organizational responses to fraud indicators can lead to significantly greater financial and reputational damage.

Along with the growing complexity of business activities and the increasing digitalization of organizational processes, fraud detection can no longer rely solely on traditional audit approaches. Information systems have become an important tool in supporting fraud detection by providing integrated, accurate, and real-time data that help auditors identify unusual patterns and potential fraud indicators at an earlier stage (Adam, 2023).

Several previous studies have found that information systems significantly influence fraud detection (Damayanti & Nugroho, 2024; Najatu Silva & Aufa, 2023; Nurhasanah et al., 2019). However, other studies reported insignificant results (Choirunnisa, 2022; Meiryani, et al., 2023; Polontalo et al., 2022). Conclusion These non-uniform findings suggest that the effectiveness of information systems is determined not only by the quality of the technology itself, but also by the auditor's ability to utilize and respond to the information generated by the system.

Similar issues can be found in the implementation of whistleblower systems. Conceptually, whistleblower systems are considered one of the most effective mechanisms for uncovering fraud because they provide a safe channel for reporting violations (Herawati et al., 2023; N. W. A. Ningsih, 2020). However, the existence of the system alone does not automatically guarantee its effectiveness. Without a timely, professional, and adaptive response from auditors, incoming reports may not be followed up properly. Therefore, the effectiveness of a whistleblower system depends not only on the system itself, but also on the organizational environment and the capability of individual auditors to respond to reported information.

Same pattern also appears in professional skepticism. A critical and cautious mindset is generally believed to increase auditors' sensitivity to fraud indicators (Akbar et al., 2022; Suriani et al., 2023). Nevertheless, empirical findings remain inconsistent, as several studies found no significant interaction between professional skepticism and fraud detection (Gunawan et al., 2022; Rahmawati et al., 2021). These inconsistent results suggest that professional skepticism alone may not be sufficient. Auditors also need additional capabilities that enable them to translate skeptical judgment into responsive and effective actions.

Based on these empirical gaps, this study argues that one important factor that has received limited attention is auditor agility. In today's dynamic business environment, auditors are expected not only to possess technical competence, but also to be adaptive, flexible, and responsive to changing risks (Hussein Metwally & Ayoob Mohammed Hassan, 2023; Joshi, 2021). Auditor agility can be understood as a dynamic capability that enables auditors to utilize technology effectively, respond to information in real time, and adjust audit strategies according to the complexity of each case (DeRoche, 2022; PWC, 2020; Sasviranti et al., 2023). Existing research on auditor agility has primarily focused on its direct impact on audit performance, with only a few studies investigating its

moderating function in the interaction of information systems, whistleblower mechanisms, professional skepticism, and fraud detection.

Accordingly, the novelty of this study lies in positioning auditor agility as a moderating variable from a dynamic capability perspective to explain the inconsistencies found in previous studies. This research not only examines the direct effects of information systems, whistleblower systems, and professional skepticism on fraud detection, but also explores how auditors' adaptive capabilities may strengthen or weaken the effectiveness of organizational systems and individual characteristics in detecting fraud.

The importance of this study becomes even more relevant considering the large proportion of fraud losses that cannot be recovered and the increasingly sophisticated fraud schemes emerging in the digital era. As a result, the purpose of this study is to experimentally investigate the function of auditor agility in moderating information systems, whistleblower systems, and professional skepticism on fraud detection. As a result, the study is expected to make both theoretical and practical contributions to improving Indonesia's fraud detection procedures.

Based on the practical issues and theoretical gaps discussed above, this study specifically aims to examine the effects of information systems, whistleblower systems, and professional skepticism on fraud detection, as well as to analyze the moderating role of auditor agility in these relationships. In addition, this study seeks to explain the inconsistent findings in prior research by integrating the dynamic capability perspective into the context of fraud detection in the digital era. Ultimately, this study is expected to contribute theoretically by strengthening the conceptual model of fraud detection and practically by supporting the development of more effective audit strategies in Indonesia.

## 2. Literature Review and Hypotheses Development

### *2.1. Fraud Detection*

Fraud detection has become an increasingly important issue in organizational governance due to the growing complexity of business processes and the rapid development of information technology. Fraud is generally understood as an intentional act carried out to obtain personal or group benefits at the expense of other parties. In the context of auditing, Fraud detection is the auditor's ability to identify indications, anomalies, or evidence of fraudulent activities during the audit process.

Various fraud theories have been developed to explain the factors that drive fraudulent behavior. The Fraud Triangle Theory, first proposed by Donald Cressey in 1953, is among the oldest and most well-known. It later served as the basis for a number of other theories about fraud, such as the Fraud Diamond Theory by David T. Wolfe and Dana R. Hermanson, 2004, the Fraud Pentagon Theory by Jonathan Marks, 2011, and the Fraud Hexagon Theory by Georgios L. Vousinas, 2019. More recently, the Fraud New Star Theory proposed by (Monteverde, 2021) expanded these perspectives by suggesting that fraud is influenced not only by pressure, opportunity, rationalization, and individual capability, but also by internal and external organizational factors as well as organizational social culture. According to this viewpoint, auditor conduct and the dynamics of the audit environment influence the efficacy of fraud detection in addition to organizational mechanisms.

In this study, information systems, whistleblower systems, and professional skepticism are positioned as the main factors influencing fraud detection. Meanwhile, the increasing complexity of fraud requires auditors to be more adaptive and responsive in dealing with changing risks. Therefore, auditor agility is considered a relevant factor that may strengthen the influence of these variables on fraud detection.

### *2.2. Dynamic Capabilities Theory*

This study adopts Dynamic Capabilities Theory as the main theoretical foundation to explain how organizations and auditors manage resources and capabilities in responding to dynamic environments. According to (Teece et

al., 1997), The ability of a company to integrate, develop, and reconfigure internal and external skills in order to successfully respond to changes in the environment is referred to as dynamic capabilities.

In the context of this study, information systems and whistleblower systems are viewed as organizational resources that support the fraud detection process. However, the existence of these systems alone may not automatically improve the effectiveness of fraud detection if auditors do not have the capability to utilize and adapt them to changing fraud risks. Professional skepticism is considered an ordinary capability embedded within the audit process, while auditor agility represents a dynamic capability that enables auditors to respond to change, adjust audit procedures, and integrate various sources of information in a flexible manner.

Therefore, Dynamic Capabilities Theory supports the argument that auditor agility may strengthen the effectiveness of information systems, whistleblower systems, and professional skepticism in improving fraud detection.

### *2.3. Information System and Fraud Detection*

Information systems play an important role in supporting organizational transparency, internal control, and fraud detection processes. (Romney & Steinbart, 2020) explained, a system for gathering, processing, storing, and disseminating data to aid in decision-making is called an information system.

In the audit environment, information systems provide real-time, accurate, and traceable data that help auditors identify anomalies or unusual transactions more effectively. The implementation of integrated information systems, supported by strong internal controls, may reduce opportunities for fraud. The Committee of Sponsoring Organizations of the Treadway Commission (COSO) Internal Control Integrated Framework explains the control environment, risk assessment, control activities, information and communication, and monitoring activities are the five primary elements of an effective internal control system.

Previous studies have shown that information systems influence fraud detection. (Damayanti & Nugroho, 2024; Nurhasanah et al., 2019; Yusuf Ansori & Kuntadi, 2022), as well as (Najatu Silva & Aufa, 2023) found that information systems significantly affect fraud detection and fraud prevention. However, several studies reported inconsistent findings. (Choirunnisa, 2022; M. Ikhwan Mansyuri et al., 2023; Meiryani, et al., 2023; Polontalo et al., 2022) concluded that fraud detection is not much impacted by information systems.

These inconsistent findings suggest that the effectiveness of information systems may depend on the auditor's ability to utilize the system and interpret the information provided. Auditors who are adaptive and responsive are more likely to integrate technology effectively into audit procedures, which may improve fraud detection.

H1: Information systems influence fraud detection.

### *2.4. Whistleblower System and Fraud Detection*

A whistleblower system is a formal mechanism that allows individuals within an organization to report misconduct or suspected fraud in a safe and confidential manner. The system is built on the principles of trust, protection, and impartiality, ensuring that individuals feel secure when reporting information (COSO, 2013; International Organization for Standarization (ISO), 2021).

Whistleblower systems are considered important because fraud is often hidden and difficult to detect through routine audit procedures. Information provided by whistleblowers frequently serves as an early warning signal of irregularities within an organization (Hartono Putri & Trisnaningsih, 2022). Therefore, whistleblower systems are closely related to forensic auditing and investigative auditing practices.

Several studies have shown that whistleblower systems positively influence fraud detection. (Herawati et al., 2023; Kawistara Yasa & Haq, 2023; Piserah et al., 2022; Priyadi et al., 2022; Rahman, 2020) found that whistleblower

systems improve the effectiveness of fraud detection. In addition, (Hamilah et al., 2022) and (Nwakeze et al., 2023) emphasized that stronger protection for whistleblowers enhances the effectiveness of whistleblowing systems.

However, the effectiveness of a whistleblower system also depends on the auditor's ability to respond to and follow up on the reports received. Agile auditors are more likely to respond quickly and integrate whistleblower reports more effectively into audit procedures and fraud investigations.

H2: Whistleblower systems influence fraud detection.

*2.5. Professional Skepticism and Fraud Detection*

Professional skepticism describes the auditor's critical mindset and questioning attitude when evaluating audit evidence. (Herawati et al., 2023) and (Kuntadi et al., 2022) reveals that auditors with a high level of professional skepticism are less likely to accept management's explanations without conducting further examination and are more likely to be alert to signs of fraud.

According to (Suriani et al., 2023) and (Nurleni et al., 2024), professional skepticism plays an important role in fraud detection because fraudulent activities are usually concealed and intentionally designed to avoid detection. Auditors who maintain a skeptical attitude will more often seek additional evidence, identify inconsistencies in the information, and critically evaluate the reasonableness of transactions.

Numerous earlier studies have demonstrated that professional skepticism favorably affects fraud detection. (Akbar et al., 2022; Kuntadi et al., 2022; Nurleni et al., 2024; Pamela Citranagari, 2022; Pramuki & Agustine, 2023; Salsabila et al., 2023; Suriani et al., 2023; Surtikanti et al., 2023) discovered a strong correlation between professional skepticism and the auditor's ability to detect fraud. However, other studies reported different findings. (Bagus Amlayasa & Riasning, 2022; Gunawan et al., 2022; Jumaili et al., 2023; Piserah et al., 2022; Rahmawati et al., 2021) discovered that fraud detection is not considerably impacted by expert skepticism. In addition, (Ardiansyah et al., 2024; N. Ningsih et al., 2022) suggested that factors such as auditor experience, time pressure, and task complexity may contribute to these inconsistent findings.

These differences indicate that professional skepticism alone may not be sufficient to improve fraud detection in dynamic and complex audit environments. Auditors also need adaptive capabilities and flexibility in applying skeptical judgment according to the audit conditions they face.

H3: Professional skepticism influences fraud detection.

*2.6. Auditor Agility: A Direct Predictor and Moderating Variable in Fraud Detection*

Auditor agility refers to the auditor's ability to adapt quickly to change, respond effectively to risks, and adjust audit approaches according to the dynamics of the business environment. Agile auditors emphasize flexibility, collaboration, responsiveness, and continuous improvement throughout the audit process.

Rapid technological developments, increasingly complex fraud schemes, and changes in the business environment require auditors to possess adaptive capabilities beyond traditional audit procedures. Agile auditors are generally better equipped to manage large volumes of information, integrate data from multiple sources, and respond more quickly to fraud indicators.

Agile auditing is crucial for increasing audit effectiveness, according to earlier research. (Dobrowolski, 2021; Joshi, 2021; Koerniawati, 2021), as well as (Hussein Metwally & Ayoob Mohammed Hassan, 2023) explained that agile audit approaches improve responsiveness, communication, and audit efficiency. In this study, auditor agility is positioned both as a variable that directly influences fraud detection and as a moderating factor that improves the connection between information systems, whistleblower systems, professional skepticism, and fraud detection.

Auditor agility enables auditors to utilize information systems more effectively, respond to whistleblower reports more quickly, and apply professional skepticism more flexibly in complex audit situations. Thus, it is anticipated that auditor agility would improve the connection between these factors and fraud detection.

H4: Auditor agility influences fraud detection.

H5: Auditor agility strengthens the influence of information systems on fraud detection.

H6: Auditor agility strengthens the influence of whistleblower systems on fraud detection.

H7: Auditor agility strengthens the influence of professional skepticism on fraud detection.

According the theoretical and empirical review, this study proposes that information systems, whistleblower systems, and professional skepticism have direct effects on fraud detection. However, the effectiveness of these variables may vary depending on the auditor's adaptive capabilities.

In this study, auditor agility is positioned as a moderating variable that enhances the impact of information systems, whistleblower systems, and professional skepticism on fraud detection in addition to being a variable that directly affects fraud detection. Auditors with a higher level of agility are expected to be better able to utilize technology, integrate information, and adjust audit procedures in response to the dynamic nature of fraud risks.

## 3. Method

### *3.1. Study Design*

This research employed a quantitative approach using an explanatory research design to examine the causal relationships between information systems, whistleblower systems, professional skepticism, and fraud detection, auditor agility acts as both an independent and moderating variable. The quantitative approach was selected because the study relied on numerical data collected through questionnaires and analyzed using statistical techniques. In addition, the explanatory design was considered appropriate because the study aimed not only to describe phenomena, but also to explain Investigate causal linkages between variables and test the given hypotheses.

The study adopted a survey-based research design to obtain primary data directly from respondents. The population consisted of internal auditors in Indonesia, considering that internal auditors are directly involved in internal control, fraud prevention, and fraud investigation processes. Therefore, they were considered the most relevant respondents for examining factors influencing fraud detection. Purposive sampling was used to determine the sample, which included the following criteria:

(1) respondents must be internal auditors working in internal audit units in Indonesia, and

(2) respondents must have at least one year of audit experience.

### *3.2. Data Collection*

Using the Slovin formula and a 10% margin of error, the minimum sample size required for this study was 92 respondents. Data were collected through an online questionnaire sent using Google Forms via WhatsApp groups inside the D'Indonesia IA Community, and other internal auditor networks outside the community. The questionnaire used a Likert scale to measure all research variables, with items rated on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree).

This study examined five variables: information system, whistleblower system, professional skepticism, auditor agility, and fraud detection.

- Fraud detection adapted (Monteverde, 2021):Pressure, opportunity, Rasionalitation, capanility, Eksternal Factor, Internal Factor, Social/Organizational Culture.
- Information system was measured using indicators related to (COSO, 2013; Damayanti & Nugroho, 2024): system integration, data accuracy, information security, real-time reporting, accessibility.
- Whistleblower system was measured through (International Organization for Standarization (ISO), 2021; Nwakeze et al., 2023; Pamela Citranagari, 2022): accessibility, confidentiality, protection, responsiveness, and independence of the reporting mechanism.
- Professional skepticism was measured using indicators adapted (Suriani et al., 2023) such as critical thinking, questioning mind, scientific and strong evidence, openness in judgment, and due care.
- Auditor agility was measured through adapted (Dobrowolski, 2021): stakeholder focus, audit simplification, adaptive excellence, collaboration, process progress, motivation and sustainability, team independence, timely reporting, and continuous improvement.

### *3.3. Data Analysis*

The data were analyzed with SmartPLS version 4.1.1.4, which used Partial Least Squares-Structural Equation Modeling (PLS-SEM). PLS-SEM was used for various methodological reasons. First, this study was predictive and explanatory in nature, aiming to examine and predict the relationships among variables as well as the moderating role of auditor agility. Second, the research model involved complex latent constructs and moderation effects, making PLS-SEM more suitable and flexible for estimating structural relationships. Third, PLS-SEM does not require multivariate normal data distribution, which is appropriate for questionnaire-based data using Likert scales.

To minimize the risk of common method bias (CMB), this study applied procedural remedies recommended by (Podsakoff et al, 2003), including ensuring respondent anonymity, maintaining confidentiality, and using neutral questionnaire wording. In addition, statistical tests for CMB were conducted using Harman's Single Factor Test through Principal Component Analysis (PCA) and Full Collinearity Assessment using Variance Inflation Factor (VIF).

The analysis procedure consisted of descriptive statistics, measurement model evaluation (outer model), and structural model evaluation (inner model). The outer model evaluation included tests of convergent validity, discriminant validity, and construct reliability using outer loading values, Average Variance Extracted (AVE), Composite Reliability, and Cronbach's Alpha. Indicators with loading values above 0.70 were considered acceptable, although loading values above 0.60 were still considered adequate for exploratory research. The inner model evaluation was conducted to test the proposed hypotheses using path coefficients, t-statistics, p-values, coefficient of determination ($R^2$), and moderation effect analysis.

## 4. Results and Discussion

### *4.1. Description of the Research Subject*

The minimum sample size required was 92 respondents, a figure based on the Slovin formula with a 10% margin of error. A total of 197 respondents were successfully recruited, which met the minimum sample requirement. The majority of respondents were internal audit practitioners working in the agribusiness sector (41.6%), followed by the manufacturing sector (16.8%). In terms of audit experience, the majority of respondents had more than 10 years of experience as internal auditors (53.3%), while 21.8% had between 6 and 10 years of experience. The demographic characteristics of the respondents are presented in Table 1.

Table 1: Demographic Data of Respondents

| Business Sector | Work Experience (years) | | | | | % Sector | |
|---|---|---|---|---|---|---|---|
| | 1 | >1 - 2 | 3 - 5 | 6 - 10 | >10 | Total | % |
| Information Technology | | | | | 3 | 3 | 1.5% |
| Transportation | | | | | 3 | 3 | 1.5% |
| Food And Beverage | | | 2 | 2 | | 4 | 2.0% |
| Logistic & Supply Chain | | 1 | 1 | | 4 | 6 | 3.0% |
| Miscellaneous | | 1 | 2 | 1 | 3 | 7 | 3.6% |
| Government | | 1 | | 3 | 7 | 11 | 5.6% |
| Mining & Energy | | | 2 | 5 | 7 | 14 | 7.1% |
| Financial /Bank | 2 | 1 | 2 | 4 | 6 | 15 | 7.6% |
| Services / Insurance | | 1 | 7 | 3 | 8 | 19 | 9.6% |
| Manufacturing | 2 | 1 | 3 | 7 | 20 | 33 | 16.8% |
| Agribusiness | 2 | 2 | 16 | 18 | 44 | 82 | 41.6% |
| Total | 6 | 8 | 35 | 43 | 105 | 197 | 100.0% |
| % Work Experience | 3.0% | 4.1% | 17.8% | 21.8% | 53.3% | 100.0% | |

### *4.2. Descriptive Statistics*

Descriptive statistics were used to describe respondents' perceptions of fraud detection (FD), information systems (IS), whistleblower systems (WS), professional skepticism (PS), and auditor agility (AA). Overall, all variables showed relatively high mean values, indicating positive respondent perceptions toward the effectiveness of fraud detection practices, information systems, whistleblower systems, professional skepticism, and auditor agility.

The fraud detection variable recorded mean values ranging from 3.980 to 4.665, while information systems ranged from 3.594 to 4.183, indicating moderate to high perceptions of system effectiveness. Whistleblower systems showed consistently high mean values between 4.203 and 4.406, suggesting strong respondent agreement regarding the effectiveness of reporting mechanisms. Professional skepticism demonstrated the highest mean values among all variables, ranging from 4.416 to 4.741, indicating that respondents perceived skeptical attitudes as highly important in the audit process. Similarly, auditor agility demonstrated high mean values ranging from 3.858 to 4.635, reflecting positive perceptions of auditors' adaptability and responsiveness in managing fraud risks.

In general, the standard deviation values indicate acceptable variation in responses, while the skewness and kurtosis values suggest that the data distribution remained within acceptable limits for further analysis using PLS-SEM.

### *4.3. Model Testing*

#### *4.3.1. Common Method Bias (CMB) Test*

Common method bias (CMB) was assessed using Harman's Single Factor Test through Principal Component Analysis (PCA) and the Full Collinearity Test using Variance Inflation Factor (VIF) values in SmartPLS 4.1.1.4. Test Harman's Single Factor showed that no single factor dominated the overall variance, with the first component explaining only 32.9% of the variance, which is below the 50% threshold (Harman, 1976; Podsakoff et al., 2003). In addition, all VIF values in the Full Collinearity Test were below the essential threshold of 3.3, showing that the data were free from significant common method bias (Kock, 2015).

#### *4.3.2. Convergen Validity*

Outer loading values and Average Variance Extracted (AVE) were used to assess convergent validity. The correlation between each indicator and its relevant construct was assessed using outer loading values. Valid indicators were those with loading levels greater than 0.70, while values above 0.60 were still regarded as acceptable. Indicators with loading values below 0.60 were excluded from further analysis.

Table 2: Outer Loading Convergen Validity Test

| Indicator | FD | SI | WS | PS | AA | Description |
|---|---|---|---|---|---|---|
| FD1 (Pressure) | 0.46 | | | | | Invalid |
| FD2 (Opportunity) | 0.64 | | | | | Valid |
| FD3 (Rasionalitation) | 0.43 | | | | | Invalid |
| FD4 (Capability) | 0.56 | | | | | Invalid |
| FD5 (Eksternal Factor) | 0.70 | | | | | Valid |
| FD6 (Internal Factor) | 0.80 | | | | | Valid |
| FD7 (Social/Org. Culture) | 0.69 | | | | | Valid |
| SI1 (Information Quality) | | 0.83 | | | | Valid |
| SI2 (Integration Sys.) | | 0.78 | | | | Valid |
| SI3 (Real time) | | 0.86 | | | | Valid |
| SI4 (Accessibility Auditor) | | 0.64 | | | | Valid |
| SI5 (Information Security) | | 0.86 | | | | Valid |
| WS1 (Accessibility) | | | 0.81 | | | Valid |
| WS2 (Confidentiality) | | | 0.85 | | | Valid |
| WS3 (Protection) | | | 0.88 | | | Valid |
| WS4 (Responsiveness) | | | 0.85 | | | Valid |
| WS5 (Independen) | | | 0.89 | | | Valid |
| PS1 (Strong Evidence) | | | | 0.73 | | Valid |
| PS2 (Judgment & Openness) | | | | 0.65 | | Valid |
| PS3 (Critical Tinking) | | | | 0.79 | | Valid |
| PS4 (Scientific Evidence) | | | | 0.79 | | Valid |
| PS5 (Questioning Mind) | | | | 0.77 | | Valid |
| PS6 (Limited Response) | | | | 0.70 | | Valid |
| PS7 (Due Care) | | | | 0.81 | | Valid |
| AA1 (Stakeholder Focus) | | | | | 0.47 | Invalid |
| AA2 (Audit Simplification) | | | | | 0.71 | Valid |
| AA3 (Adaptive Excellence) | | | | | 0.82 | Valid |
| AA4 (Daily Collaboration) | | | | | 0.77 | Valid |
| AA5 (Process Progress) | | | | | 0.65 | Valid |
| AA6 (Motivation & Sustainability) | | | | | 0.71 | Valid |
| AA7 (Team Independence) | | | | | 0.58 | Invalid |
| AA8 (Timely Reporting) | | | | | 0.76 | Valid |
| AA9 (Continuous Improvement) | | | | | 0.81 | Valid |

The Average Variance Extracted (AVE) values for all variables exceeded the minimum threshold of 0.05, indicating that they are valid. The System Information variable has an AVE of 0.635, while the Whistleblower System variable has an AVE of 0.731, which is the highest among the other variables. Additionally, Professional Skepticism has an AVE of 0.563, Auditor Agility 0.570, and Fraud Detection 0.555.

*4.3.3. Discriminant Validity*

To ensure there are significant differences between the variables in this study, discriminant validity will be evaluated using cross-loading tests, latent variable correlations, and the Fornell–Larcker test. The results of the cross-loading test show that all indicators have higher values than other indicators within the same variable, leading to the conclusion that they are valid. The results of the latent variable correlation and Fornell–Larcker tests show that the root mean square error of approximation (√AVE) for each variable is greater than the correlation with other variables. The √AVE values for fraud detection (0.745), information systems (0.797), whistleblower systems (0.855), professional skepticism (0.751), and auditor agility (0.755) are all higher than the correlations between variables; with these results, each variable is deemed valid and can proceed to further analysis.

*4.3.4. Reliability Test*

Cronbach's Alpha and Composite Reliability were used to test the reliability of the variables, with a value of 0.70 considered valid. The test results showed that the variables met the reliability criteria, as Cronbach's Alpha values ranged from 0.730 to 0.908, and Composite Reliability values ranged from 0.832 to 0.931. These results indicate that all variables exhibit good consistency; furthermore, no values exceeded 0.95, suggesting that there is no redundancy (excessive similarity or repetition) among the indicators.

*4.3.5. Model Fit Test*

The SRMR value from the SmartPLS 4.1.1.4 software was used to assess the model fit in this study. The SRMR value in this study was 0.07, indicating that the model has a fairly good level of fit because it is still below the recommended threshold of 0.01 and slightly below the ideal value of 0.080. Therefore, this model is suitable for further analysis.

*4.3.6. Inner Model Evaluation*

To evaluate the internal model in this study, R-square ($R^2$) and effect size ($f^2$) analyses were conducted to assess the predictive ability and contribution of each variable in the model. The resulting R-square value was 0.546, meaning that 54.6% of the independent variables and moderators in this model can explain their relationship with fraud detection at a moderate level. Additionally, the adjusted R-square value of 0.529—which differs only slightly from the R-square value—indicates that the model remains capable of explaining the relationship with fraud detection even with the addition of moderator variables.

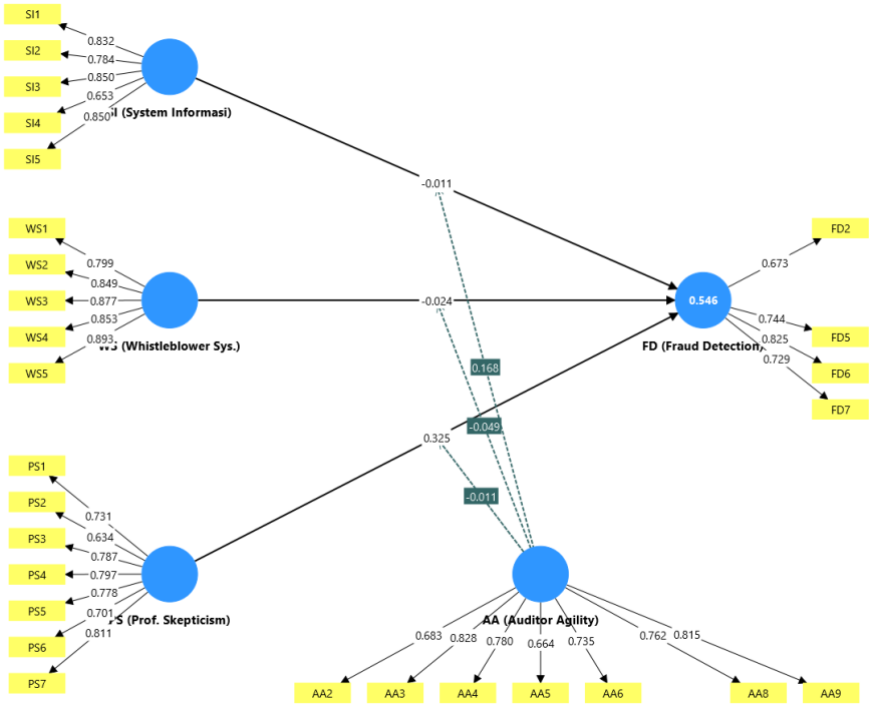



Figure 1: Output model PLS-SEM alogaritm

Regarding the effect size analysis ($f^2$), auditor agility influences fraud detection at a moderate level ($f^2 = 0.163$). This means that auditor agility has a significant influence on fraud detection. Professional skepticism has a small influence ($f^2 = 0.077$), while information systems and whistleblower systems show a very insignificant influence on fraud detection.

The moderating role of auditor agility as a moderator shows a small effect on the relationship between information systems and fraud detection ($f^2 = 0.050$). However, the relationship between whistleblower systems and professional skepticism and fraud detection has a non-significant influence.

*4.4. Hypothesis Testing*

Hypotheses were tested using the bootstrapping procedure in PLS-SEM; the values evaluated were t-statistics and p-values. A variable's relationship with fraud detection was considered significant if the t-statistic was greater than 1.96 and the p-value was less than 0.05.

Table 3: Hypothesis Testing Results

| Hypothesis | Original sample (O) | Sample mean (M) | Standard deviation (STDEV) | T statistics (\|O/STDEV\|) | P values | Description |
|---|---|---|---|---|---|---|
| H1: SI → FD | -0.01 | -0 | 0.068 | 0.156 | 0.88 | Not significant |
| H2: WS → FD | -0.02 | -0.02 | 0.057 | 0.419 | 0.68 | Not significant |
| H3: PS → FD | 0.325 | 0.327 | 0.087 | 3.745 | 0 | Significant |
| H4: AA → FD | 0.473 | 0.472 | 0.087 | 5.414 | 0 | Significant |
| H5: AA x SI → FD | 0.168 | 0.164 | 0.059 | 2.831 | 0.01 | Significant |
| H6; AA x WS → FD | -0.05 | -0.04 | 0.063 | 0.788 | 0.43 | Not significant |
| H7: AA x PS → FD | -0.01 | -0.02 | 0.095 | 0.118 | 0.91 | Not significant |

Note: SI: Information System; WS:Whistleblower System; PS: Professional Skepticism; AA: Auditor Agility; FD: Fraud Detection.

The results of the study on the 7 proposed hypotheses show that 3 hypotheses were accepted, namely, that professional skepticism influences fraud detection ($\beta = 0.325$; $t = 3.745$; $p < 0.001$), which means that H3 is

accepted. These results indicate that auditors' professional skepticism influences fraud detection. The higher the level of professional skepticism, the more thoroughly auditors will evaluate suspicious transactions, and the explanations provided will be evaluated more critically. The auditor agility variable also yields a significant direct effect on fraud detection ($\beta = 0.473$; $t = 5.414$; $p < 0.001$), thus accepting Hypothesis H4. Auditor agility influencing fraud detection indicates that auditors who are adaptive, flexible, and responsive are better able to detect fraud in a dynamic audit environment.

Auditor agility moderation has a significant effect on the relationship between information systems and fraud detection ($\beta = 0.168$; $t = 2.831$; $p = 0.010$), so Hypothesis H5 is also accepted. This finding clearly illustrates that new information systems play an optimal role in fraud detection when auditors are able to leverage the technology, utilize information from various sources, and keenly identify fraud risks arising from the system's weaknesses.

In contrast, information systems ($\beta = -0.011$; $p = 0.880$) and whistleblower systems ($\beta = -0.024$; $p = 0.680$) did not have a significant effect on fraud detection; this means that hypotheses H1 and H2 are rejected. This finding reinforces that technology systems and reporting mechanisms alone cannot necessarily improve fraud detection without being supported by adequate auditor capabilities and responsiveness. A similar pattern emerged regarding the moderating effect of auditor agility on the relationship between whistleblower systems and fraud detection ($\beta = -0.049$; $p = 0.430$) as well as between professional skepticism and fraud detection ($\beta = -0.011$; $p = 0.910$), which were both insignificant; thus, hypotheses H6 and H7 are rejected. This indicates that auditor agility cannot automatically strengthen all organizational factors or individual auditor factors in fraud detection.

Overall, this study provides a general overview that professional skepticism and auditor agility are key factors influencing improved fraud detection. The study also shows that agile auditors are able to make the most of information systems, thereby supporting fraud detection. The structural model of the study can be stated as follows:

$$FD=-0.011SI-0.024WS+0.325PS+0.473AA+0.168(SI\times AA)-0.049(WS\times AA)-0.011(PS\times AA)$$

*4.5. Discussion*

This study analyzes the effects of information systems, whistleblower systems, and professional skepticism on fraud detection, as well as the direct effect of auditor agility on fraud detection and its moderating role. The findings provide important insights into how technological resources, organizational mechanisms, and auditor capabilities interact to support the effectiveness of fraud detection in an increasingly dynamic audit environment.

*4.5.1. Limitations of Information Systems and Whistleblower Systems in Improving Fraud Detection*

In this study, the presence of information systems and whistleblower systems was not found to have a significant impact on fraud detection. The study indicates that organizations with well-established information systems do not necessarily improve their ability or effectiveness in detecting fraud. Similarly, regarding whistleblower systems, although respondents stated that their organizations had complaint mechanisms in place, these were not yet optimal for fraud detection.

Information systems developed within organizations tend to serve as tools for operational and administrative purposes, rather than as tools for strategic analysis in detecting fraud. From the perspective of Dynamic Capabilities Theory, information systems are merely organizational resources, not organizational capabilities themselves. Resources, without the ability to utilize them in interpreting, integrating, and leveraging information strategically, will not yield effectiveness for the organization. In the context of this study, information systems function only as data sources, whereas the auditors' ability to utilize these data sources plays a primary supporting role in detecting fraud.

Similar findings were also observed in whistleblower systems; this study indicates that whistleblower systems implemented within organizations tend to be merely a formality in meeting compliance requirements, yet their actual implementation still faces obstacles. Theoretically, whistleblower systems are designed as a means of early

warning through confidential information provided by both internal and external parties. However, based on Contingency Theory, the effectiveness of such a system is highly dependent on the organizational including ethical culture, levels of trust, protection mechanisms, and management responsiveness. Without these supporting conditions, the whistleblower system remains merely a symbolic system that tends not to function optimally as a complaint mechanism.

The findings of this study may reflect conditions that are still present in some organization in Indonesia where information systems and whistleblower systems are often established primarily to meet formal requirements but are not yet utilized to their full potential. Information systems tend to be used solely to fulfill compliance, documentation, and reporting requirements but are not yet fully integrated into proactive fraud detection. Similarly, while whistleblower systems exist within the organization, they do not function optimally due to barriers such as hierarchical culture, fear of retaliation, and low levels of trust (including concerns about confidentiality and protection), which remain the primary reasons for hesitation in reporting instances of fraud.

Information system in this study aligns with the findings of research conducted by (Choirunnisa, 2022; M. Ikhwan Mansyuri et al., 2023; Meiryani, et al., 2023), which found that information systems do not have a significant impact on fraud detection when system integration, data quality, and auditor capabilities remain limited. Investments in technology have not been able to strengthen fraud detection without being supported by improvements in auditors' competencies and analytical skills.

Meanwhile, the findings regarding the whistleblower system in this study contradict the results of studies by (Herawati et al., 2023; Kawistara Yasa & Haq, 2023; Piserah et al., 2022; Rahman, 2020), which reported that whistleblower systems have an impact on fraud detection. Thus, the existence of an information system within an organization does not automatically enhance fraud detection but requires auditors' capabilities to utilize it; without such capabilities, the information system tends to serve merely as an operational tool and a data source. Similarly, for a whistleblower system to function optimally, it is necessary to build trust, provide tangible protection, and secure organizational (cultural) support. Without these supporting factors, both systems tend to function as administrative tools rather than as instruments that effectively strengthen fraud detection.

*4.5.2. The Role of Auditor Capabilities in Improving Fraud Detection*

This study found that professional skepticism has a positive impact on fraud detection, as does auditor agility. These findings indicate that existing systems and mechanisms within an organization do not guarantee improved fraud detection; rather, other factors are involved, such as the auditor's ability to identify, analyze, and respond to various signs of fraud. In today's increasingly complex business environment, auditors' capabilities are a critical factor in the effectiveness of fraud detection.

Professional skepticism is a key asset for an auditor during the audit process. This mindset fosters a critical approach, encourages the verification of obtained information, and leads to a more thorough re-evaluation of audit evidence. In principle, fraud is always concealed as effectively as possible by the perpetrator; with a high level of professional skepticism, auditors are more likely to detect anomalies or red flags, supplement and test evidence for verification, and re-examine information deemed insufficiently convincing. In the context of the auditing world in Indonesia, the use of technology-based tools in fraud detection is still relatively limited; therefore, the professional judgment of auditors becomes a critical factor in determining the quality of fraud detection.

However, as fraud becomes increasingly complex, professional skepticism alone is not enough. Auditors are required to be agile so they can quickly adapt to changes in the audit environment and transaction complexity, as well as keep pace with technological advancements to support the audit process in detecting fraud. In this study, auditor agility is identified as a capability that enables auditors to adjust audit procedures, focus on high-risk issues that arise during the audit process, gather and integrate information from various sources, and respond to suspicious findings quickly and appropriately.

From the perspective of Dynamic Capabilities Theory, these two variables represent auditor capabilities that play a significant role in improving fraud detection. Professional skepticism is classified as an ordinary capability, reflecting the auditor's cognitive competencies and attitudes that continue to develop through experience and training. Auditor agility, on the other hand, reflects a dynamic capability that enables auditors to engage in the processes of sensing, seizing, and transforming in response to changes in fraud risk.

These findings confirm that the quality of audit resources is the most important factor in supporting fraud detection. Information systems and whistleblower systems can provide information and supporting mechanisms, but without an auditor's ability to interpret information, critically evaluate the risks involved, and act appropriately, the effectiveness of these two systems is compromised. Therefore, professional skepticism and auditor agility can be viewed as core capabilities of auditors in the audit process for processing information into clues or evidence for fraud detection.

The findings of this study are consistent with the research by (Akbar et al., 2022; Nurleni et al., 2024; Salsabila et al., 2023; Suriani et al., 2023; Surtikanti et al., 2023), which concluded that professional skepticism enhances the effectiveness of fraud detection. These findings also support the research by (Dobrowolski, 2021; Hussein Metwally & Ayoob Mohammed Hassan, 2023; Joshi, 2021; Koerniawati, 2021), which affirm that auditor agility contributes to increased responsiveness, audit effectiveness, and the ability to detect fraud. In conclusion, the results of this study reinforce the view that in a modern audit environment, the quality of professional judgment and the adaptability of auditors are more decisive factors in the success of fraud detection than the mere existence of organizational systems.

*4.5.3. The Role of Agility Auditors as a Moderating Variable in Fraud Detection*

The results of this study indicate that auditor agility does not generally moderate the variables tested in this study. Auditor agility can strengthen the relationship between information systems and fraud detection; however, it does not have a significant effect on the relationship between whistleblower systems and fraud detection, nor on the relationship between professional skepticism and fraud detection in this study.

The relationship between information systems and fraud detection does not have a significant direct effect. However, when moderated by auditor agility, this relationship does have a significant effect. This is an interesting finding that supports and reinforces the previous discussion that the mere presence of technology is not sufficient to improve the effectiveness of fraud detection. Information systems tend to merely provide the data required by auditors. However, interpreting, integrating, and utilizing that data in the fraud examination process requires a certain level of auditor agility. In line with Dynamic Capabilities Theory, organizational resources require dynamic capabilities to generate added value. In this study, the information system functions as a resource, while auditor agility serves as a dynamic capability that enables the available information or data to be transformed and utilized according to investigative needs during the audit process. With agility, auditors will be able to adapt audit procedures, select the focus of the examination based on the development of risk identification, and provide the necessary response to any anomalies discovered. These findings support the research by (Dobrowolski, 2021; Hussein Metwally & Ayoob Mohammed Hassan, 2023; Joshi, 2021), who state that auditors capable of adapting to technology are more effective in maximizing the use of digital systems to detect fraud in complex operational conditions.

The opposite is true for the relationship between other variables and fraud detection. Auditor agility does not strengthen the relationship between the whistleblower system and fraud detection. This finding indicates that auditors' adaptive capabilities have not yet been able to enhance the whistleblower system's effectiveness in detecting fraud. Unlike information systems, which generate data that is typically structured and relatively objective from various sources, whistleblower systems heavily rely on the quality of reports, the completeness of information provided by the reporter, and the credibility of the whistleblower system it self, all of which are primary considerations for reporters. Even auditors with a high level of agility will face obstacles if the information in a report lacks sufficient supporting evidence, especially if the report consists only of general information and they cannot elicit further details from the reporter. These results indicate that the effectiveness of whistleblower

systems is more heavily influenced by organizational factors—such as ethical culture, levels of trust, protection for reporters, and management commitment—than by auditors' adaptive capabilities. The findings of this study differ from those of (Koerniawati, 2021) and (Catlin & Watkins, 2021), who found that responsive and agile auditors are able to enhance the effectiveness of whistleblower reports in detecting fraud.

The same applies to the relationship between professional skepticism and fraud detection, where auditor agility does not have a significant influence. This finding indicates that professional skepticism is effectively and independently capable of supporting fraud detection without the need for reinforcement from auditor agility. Auditors with high levels of professional skepticism generally have audit experience, have received professional training, and apply audit standards. As a result, they automatically evaluate evidence and identify indications of fraud. These findings highlight the differing mechanisms of professional skepticism and auditor agility. Professional skepticism is more closely related to professional judgment and critical evaluation of audit evidence, whereas auditor agility is more closely related to the ability to adapt to and navigate constantly changing audit conditions. The results of this study differ from the findings of (Joshi, 2021) and (Sasviranti et al., 2023), who stated that agility can strengthen the application of a skeptical attitude in complex audit environments. However, this study shows that the moderating role of auditor agility is selective and does not apply universally to all factors influencing fraud detection.

## 5. Conclusion, Implication and Limitation

### *5.1. Conclusion*

This study examines the influence of information systems, whistleblower systems, and professional skepticism on fraud detection, with auditor agility serving as both an independent variable and a moderating variable. The results of this study indicate that information systems and whistleblower systems do not have a direct impact on fraud detection. Although respondents rated both systems highly, their presence has not been able to enhance the effectiveness of fraud detection. These findings also suggest that in most organizations, these two systems function primarily as operational tools and means of compliance rather than as instruments for detecting fraud.

Conversely, professional skepticism and auditor agility have been shown to have a significant impact on fraud detection. Professional skepticism empowers auditors to exercise critical judgment, question the information they receive, and carefully evaluate audit evidence, thereby enhancing their ability to identify indications of fraud. Auditor agility also plays a significant role by enabling auditors to adaptively respond to changes in risk, technological advancements, and the complexity of the audit environment. These findings confirm that the success of fraud detection remains highly dependent on auditors' cognitive capabilities and adaptive skills.

Furthermore, this study indicates that auditor agility significantly enhances the relationship between fraud detection and information systems. These findings suggest that agile auditors possess the adaptive capacity to utilize and interpret data generated by information systems, thereby supporting and enhancing the effectiveness of fraud detection. However, auditor agility does not appear to support the relationship between whistleblower systems and fraud detection, nor does it support the relationship between professional skepticism and fraud detection. The results indicate that the moderating role of auditor agility is contextual and selective and does not apply universally to all relationships related to the audit process.

Overall, this study reinforces the argument that the success of fraud detection depends not only on investments in technology and reporting mechanisms, but primarily on auditors' ability to adaptively utilize those resources. Auditor agility is a key factor that bridges the gap between technology adoption and the effectiveness of fraud detection in an increasingly complex and dynamic audit environment.

### *5.2. Theoretical Implications*

This study contributes to Dynamic Capability Theory by confirming that information systems function primarily as organizational resources rather than direct determinants of fraud detection effectiveness. Their contribution

becomes significant only when supported by auditor agility as a dynamic capability. The findings also extend the literature by positioning auditor agility as a selective moderator that is more effective in system- and technology-based relationships than in relationships involving established cognitive competencies such as professional skepticism. Furthermore, the insignificant direct effects of information system and whistleblower system support Contingency Theory, emphasizing that the effectiveness of formal control mechanisms depends heavily on organizational context, implementation quality, and auditor capability.

### *5.3. Practical Implications*

The practical implication of these research findings is that investing in technology and establishing whistleblower mechanisms does not automatically improve the effectiveness of fraud detection. Organizations should pay particular attention to the fact that technological advancements must be accompanied by improvements in auditors' capabilities, particularly in the areas of professional skepticism and auditor agility. Furthermore, organizational ethical culture must be strengthened, whistleblower protection must be guaranteed, and trust in the audit process must be enhanced—these are critical factors for the whistleblower system to function optimally as an effective fraud detection mechanism.

### *5.4. Limitations and Future Research*

This study has several limitations. First, the use of self-reported questionnaire data may introduce respondent perception bias. Second, the cross-sectional design limits the ability to capture changes in fraud risk and auditor behavior over time. Third, the study focuses only on a limited number of variables, while other factors such as ethical climate, organizational culture, management support, and auditor experience may also influence fraud detection. Future studies are therefore encouraged to adopt longitudinal or mixed-method approaches and to incorporate additional contextual variables in order to obtain a more comprehensive understanding of fraud detection effectiveness.

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