PREVENTING FINANCIAL REPORTING FRAUD USING FUZZY ANALYTIC HIERARCHY ON INDONESIAN STATE-OWNED ENTERPRISES

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Abstract: This study highlights the urgency of developing an effective strategy model to prevent fraudulent financial reporting by Indonesian State-Owned Enterprises, as current measures are considered ineffective. The objective of this study is to formulate a strategy to prevent fraudulent financial reporting using the Fuzzy Analytic Hierarchy Process. This research uses a descriptive-analytical method to analyse the phenomena and research results, employing a mixed-methods approach to obtain in-depth information through investigative procedures. Data were collected using a combination of questionnaires and interviews with 50 financial managers and five experts in formulating prevention strategies. The informants in this study were the Supreme Audit Agency of the Republic of Indonesia, the Financial and Development Supervisory Agency, Internal Auditors, Financial Managers, Audit Committee Members, the Internal Control System Bureau, Independent Auditors, and accounting professionals from State-Owned Enterprises. The study identified six strategies to prevent financial reporting fraud: strengthening monitoring and control systems through three lines of defence fostering a positive work culture; establishing anti-fraud principles; enforcing rewards and punishments; providing anti-fraud education; and empowering employees as agents of change. This study offers a feasible solution to prevent financial reporting fraud by analysing the underlying factors.

Keywords: fuzzy set, internal control, monitoring, anti-fraud, change agents

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Introduction

The investigation of fraud remains a prominent and captivating subject, given the current prevalence of cases within society. According to the Association of Certified Fraud Examiners (2018), there are three categories of fraud: fraudulent financial reporting, misappropriation of assets, and corruption. The first one poses a considerable challenge in Indonesia.

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The incidence of falsified annual financial statements has increased notably in recent years. These cases serve as evidence of the severity of accounting fraud worldwide, including in Indonesia. The wide range of fraudulent activities committed by State-Owned Enterprises (SOEs) in Indonesia has significantly eroded users' trust and confidence in the accuracy and reliability of annual financial statements. Notably, the 2017 report from the Audit Board of the Republic of Indonesia revealed incidents of fraud in SOEs, resulting in a loss of Rp 692.2 billion (42,728,395.06 USD) to the State. Audit Board of the Republic of Indonesia also highlighted that, in its assessment of 37 properties, it discovered 493 incidences of fraudulent financial management, valued at a total of 8.66 trillion rupiahs, and 702 exhibiting indicators of illicit financial management. It is worth noting that Indonesia is among the countries with a high corruption rate. As per data gathered by the Indonesian Corruption Watch, 482 corruption cases were registered in 2016, resulting in a total loss of 1.47 trillion rupiahs (Indonesian Corruption Watch, 2017). Additionally, Transparency International's 2020 study ranked Indonesia 102nd out of 179 countries, with a corruption index of 38 (https://www.transparency.org/en/cpi/2021). Fraud committed by state-owned enterprises in Indonesia indicates that management has not provided reliable financial information, remains vulnerable to fraudulent activity, and thus requires immediate preventive measures. Fraud-prevention measures are more effective at mitigating fraudulent activity than repressive measures, as they help minimize potential losses and safeguard the reputations of both institutions and individuals (Hung et al., 2019; Wahyudi et al., 2019). Furthermore, it should be noted that preventive measures are not only more cost-effective but also more efficient than conducting trials after fraud incidents. It is important to note that prevention is an essential aspect of the fraud control system, encompassing steps to reduce the risk of fraud. Internal control serves as the first line of defense in preventing fraud (Pamungkas et al., 2017).

Previous studies on accounting fraud prevention remain limited; research on prevention strategies for fraudulent financial reporting using the Fuzzy Analytic Hierarchy Process has also not been widely conducted. While fraudulent financial reporting practices continue to occur, resulting in significant losses and damage to many parties, it is crucial to identify the underlying factors contributing to such fraud and use them to inform a prevention strategy. This paper aims to analyze the prevention strategy of fraudulent financial reporting using the Fuzzy Analytical Hierarchy method. This method has proven effective in addressing various multi-criteria decision-making problems with multiple personal characteristics. This analytical tool allows managers to simultaneously identify and prioritize based on the desired goals, knowledge, and experience in addressing the problem at hand (Wahyudi and Pamungkas, 2020). This method uses expert perception as a key voice. It is hoped that the formulated strategy will meet the needs of state-owned enterprises in Indonesia.

Literature Review

Research has shown that the most effective way to prevent fraud and control related programs is by anchoring them in company values. These values create an environment that supports acceptable behaviour and sets clear expectations for employees. Values enable the company to foster a culture of honesty, openness, and mutual support among organization members, which, according to Sari et al. (2020), are essential factors in preventing fraud. Effective fraud prevention is anchored in organizational openness and a robust synergy between individual integrity and cooperation. The mitigation framework begins with a rigorous ethical recruitment process that serves as a primary control, filtering out candidates with low integrity by evaluating their motivations and personal backgrounds. Beyond selection, organizations must foster a positive work environment where performance-based rewards and professional development boost morale, thereby reducing the psychological incentive for exploitation-based violations. This cultural foundation is further strengthened by a straightforward, accessible code of ethics and specialized fraud awareness training that empowers employees to report irregularities. Moreover, implementing support programs for employees under financial pressure addresses the "pressure" element of the fraud triangle, while consistently applying penalties for misconduct ensures a powerful deterrent effect. Ultimately, prioritizing proactive prevention over reactive repression cultivates a high-performing ecosystem in which ethical conduct becomes a natural by-product of professional growth and healthy labor relations. Fraud prevention aims to limit opportunities for potential fraudsters and identify high-risk activities (Wahyudi et al., 2019). The key objectives of fraud prevention are to prevent fraud, deter potential fraudsters, complicate fraudsters' actions, identify high-risk activities and internal control vulnerabilities, and pursue legal prosecution. Effective fraud prevention ensures an organization operates correctly, efficiently, and ethically.

The Fuzzy Analytical Hierarchy Process (F-AHP) is a decision-making tool that has gained popularity in recent years. It is a modification of the Analytical Hierarchy Process (AHP) that incorporates fuzzy logic to handle uncertainty and vagueness in decision-making. The F-AHP is based on the AHP, which was developed by Alexander (2012) and Stofkova et al. (2022), a mathematician at the University of Pittsburgh in the United States.

Analytical Hierarchy Process (AHP) is a powerful tool for addressing complex decisions and aiding decision-makers in prioritizing and making optimal choices. By simplifying complex decisions into a series of pairwise comparisons and then synthesizing the results, AHP captures both subjective and objective aspects of decision-making. Additionally, AHP includes practical techniques for assessing the consistency of decision-makers' judgments and streamlining the decision-making process.

AHP is a decision-making model that represents the complexity of problems with multiple factors or criteria in a hierarchical structure. According to Galo (2017) and Oleniacz (2019), AHP has three basic principles: building hierarchy, setting

priorities, and logical consistency. To build the hierarchy, practical knowledge or information is identified, starting from a complex problem and breaking it down into main elements, which are further broken down into more detailed parts, and so on. The ultimate goal of using AHP is to determine the best strategy priorities.

The second principle is setting priorities. The first step in setting priorities for decision items is to make pairwise comparisons. This involves comparing elements in pairs against predetermined criteria using a matrix format. To start this process, one must begin at the top of the hierarchy and select the criteria or characteristics to compare. Next, numbers from 1 to 9 are assigned to each comparison based on their value.

The last principle in AHP is to ensure logical consistency, meaning that all elements are logically grouped and compared according to rational criteria. This is measured using a consistency ratio, and an acceptable value is 0.1. If the consistency value is more than 0.1, the reviews are considered more random and in need of improvement (Fadjar et al., 2021; Siekelova et al., 2021). Previous techniques in this study began with the fraud triangle theory (Schuchter and Levi, 2016), agency theory (Teece, 2019), the diamond theory (Ruankaew, 2016; Made1 et al., 2023), and Pentagon's theory (Horwarth, 2012), as well as the analytic hierarchy process theory (Alexander, 2012; Stofkova et al., 2022) and the analytical hierarchical procedure method (Fadjar et al., 2021; Siekelova et al., 2021).

The steps involved in problem-solving with AHP method include: (1) determining the problem hierarchy, (2) establishing priorities, (3) performing synthesis, (4) calculating the consistency index (CI), (5) calculating the consistency ratio (CR), and (6) checking the consistency of the hierarchy (Pane et al., 2017). The initial step in the AHP method involves defining the problem and breaking it down into a hierarchy to simplify it. According to Saaty (2016), a hierarchy represents a complex and structured problem at various levels, with the first level being the goal, followed by the factor or criterion, sub-criteria, and the alternative at the last level. This hierarchical breakdown helps to structure and systematize complex problems for resolution (Ortega et al., 2020).

Despite its popularity, the AHP method has shortcomings, particularly in the evaluation scale of paired-comparison matrices, as the AHP scale is expressed as crisp numbers and is deemed unbalanced and less capable of handling uncertainty. Therefore, AHP should be combined with other methods, such as fuzzy logic, to address this limitation.

Fuzzy logic was first introduced by Zadeh in 1965 at the University of California (Zimmermann, 2010; Kumari, 2025). According to Zimmermann (2010) and Kumari (2025), Zadeh argued that conventional right and wrong values are incapable of solving infinite gradation in the real world. To solve these problems, Zadeh (1965) developed a fuzzy set theory. Unlike classical logic, which has only true and false values, fuzzy logic has continuous values. Actual or incorrect values in fuzzy logic are not absolute, depending on the degree of membership it has, which is in the range

of 0 to 1. Therefore, a situation can be partly true and partly false at the same time, and the role of membership degree is significant and a hallmark of fuzzy reasoning. Fuzzy Analytic Hierarchy Process (F-AHP) is an extension of Analytical Hierarchy Process (AHP) that incorporates fuzzy logic theory. It was originally proposed by Reig-Mullor et al. (2020) and further extended by Alyamani and Long, S. (2020). This method was developed to address the shortcomings of the AHP, specifically to alleviate issues of incoherence in AHP when evaluating combined comparative matrices. The main difference between this methodology and the aforementioned one lies in the incorporation of checks into the relative matrix linking the AHP criteria. In F-AHP, the opaque ratio ladder is used to assess the relative resistance of the factors within the criteria, resulting in a fuzzy decision matrix. The final values for alternative decisions are also presented in fuzzy figures. The F-AHP value of each format is denoted by three variables, namely, (A, B, C) or (L, M, U), which are collectively referred to as Triangular Fuzzy Numbers (TFN). According to Saaty (2008), the procedure for implementing the F-AHP method is as follows: (1) develop a hierarchical structure outlining the problem at hand and identify the values in the comparative matrix pairs between TFN-scaled criteria; (2) compute the fuzzy synthesis value; (3) calculate the vector values (V) and controlled publications (D); (4) normalize the weight of the fuzzy vector (W); and (5) calculate the consistency (CR) value.

Fuzzy Analytic Hierarchy Process (F-AHP) is an analytical method that improves the quality of decision descriptions compared to conventional AHP (Pane et al., 2017). In AHP, the decision-maker's or expert's judgment is not deterministic but rather a linguistic perception, whereas in F-AHP, decision-making is modeled under uncertainty using fuzzy logic. Fuzzy Analytic Hierarchy Process (F-AHP) utilizes a pairwise comparison matrix to obtain information and converts conventional Analytical Hierarchy Process (AHP) variables to a fuzzy format with TFN. When determining element weights, arithmetic operations on TFN (Triangular Fuzzy Numbers) or fuzzy trapezoidal numbers are used.

Data processing using the Fuzzy Analytic Hierarchy Process (F-AHP) method involves several steps: Calculate the inconsistency value and create a pairwise comparison matrix AHP, convert the values of the pairwise comparison matrix of the AHP to the TFN scale, calculate the geometric mean, calculate the weights using the F-AHP method, and perform a sensitivity test.

Research Methodology

This study examines the factors contributing to accounting fraud using the Fuzzy Analytic Hierarchy Process (F-AHP) method and identifies an appropriate strategy model to prevent departmental corporate fraud in Indonesian state-owned enterprises (SOEs). Given the need for comprehensive insights, a mixed method, a combination of quantitative and qualitative methods, is considered suitable for investigating and identifying the causes and strategies to mitigate fraudulent practices within Indonesian SOEs.

Structured interviews and questionnaires were used to collect data. Semi-structured interviews were conducted with 50 informants, including the Audit Board of the Republic of Indonesia (BPK) officers, the Finance and Development Supervisory Agency (BPKP) officers, Internal Auditors, Finance Managers, Audit Committee Members, Internal Control System Bureau, Independent Auditors, and accounting professionals from the state-owned enterprises in Indonesia. The interview consisted of questions tailored to sector conditions, aimed at gathering information on the causes and strategies to prevent balance sheet fraud. The data obtained from the questionnaire were analyzed based on the responses. This study formulated a strategy using F-AHP, with expert selection of 11 applications for data processing. In addition, secondary data such as company profiles and other relevant documents were obtained from other departments.

The Analytical Hierarchy Process (AHP) method was chosen to formulate strategies for preventing budget fraud because it allows decision-making processes to be explained and illustrated graphically. This case study focuses on factors and strategies to prevent balance sheet fraud within corporate departments in Indonesia. For this purpose, initially, it identifies models and concepts to mitigate budget fraud. The application of these models, which assess fraud in Indonesia, is empirically analyzed using F-AHP. The Fuzzy Analytic Hierarchy Process (F-AHP) was also employed to evaluate and enhance the strategy model for preventing annual financial report fraud in Indonesia. This method supports decision-making by using a multidimensional approach to determine weights, probabilities, and outcomes for each aspect of the fraud prevention strategy. Data validity was assessed using original regression analyses to assess data credibility, particularly when controlling for various data sources.

The Analytical Hierarchy Process (AHP) a quantitative method for evaluating alternatives and selecting the best option based on specific criteria. This method uses comparison of different options against predetermined criteria. According to the AHP method, the alternatives and criteria were first identified, and a hierarchy was then organized based on them. The next step was to create a relationship matrix and determine the size of a large vector to calculate consistency. After counting character records, priority values were obtained from the alternatives.

The Analytical Hierarchy Process (AHP) employs a hierarchical structure with human perception as the primary input. AHP circulation is a weighting process for classifying decision alternatives based on the satisfaction of the complex decision criteria. It is a versatile tool for resolving multiple problems by comparing parameters within the hierarchy. The Analytical Hierarchy Process (AHP) involves a series of steps, including: analyzing the actual situation in a hierarchical structure of support elements, assessing the relative importance of each element using a priority scale, and creating a comparison matrix with dimensions of n x n when n elements are present. The number of evaluations required is n(n-1)/2. The steps taken in reviewing the comparison elements are as follows: (1) determining the more critical, influential, or preferred element, and (2) assessing how often the more

critical, influential, or preferred element affects or is selected over other elements. The final phase of AHP involves calculating the global priority by performing a local matrix multiplication: multiplying the lower-level matrix by the higher-level matrix. This research formulates an accounting strategy that extends AHP method, ensuring theoretical, logical, and transparent priorities. In this study, the hierarchy of strategic priorities was developed through a literature review and interviews with relevant officials. The hierarchy consists of five levels: level 1 focuses on factors, level 2 on actors, level 3 on barriers, and level 5 on strategies. The factors within the hierarchy that significantly influence financial management include the effectiveness of the internal control system, organizational ethical culture, and individual morality. The actors in the hierarchy are those with the authority to shape leadership factors: financial managers, internal auditors, and external auditors. Barriers are constraints that impact fraud prevention efforts. These barriers span individual, organizational, and regulatory aspects. Finally, the final level of strategy preparation involves selecting alternative approaches to prevent fraudulent financial reporting within financial management.

A priority was assigned to each element in the hierarchy to indicate the relative weight of one element relative to another. The purpose of priority setting is to determine the problem's importance level relative to the criteria and the overall hierarchical structure. The first step involves creating paired comparisons to link each requirement to a hierarchical subsystem. The paired comparisons are then combined into a paired-comparison matrix for numerical analysis. Numerical values ranging from 1 to 9 are assigned to each comparison using the scales set by Galo (2017) and Oleniacz (2019), as shown in Table 1.

Table 1. Comparison Scale

Intensity of Interest	Pair	Definition	Explanation
1	1	Equally Important	Two criteria contribute similarly to the goal
3	1/3	A little more Important	Experience and judgment slightly favor one criterion over another
5	1/5	More important	Experience and judgment strongly support the criteria above other criteria
6	1/7	Very important	One criterion decisively outweighs the other; its dominance is evident in practice.
9	1/9	Absolute importance	Evidence supporting one criterion over another is the highest possible order of affirmation.
2, 4, 6, 8	1/2, 1/4, 1/6, 1/8	For consideration between the values above	For consideration between the values above

Once decision-makers share a common perception, comparisons are made among criteria within a single level. Next, the most important criteria were determined, and a comparison matrix was compiled at each level.

Given that inconsistencies can arise in decision-makers' perceptions used as inputs to the AHP method, the consistency index was calculated. This index aligns with AHP principles, which assess the overall coherence of various considerations using a consistency ratio. The index can help the decision-maker to see whether the perception is logically consistent. Logical consistency was evaluated to determine whether all elements are logically grouped and consistently prioritized based on rational criteria. If the value is zero, the added comparison matrix is considered consistent. The inconsistency threshold was determined using the consistency ratio (CR), which is calculated by dividing the consistency index (CI) by the random index (RI), following an approach developed by a national laboratory at the Wharton School. The consistency ratio equation is as follows:

$$\text{Consistency Ratio} = \frac{\text{Consistency Index}}{\text{Random Index}} \quad (1)$$

If the pairwise comparison matrix has a value of 0.1 or less, the inconsistency in decision-makers' opinions is still acceptable; otherwise, the assessment needs to be repeated. This refers to Nguyen (2014), who stated that a consistency value of 0.1 is acceptable because the reviews are somewhat random, and improvement is needed if the consistency value exceeds 0.1.

Research Results

Analysis started with the basic Fuzzy Analytic Hierarchy Process (F-AHP) matrix method, which was applied to the matrix and organized according to the records of individual experts using a geometric approach to the media. The decision-making process approach was based on the acceptance of heavy calculation attributes under hygiene. Based on expert and literature analysis, six main criteria are identified: (1) improving the monitoring and control system, (2) improving the corporate culture, (3) anti-fraud formula, (4) realization of a reward and punishment system, (5) implementation of anti-fraud training controls, and (6) whether employees are agents of change (see Table 2). Calculating the most significant criteria and determining the sub-activity of natural consequences were based on the evaluation of 45 research papers using expert declarations, according to the combined ratio matrix.

Table 2. Main Fraudulent Financial Reporting Attributes

Main Criteria	Code	Weight	Rank
Improvement of monitoring and control systems	MCS	0.4374	1st
Improving organizational culture	IOC	0.3283	2nd
Formulate anti-fraud values	FAF	0.3113	3rd
Implement a strict reward and punishment system	RPS	0.2981	4th

Anti-fraud socialization for employees	AFTER	0.2372	5th
Form a change agent	FCA	0.1717	6th

Discussion

To develop fraud prevention strategies, Fuzzy Analytic Hierarchy Process (F-AHP) was employed to estimate the weights of criteria and adversaries. The following six steps outline our approach. In the first step, a problem structural design was constructed using a hierarchical approach. Next, in the second step, after designing a hierarchical problem structure, a pairwise comparison matrix was established, the ladder of relative interest was expanded, and then the scale of the comparison material was determined, resulting in a combined comparative matrix with values ranging from 1 to 9 that is used to increase the accuracy of the traditional model. Five TFNs were introduced: E1, E3, E5, E7, and E9, corresponding to the number of qualitative correspondence assessments, to capture vagueness and eliminate uncertainty. Subsequently, in the third step, a fuzzy matrix was developed to represent the relationships among criteria. In the fourth step, the matrix and the coherence relationship were developed, and in the fifth step, the attribute weights were calculated. In the sixth step, the weights were described by standardizing the criteria for all rows and columns of the pairwise comparison matrix.

AHP structure in this study comprises five levels: focus, factors, actors, barriers, and strategies. The elements in the compilation hierarchy that influence financial management are the effectiveness of the internal control system, organizational ethical culture, and individual morality. The actors involved in constructing the hierarchy are those with the authority to shape the leadership factor. These actors include financial managers, internal auditors, and external auditors. Barriers encountered by the priority scale in the development of hierarchy are the constraints that influence fraud prevention efforts. These constraints include individual, organizational, and regulatory aspects. The final level of strategy formulation is selecting the alternative strategy to mitigate fraudulent financial reporting in financial management.

Factors for financial fraud prevention and the results of treatment with the AHP method. A comparative analysis of the factors influencing fraud prevention strategies in financial management has revealed that the internal control system holds the highest priority, with a value of 0.503. This particular strategy has proven highly effective in reducing opportunities for employee misconduct in financial reporting. According to Mappadang (2022), a robust internal control system can effectively curb employee fraud. Conversely, a weak internal control system may create opportunities for employees to engage in fraudulent activities. Thus, supporting the implementation of efficient internal controls in state-owned enterprises is essential for minimizing fraud risk.

The next priority, with a value of 0.313, is the ethical organizational culture. Organizational culture is a set of values developed within the organization that serves

as a behavioral framework. It can prevent fraudulent behaviour within the organization (Pamungkas and Utomo, 2018) and plays an essential role in designing the character of executive members. Organizations with a strong ethical culture will actively discourage their members from engaging in deviant behavior.

The last priority is individual morality valued at 0.18. One contributing factor to criminal behavior is a lack of integrity. Implementing effective internal controls, fostering an economical culture, assembling a morally sound staff, and practicing prudent financial management all contribute to reducing the risk of fraud. Ghozali et al. (2019) highlight that the root cause of fraudulent behavior lies in the lack of integrity within the state apparatus, which should embody moral and honest values. The higher an individual's moral compass, the more he/she strives to avoid committing fraud that can harm others. To prevent fraud within an organization, it is necessary to foster individuals' moral fortitude.

Preventing fraudulent financial reporting is driven by three primary actors, with priority levels determined by their organizational influence and oversight capabilities. The financial manager has the highest priority (0.583), as they are responsible for the company's financial guidelines and serve as the central ethical role model for subordinates, necessitating robust reporting mechanisms for misconduct. The internal auditor follows as the second priority (0.307), performing mandatory functions of inspection, evaluation, and monitoring to ensure efficient management and good governance in accordance with regulatory standards. Lastly, the external auditor (0.110), exemplified by the Supreme Audit Board (BPK), provides an essential layer of oversight by investigating the financial management of state institutions and government-related corporations. Together, these actors form a structured defense against financial misreporting through leadership, internal control, and independent verification barriers to the prevention of fraudulent financial reporting. Among the elements constituting 'barriers', the first aspect, valued at 0.67, pertains to the individual aspect. The limitation of the unique aspect is the restriction or control by persons. As staff is limited, individuals may overlook fraudulent activities that deviate from established standards or hesitate to report such behavior in the workplace.

According to survey respondents, the second priority lies in the regulatory aspect, with a value of 0.298. Regulatory restrictions encompass inadequate rules, the imposition of minor sanctions, inconsistent preventive measures, and weaknesses in evaluating and revising regulations.

Lastly, the organizational aspect, valued at 0.235, represents barriers within administrative structures. These barriers include a lack of leadership examples and commitment. Executives must serve as exemplary models for subordinates to effectively prevent fraudulent financial statements.

Alternative strategies for preventing fraudulent financial reporting: The top priority for preventing fraudulent financial practices lies in enhancing the monitoring and control system (0.200). Strengthening the organizational culture (0.171) ranks second, followed by developing a clear understanding of fraud within the

organization (0.166), implementing a rigorous reward-and-punishment system (0.166), disseminating fraud-prevention awareness among employees (0.155), and providing targeted training (0.12). Respondents emphasized that improving monitoring and control systems is a strategic approach to fortifying fraud prevention efforts. With the audio system implemented in broom, the company can minimize and eliminate employee motivation and timeliness issues that lead to fraudulent financial reporting.

Based on the analysis results, the strategy to prevent fraudulent financial reporting is outlined as follows: targeted implementation, enhanced monitoring, and a control system. According to the Institute of Internal Auditors (2013), the enhancement of administrative control is closely tied to the distribution of roles and responsibilities for implementing risk management. The prevention of fraud within an organization relies on a robust "three lines of defence" model and the continuous improvement of corporate culture. The first line, operations management, ensures adherence to guidelines through daily monitoring of activities, risk management applications, and financial reconciliation. The second line focuses on monitoring and maintenance, serving as an ethical resource for troubleshooting compliance issues and helping employees resolve ethical dilemmas. The third line involves internal auditors who evaluate the entire control system and optimize their roles through coaching and fraud-prevention training. Beyond these structural controls, improving organizational culture is vital; exemplary leadership and positive conduct from executives encourage subordinates to emulate ethical behaviour. By fostering a work environment characterized by realistic goals, clear authority, and effective communication, organizations can naturally inhibit fraudulent actions. This system is further solidified by formulating anti-fraud values, specifically integrity, which are embedded in a code of ethics and reinforced through annual integrity pacts. Ultimately, when employees are guided by moral qualities and clear standards of conduct, they are better equipped to make ethical decisions, thereby curbing bureaucratic fraud and enhancing overall organizational performance.

Implementation of a rigorous reward and punishment system. A reward and punishment system is equally necessary to motivate employees and enhance work quality. Rewards serve as incentives, encouraging employees to work diligently and fulfil their responsibilities. Simultaneously, when an employee makes mistakes or violates policies, corrective actions can promote different behaviour and ultimately lead to positive outcomes (Sury, 2017). In addition to performance-based rewards, providing employees with advice offers opportunities for skill development through training, promotions, and continuing education.

Anti-fraud education/outreach. Outreach and anti-fraud education aim to strengthen individuals' decision-making, enhance ethical integrity, and foster a culture of zero tolerance for fraud. Combating fraudulent behaviour occurs across various contexts, including general organizational settings, educational programs, and leadership initiatives (WIRA, 2015). Effective fraud prevention requires continuous education, beginning with induction training and extending to ethical seminars that clarify

permissible practices and address moral dilemmas. By integrating anti-fraud initiatives into meetings, ceremonies, and various media, organizations can cultivate a culture of zero tolerance. A critical strategy involves empowering employees as agents of change and role models who align their behaviour with corporate values, ultimately enhancing individual integrity.

This research implies that Indonesian State-Owned Enterprises (SOEs) must strengthen their monitoring systems through the "three lines of defence" and risk management. Key to this transformation is improving organizational culture through exemplary leadership, anti-fraud values, and a rigorous reward and punishment system. Furthermore, increasing transparency and service quality is vital for building public trust. While insightful, this study is limited by potential bias introduced by its 50 informants, who were mostly financial managers. Future research should involve more independent sources, such as Internal Audit Committees or external forensic auditors, to ensure a more objective evaluation of fraud prevention effectiveness.

Conclusion

This study formulates a strategy to prevent financial reporting fraud in Indonesian state-owned companies using the Fuzzy Analytic Hierarchy Process (F-AHP). Using the Analytical Hierarchy Process (AHP), a budget fraud prevention strategy is formulated, with the decision-making process explained and illustrated graphically. The research results show several strategies to prevent financial reporting fraud, such as: improving the monitoring and control system achieved through risk management and three lines of defence control; improving organizational culture by leading by example, demonstrating leadership commitment, and creating a positive work environment; formulating anti-fraud values through clear rules of conduct and a strong emphasis on integrity; implementing a strict reward and punishment system, providing performance benefits and opportunities for skill enhancement, while also imposing strict disciplinary sanctions; educational anti-fraud initiatives for employees, including awareness campaigns, training seminars, and ethics promotions; and empowering employees as agents of change. These strategies collectively contribute to a comprehensive anti-fraud approach, fostering ethical behaviour and maintaining financial integrity in organizations, especially state-owned enterprises in Indonesia.

While this study makes an important contribution to analyzing fraudulent financial reporting prevention, it has limitations. This limitation is that the research was conducted in state-owned companies and cannot therefore be generalized to the public sector. Further research should expand beyond public-sector companies in Indonesia. Furthermore, future studies should also examine foreign companies in several ASEAN countries to gain broader insights.

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ZAPOBIEGANIE OSZUSTWOM W SPRAWOZDANIACH FINANSOWYCH Z WYKORZYSTANIEM METODY FUZZY ANALYTIC HIERARCHY PROCESS W INDONEZYJSKICH PRZEDSIĘBIORSTWACH PAŃSTWOWYCH

Streszczenie: Niniejsze badanie podkreśla pilną potrzebę opracowania skutecznego modelu strategicznego w celu zapobiegania oszustwom w sprawozdawczości finansowej indonezyjskich przedsiębiorstw państwowych, ponieważ obecne środki są uważane za nieskuteczne. Celem niniejszego badania jest sformułowanie strategii zapobiegania oszustwom w sprawozdawczości finansowej z wykorzystaniem metody Fuzzy Analytic Hierarchy Process. W badaniu tym zastosowano metodę opisowo-analityczną do analizy zjawisk i wyników badań, wykorzystując podejście oparte na metodach mieszanych w celu uzyskania dogłębnych informacji poprzez procedury dochodzeniowe. Dane zebrano za pomocą kombinacji kwestionariuszy i wywiadów z 50 menedżerami finansowymi oraz pięcioma ekspertami w zakresie formułowania strategii zapobiegania. Wśród informatorów w niniejszym badaniu znaleźli się przedstawiciele Najwyższej Izby Kontroli Republiki

Indonezji, Agencji Nadzoru Finansowego i Rozwoju, audytorzy wewnętrzni, menedżerowie finansowi, członkowie komitetów audytowych, Biuro Systemu Kontroli Wewnętrznej, niezależni audytorzy oraz specjaliści ds. rachunkowości z przedsiębiorstw państwowych. W badaniu zidentyfikowano sześć strategii zapobiegania oszustwom w sprawozdawczości finansowej: wzmocnienie systemów monitorowania i kontroli poprzez trzy linie obrony; promowanie pozytywnej kultury pracy; ustanowienie zasad przeciwdziałania oszustwom; egzekwowanie nagród i kar; zapewnienie edukacji w zakresie przeciwdziałania oszustwom; oraz wzmacnianie pozycji pracowników jako agentów zmian. Niniejsze badanie oferuje realne rozwiązanie w zakresie zapobiegania oszustwom w sprawozdawczości finansowej poprzez analizę czynników leżących u ich podstaw.

Słowa kluczowe: zbiór rozmyty, kontrola wewnętrzna, monitorowanie, przeciwdziałanie oszustwom, agenci zmian.