



The Effect of Environmental Uncertainty on Managerial Performance with Management Accounting Information Systems as an Intervening Variable (in the Indonesian State-Owned Defense Industry Sector)

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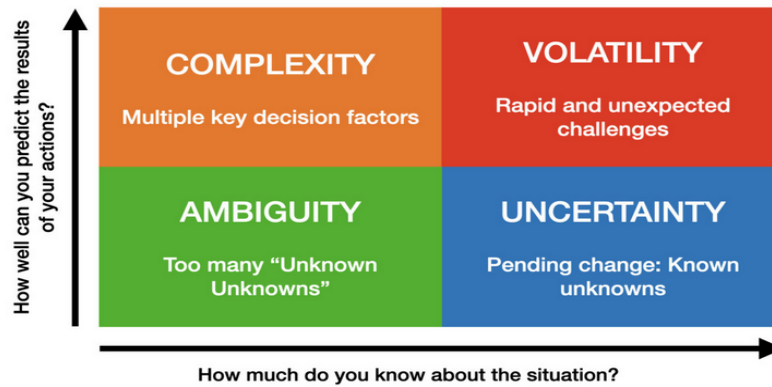
Abstract

The study aims to analyze the effect of environmental uncertainty on managerial performance, with management accounting information systems (MAIS) as an intervening variable in Indonesian defense industry state-owned enterprises. A quantitative explanatory survey method was employed, using questionnaires distributed to managers, with the data analyzed through path analysis to test direct and indirect effects among environmental uncertainty, MAIS, and managerial performance. The results show that environmental uncertainty has a weak and statistically insignificant direct effect on managerial performance, while MAIS also has a weak and insignificant direct effect on managerial performance (path coefficients below 0.20 and significance levels above 0.05). In addition, environmental uncertainty does not significantly influence managerial performance through MAIS as an intervening variable, indicating that MAIS does not mediate the relationship between environmental uncertainty and managerial performance in this context. These findings suggest that other organizational and managerial factors, beyond environmental uncertainty and MAIS, may play a more dominant role in shaping managerial performance in Indonesian defense industry state-owned enterprises.

INTRODUCTION

The business environment faced by companies today is experiencing rapid and continuous changes. This is caused by the simultaneous occurrence of four eras: economic globalization, information technology, strategic quality management, and management revolution eras (Mulyadi dan Setyawan, (Putri 2014)). Rapid environmental changes lead companies to adapt to existing conditions by implementing strategy changes and better management controls (Lathifah 2018).

In 1987, the United States Army War College introduced the acronym VUCA, which stands for Volatility, Uncertainty, Complexity, and Ambiguity, to describe the unstable geopolitical conditions after the end of the Cold War (Murugan et al. 2021). After the Industrial Revolution 4.0, this acronym has been widely used in various fields such as business and organizations to characterize a chaotic, turbulent, and rapidly changing business environment (Korohodova et al. 2022).



(Source : (Macpherson 2017))

Figure 1. VUCA Dimension (*Volatility, Uncertainty, Complexity, Ambiguity*)

Over time, amid continuously evolving environmental uncertainty, Stephan Grabmeier in his article titled “Transformation to the Era of BANI” reveals a paradigm shift in perspectives on uncertainty, moving from the VUCA (Volatility, Uncertainty, Complexity, Ambiguity) framework established in the 1980s to TUNA (Turbulency, Uncertainty, Novelty, Ambiguity) introduced in 2018 by Ramirez & Wilkinson, and ultimately to the BANI era starting in 2020. The primary focus of this BANI (Brittle, Anxious, Non-Linear, Incomprehensible) transformation era refers to the demand for understanding approaches to complexity that have shifted from cognitive complexity patterns to cyclomatic complexity (Anbanathan 2022).

The uncertainty in the business environment was felt during the Covid-19 pandemic that struck the world. Coronavirus Disease (Covid-19) caused changes in stability across many activity sectors in nearly all countries worldwide, particularly in health and business sectors (Adnan et al. 2021). The outbreak, which initially hit China, quickly spread to several neighboring countries in Asia and Europe, infecting 198 countries as recorded on March 25 and increasing to 213 countries by June 20, 2020 (Korohodova et al. 2022).

Industry 4.0 poses challenges for the business world, including inadequate human resource skills, communication technology security issues, production machine stability reliability, stakeholders' inability to adapt, and job losses due to automation shifts. Society 5.0 offers a human-centered society that balances economic advancement with social problem-solving through highly integrated cyber-physical systems (Ellitan 2020).

While Society 4.0 enables anyone to access and share information on the internet, Society 5.0 represents an era where technology becomes an integral part of humanity itself. Transforming environmental uncertainty challenges into opportunities requires transformative leadership in human resource management. To compete and overcome new challenges, companies need innovative and differentiated approaches aligned with consumer needs (Murugan et al. 2021).

State-Owned Enterprises (SOEs) represent one of the companies facing high environmental change conditions, necessitating appropriate strategies and effective management controls to enhance company performance (Senduk et al. 2017). SOEs possess numerous diverse systems, requiring accurate information to support subsequent decision-making processes.

Managerial performance is crucial for conducting evaluation, analysis, and development of management programs. This evaluation is needed to prepare managers who can carry out their duties optimally (Damayanti et al. 2019). Performance reflects the degree of achievement in implementing activities, programs, or policies to realize objectives, fulfill missions, and attain the organization's vision.

According to (Putri 2014) performance is a continuous combination process of cooperation between an employee and direct regulations, involving the implementation of rewards as well as understanding of employee job functions. Managerial performance is a key factor for companies, because improving managerial performance can enhance overall corporate performance (Damayanti et al. 2019). Several factors that may influence managerial performance include the characteristics of management accounting system information and environmental uncertainty

Information needs within a company depend on various factors. The availability of each characteristic of accounting system information may not always be the same across organizations, as there are other factors that influence the extent of the need for management accounting information (Sigilipu 2013).

Management accounting information systems provide both financial and non-financial information to managers and employees within the organization. Utilizing management accounting information helps management make effective decisions, reduce uncertainty, and minimize risks in selecting alternatives. The use of accounting information has a positive impact as it serves as a basis for policy-making and improvement efforts (Wirjono 2020).

In conditions of high environmental uncertainty, information becomes a highly valuable commodity in organizational planning and control activities (Henri et al. 2020; Mao et al. 2015). Reliable accounting systems (indicated by the adequacy of management accounting information characteristics) facilitate the provision of timely and relevant information, as managers have varying information needs. Thus, the level of environmental uncertainty influences the availability of management accounting system information, and environmental uncertainty has been identified as a variable affecting managerial performance.

Global economic uncertainty from Covid-19, commodity price fluctuations, to the Russia-Ukraine geopolitical tensions poses challenges for the Indonesian government (Pangastuti 2022). At the organizational level, high environmental uncertainty makes it difficult for managers to formulate accurate planning and control. Planning developed under high uncertainty becomes problematic due to managers' inability to predict future conditions, necessitating reliable management accounting information systems to address these issues.

Several studies have examined the influence of environmental uncertainty factors on various management accounting system characteristics (Lathifah 2018). These findings explain that the availability of reliable management accounting information enhances managerial performance under conditions of environmental uncertainty.

The Covid-19 pandemic has impacted various aspects of life, including Indonesian SOEs, with at least 90% of state-owned company performance declining (Ramalan 2022). SOEs, as extensions of the government, play a strategic role in national development, as their contributions represent returns on state wealth invested as share capital in SOEs.

Current environmental uncertainty also affects global supply chains, where delayed raw material deliveries increase company burdens by disrupting product completion timelines. More broadly, this can lead to companies bearing greater labor costs compared to raw material costs (Dwiguna et al. 2022).

In the Ministry of SOEs Regulation attachment issued on August 10, 2020, and officially published on the Ministry of SOEs website, Erick Thohir stated that SOEs consistently contribute over 16% to Indonesia's GDP since 2018. However, compared to other countries, this 16% is relatively small given SOEs' USD573 billion in assets; for instance, Singapore's Temasek Superholding with USD227 billion assets contributes 21.6% to Singapore's GDP, while China's SOEs contribute 58.4% from USD10,400 billion assets, and Malaysia's Khazanah lags at 1.4% from USD3 billion assets.

Former Minister of State-Owned Enterprises (1998-2001), Tanri Abeng, noted that the decline in several SOEs' performance predates Covid-19, stemming from inefficiencies, poor leadership, and management in entities like PTPN, construction SOEs, and Garuda Indonesia (CNBC 2021). Thus, SOE recovery requires swift and comprehensive restructuring and efficiency measures. Problems of debt burdens and poor operational/financial performance stem from two sources: government-assigned tasks (PSO) and the managerial capabilities of directors and commissioners (Cory 2021).

In Indonesia, the defense industry experienced contraction but survived and grew amid the crisis, as its business processes are largely unrelated to public needs, fostering optimism for entering the global Top 50 by 2024 (Fuad, 2021; (Dwiguna et al. 2022)). This aligns with the defense industry's resilience to global shocks, as most countries rely on domestic producers. Like global industry chains, defense supply chains have diversified, with companies preferring "system integrator" roles over pure production, increasing vulnerability due to extensive production networks (Dwiguna et al. 2022).

President Joko Widodo signed Government Regulation (PP) No. 5 of 2022 on January 12, 2022, adding state capital participation (PMN) to PT Len Industri (Persero) shares. The Defense Industry SOE Holding, DEFEND ID (Defence Industry Indonesia), comprises PT Len Industri as the parent, with PT Pindad, PT Dirgantara Indonesia, PT PAL Indonesia, and PT Dahana as members. PP No. 5/2022 aims to strengthen Len Industri's capital structure and business capacity (LenIndustri 2021).

This Government Regulation does not alter the share ownership of Len Industri's four subsidiaries: PT Eltran Indonesia (EI), PT Surya Energi Indotama (SEI), PT Len Railway Systems (LRS), and PT Len Telekomunikasi Indonesia (LTI), most of which are owned by Len Industri. The appointment of Len as the parent holding since 2020 is based on its business network covering all defense sectors. Len can integrate technology across sectors and possesses capabilities in C5ISR (Command, Control, Communication, Computer, Cyber, Intelligence, Surveillance, and Reconnaissance) as interoperability and brain systems for all electronic-based platforms.

These changes challenge human resources, especially managers responsible for planning and actions to achieve company goals (Dwiguna et al. 2022). Managerial performance determines the success of strategies to reach Top 50 Global Defence Company status. The holding must integrate diverse financial and non-financial systems across members, while culture may hinder alignment, leading managers to varied decision-making

on similar issues. With experience, knowledge, and good information, managers can select low-risk options to meet RKAP targets amid rapid market, strategy, and competitor shifts, demanding speed and decisiveness

The Covid-19 pandemic in early 2020 significantly impacted the company, slowing economic growth and redirecting government spending to pandemic response, leading to delayed or cancelled projects (APBN, APBD, and non-government), causing unmet targets. 2020 was a challenging year of competency rebuilding, with delayed contracts preventing positive profits, placing the company in survival mode amid hampered national infrastructure plans and a Q2 GDP contraction of -5.4%.

The company pursued oil and gas opportunities via a KSO between PT Eltran Indonesia and PT Len Industri (Rp 110 billion APBN contract), but budget cuts reduced it to Rp 70 billion for Covid-19 vaccination, stranding Rp 41 billion in pre-cut bank loans. Managers attempted efficiencies, cross-subsidies from other/carry-over projects, and high-interest non-bank financing, but faced customs delays, PSBB/WFH restrictions, and repeated issues due to poor forecasting and information gaps. Holding restructuring and bank trust issues from parent global-line loans further worsened financing access.

In 2021, despite the involvement of employees, managers, and top executives, the company persistently bid on 5 ESDM Ministry projects similar to previous ones, with departments analyzing to prevent 2020's Rp 25 billion losses. However, due to insufficient information and coordination, these major opportunities failed when one manager erred in issuing a critical Bid Guarantee document, canceling the tender worth nearly Rp 300 billion. This clashed with departmental interests pushing for the contracts, forcing the company to extend third-party loans amid absent projects or cash inflows.

In 2022, the company shifted to Digital Solution business via a subsidiary, securing a nearly Rp 1 trillion KOMINFO content filtering infrastructure project (Phase 1), followed by Phase 2 worth Rp 800 billion after competing successfully. Managers strategized by coordinating with competitors' weaknesses, partnering to win the bid and subcontracting the rival. Additionally, a Rp 119 billion Automated People Mover System project from PT Angkasa Pura II prompted financial managers to secure Rp 63 billion in bank loans for funding.

However, the project was delayed, while funding had already been disbursed. With the company surviving on limited 2022 projects, top management and managers decided to allocate the loan for operational needs, including employee salaries, interest on other project loans, building payments (investment credit), and similar expenses to sustain the organization.

In 2023, Phase 3 of the content filtering project failed due to Attorney General's suspicions after two consecutive wins, reducing sales. Managers pursued a KOMINFO tender for BBPPT 2023 calibration procurement to prove Marketing Department performance, accepting a thin 4.74% margin (Rp 4.07 billion) on Rp 85.87 billion net cost (HPP 95.26%). Delays past year-end into March 2024 incurred a Rp 3.06 billion late penalty.

In 2024, the company delayed employee salaries due to unmet RKAP targets and unpaid non-bank debts, implementing efficiencies that left wages outstanding as of this study's writing. This indicates that unpredictable environmental uncertainty and inadequate

information have degraded managerial performance by hindering accurate company forecasting.

Research on managerial performance has been conducted across various sectors, including banking (Senduk et al. 2017), hospitality (Damayanti et al. 2019), manufacturing (Maryam 2019), and state-owned enterprises (SOEs) (Senduk et al. 2017).

This study extends prior research by examining management accounting information systems, environmental uncertainty, and managerial performance within Indonesia's Defense Industry SOE Cluster. Based on the above discussion, the research problem is formulated as:

1. How does environmental uncertainty affect managerial performance in Defense Industry SOEs?
2. How does environmental uncertainty affect management accounting information systems in Defense Industry SOEs?
3. How does the management accounting information system affect managerial performance in Defense Industry SOEs?
4. How does environmental uncertainty affect managerial performance through the management accounting information system in Defense Industry SOEs?

METHOD

This study employed a quantitative explanatory survey design to examine the effect of environmental uncertainty on managerial performance, with management accounting information systems (MAIS) as an intervening variable. The research aimed to test the direct and indirect relationships among variables within the framework of contingency theory, using path analysis as the main analytical technique.

The population comprised Echelon 1 structural officials in Indonesian defense industry state-owned enterprises (DEFEND ID holding), totaling 100 individuals with a minimum tenure of six years. The criteria included direct interaction with top management and responsibility over multiple units, ensuring employee maturity and experience (Sugiyono, 2014). The data were obtained from interviews with PT Len Industri's Human Capital Services as the parent holding.

The sample was a subset of the population selected to participate in the study (Sugiyono, 2014). Due to data limitations and respondent time constraints, not all 100 population members could be surveyed; thus, a representative sample was calculated using the Isaac and Michael formula.

$$s = \frac{\delta^2 \cdot N \cdot P \cdot Q}{d^2 \cdot (N - 1) + \delta^2 \cdot P \cdot Q}$$

$$S = \frac{3,841 \times 100 \times 0,5 \times 0,5}{0,05^2 \times (100 - 1) + 3,841 \times 0,5 \times 0,5}$$

$$S = \frac{96,025}{1,20775}$$

$$S = 79,50$$

This yields 80 Echelon structural officials from Defense Industry SOEs, ensuring 95% accuracy.

This study examines three core variables: environmental uncertainty (X) as independent, managerial performance (Y) as dependent, and management accounting information systems (Z) as intervening.

Environmental Uncertainty (X) - (Milliken 1987)

- a. State Uncertainty (KL1-KL12): Unpredictability of environmental conditions, competitors, suppliers, customers, government actions.
- b. Effect Uncertainty (KL13-KL14): Inability to predict environmental change impacts.
- c. Response Uncertainty (KL15-KL16): Lack of knowledge on response options and consequences.

Management Accounting Information Systems (Z) - (Chenhall et al. 1986)

- d. Broadscope (SIAM1-SIAM4): External economic/non-economic information (market share, demographics, competitors).
- e. Timeliness (SIAM5-SIAM7): Frequent, rapid reporting and feedback.
- f. Aggregation (SIAM8-SIAM10): Decision models (cash flow analysis, linear programming).
- g. Integration (SIAM11-SIAM13): Cross-segment coordination and subunit impacts.

Managerial Performance (Y) - (Mahoney 1965)

- h. Planning (KM1-KM5): Goal setting, budgeting, scheduling.
- i. Investigating (KM6-KM9): Information collection, reporting, performance measurement.
- j. Coordinating (KM10-KM14): Inter-departmental information exchange.
- k. Staffing (KM15-KM17): Employee evaluation, appraisal.
- l. Supervising (KM18-KM22): Directing, training subordinates.
- m. Staffing (KM23-KM25): Recruitment, placement, promotion.
- n. Negotiating (KM26-KM30): Contracts, purchases, sales agreements.
- o. Representing (KM31-KM33): External meetings, public relations.

Data collection employed three techniques: literature study reviewing books, journals, theses, and websites on environmental uncertainty, managerial performance, and management accounting systems; field study via online questionnaires created on Google Forms and distributed through DEFEND ID holding to 80 Echelon structural officials measuring indicators of variables X, Y, and Z; and additional literature review from libraries, prior theses, accounting journals, print media, and internet sources.

Data analysis was conducted using quantitative procedures comprising three main stages: editing, scoring, and tabulation. Editing was performed to ensure the completeness and consistency of the questionnaires. Scoring employed a five-point Likert scale ranging from 5 to 1 for positive statements and from 1 to 5 for negative statements. Tabulation involved organizing respondents' answers into frequency tables for further analysis.

Descriptive analysis was used to describe the characteristics of variables X (environmental uncertainty), Y (managerial performance), and Z (management accounting information systems). The analysis included frequency distributions, cross-tabulations, and percentage interpretations, where 0% indicates none, 50% represents half, and 100% indicates all respondents. A continuum line was applied to classify the results into seven categories ranging from very good to very poor. The highest score was calculated as 5 multiplied by the number of items and respondents, while the class interval was obtained by dividing the difference between the highest and lowest scores by seven.

Verification analysis was conducted using path analysis to examine both direct and indirect effects among variables ($X \rightarrow Y$ and $X \rightarrow Z \rightarrow Y$). Path analysis was applied as an extension of multiple regression analysis (Sugiyono, 2014). The structural model consisted of path coefficients ρ_1 ($X \rightarrow Z$), ρ_2 ($Z \rightarrow Y$), and ρ_3 ($X \rightarrow Y$). The strength of influence was interpreted using Guilford's criteria, ranging from very weak (0–20%) to very strong (80–100%).

Normality was tested using the Kolmogorov–Smirnov test (Sig. > 0.05). Multicollinearity was assessed using tolerance values (> 0.10) and variance inflation factor (VIF < 10). Heteroskedasticity was tested using Spearman's correlation (Sig. > 0.05). The coefficient of determination (R^2) was used to measure the proportion of variance explained by the model. Simultaneous significance was examined using the F-test, while partial effects were tested using the t-test ($t_{\text{count}} > t_{\text{table}}$ or Sig. < 0.05). Mediation effects were evaluated using the Sobel test.

RESULTS AND DISCUSSION

This section presents the research results and their discussion based on the objectives and hypotheses formulated previously. The analysis covers descriptive statistics, verification testing, and interpretation of the relationships among environmental uncertainty, management accounting information systems, and managerial performance in Indonesian state-owned defense industry enterprises.

Respondent Characteristics

Table 1. Respondent Characteristics

Gender	Frequency	Percentage
Male	53	66,25%
Female	27	33,75%
Age (Years)		
21 – 25 Years	7	8,75%
26 – 30 Years	12	15%
31 – 35 Years	20	25%
36 – 40 Years	18	22,5%
41 – 45 Years	18	22,5%
> 45 Years	5	6,25%
Educational Level		
Bachelor's Degree	74	92,5%
Master's Degree	60	7,5%

Source: Research data

The respondents were predominantly male, accounting for 66.25% of the total sample, while female respondents represented 33.75%. In terms of age, most respondents were within the productive age range of 31–35 years (25%), followed by those aged 36–40 years and 41–45 years, each comprising 22.5%. Regarding educational background, the majority of respondents held a bachelor's degree (92.5%), whereas only a small proportion had completed a master's degree (7.5%). This distribution indicates that the respondents generally

possess sufficient educational qualifications and work experience to provide reliable insights related to managerial performance and decision-making.

Descriptive Results

Table 2. Descriptive of Research Variables

Variable	Minimum	Maximum	Mean	Interpretation
Environmental Uncertainty	3,36	4,22	3,86	Good
Management Accounting Information System	2,72	3,75	3,23	Moderate Good
Managerial Performance	3,16	4,23	3,85	Good

Source: Research data

Descriptive analysis reveals that managerial performance is perceived as good, with an overall mean score of 3.85. The highest mean score relates to the managerial role in determining organizational goals, policies, and work procedures (Mean = 4.23), highlighting the strategic importance of managerial functions. Meanwhile, the lowest mean score was associated with performance evaluation and reporting activities (Mean = 3.16), indicating relatively weaker assessment capabilities. Overall, the results suggest that managers demonstrate strong performance in planning and coordination functions.

Validity and Reliability Test

Table 3. Validity and Reliability Result

Variable	Number of Items	Validity Result	Cronbach's Alpha	Reliability
Environmental Uncertainty	16	All items valid	0,830	Reliable
Management Accounting Information System	13	All items valid	0,870	Reliable
Managerial Performance	33	All items valid	0,928	Reliable

Source: Research data

The quality of the research instrument was assessed through validity and reliability tests. Item validity was examined using Pearson product-moment correlation with a significance level of 5%. The results indicate that all questionnaire items for environmental uncertainty, management accounting information systems, and managerial performance have correlation coefficients exceeding the critical value, confirming that all items are valid.

Reliability testing was conducted using Cronbach's Alpha. The results show that all variables have Cronbach's Alpha values above the recommended threshold of 0.60, indicating satisfactory internal consistency. Specifically, environmental uncertainty obtained a Cronbach's Alpha of 0.830, management accounting information systems 0.875, and managerial performance 0.928. These findings confirm that the measurement instruments are reliable and suitable for further analysis.

Classical Assumptions

Table 4. Classical Assumption Test Results

Test	Indicator	Result	Conclusion
Normality	Kolmogorov-Smirnov (Sig.)	0,053	Normal Distribution
Heteroskedasticity	Sig. (X,Z)	> 0,05	No Heteroskedasticity
Multicollinearity	VIF/Tolerance	VIF < 10 / To. > 0,10	No Multicollinearity

Source: Research data

Prior to hypothesis testing, classical assumption tests were conducted to ensure the suitability of the regression model. Normality was examined using the Kolmogorov–Smirnov test, which yielded a significance value above 0.05, indicating that the residuals were normally distributed.

Heteroskedasticity was tested using the significance values of the independent variables, all of which exceeded the 0.05 threshold, suggesting the absence of heteroskedasticity. Multicollinearity was assessed using tolerance and variance inflation factor (VIF) values. The results show tolerance values greater than 0.10 and VIF values well below 10, indicating no multicollinearity among the independent variables. Overall, the results confirm that the regression model satisfies the classical assumptions and is appropriate for further analysis.

Regression Model

Multiple regression analysis is a statistical method used to examine the relationship between one dependent variable (Y) and two or more independent variables (X). The multiple regression model in this study is expressed in the following equation form:

$$Y = 59,827 + 0,802X + 0,432Z + 12,092e$$

The multiple regression model indicates that environmental uncertainty and management accounting information systems both have positive effects on managerial performance. The estimated regression equation demonstrates that increases in environmental uncertainty and the effectiveness of management accounting information systems are associated with improvements in managerial performance.

Coefficient Determination

The coefficient of determination (R^2) value of 0.290 indicates that approximately 29% of the variance in managerial performance is explained by environmental uncertainty and management accounting information systems. The adjusted R^2 value of 0.272 confirms a moderate explanatory power of the model, while the remaining variance is influenced by other factors not included in the model.

Hypothesis Test

Table 5. Hypothesis Test

Hypothesis	Relationship	Coefficient (β)	t-value	Sig.	Result
H1	Environmental Uncertainty → Managerial Performance	0,802	4,483	0,000	Supported
H2	Management Accounting Information System → Managerial Performance	0,432	2,784	0,007	Supported

H3	Environmental Uncertainty → Management Accounting Information System	0,157	1,223	0,225	Not Supported
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Source: Research data

Hypothesis testing was conducted using multiple regression analysis to examine the relationships among the research variables. The results of the F-test indicate that the regression model is statistically significant ($F = 15.924$, $p < 0.001$), demonstrating that environmental uncertainty and management accounting information systems jointly affect managerial performance.

The t-test results show that environmental uncertainty has a positive and significant effect on managerial performance ($\beta = 0.802$, $p < 0.001$), supporting the first hypothesis. This finding indicates that higher levels of environmental uncertainty are associated with increased managerial performance.

Furthermore, management accounting information systems also have a positive and significant effect on managerial performance ($\beta = 0.432$, $p = 0.007$), confirming the second hypothesis. This result highlights the importance of effective accounting information systems in enhancing managerial performance.

However, the effect of environmental uncertainty on management accounting information systems is not statistically significant ($\beta = 0.157$, $p = 0.225$). Therefore, the third hypothesis is not supported, suggesting that environmental uncertainty does not directly influence the effectiveness of management accounting information systems in the studied organizations.

Sobel Test

Table 6. Mediation Test Results

Path	Indirect Effect (axb)	Sobel Z	Sig.	Mediation Result
Environmental Uncertainty → MAIS → Managerial Performance	0,068	1,123	> 0,05	Not Significant

Source: Research data

Mediation analysis was conducted to examine whether management accounting information systems mediate the relationship between environmental uncertainty and managerial performance. The Sobel test was applied to assess the significance of the indirect effect. The results show that the indirect effect of environmental uncertainty on managerial performance through management accounting information systems is not statistically significant (Sobel $Z = 1.123$, $p > 0.05$). Therefore, management accounting information systems do not mediate the relationship between environmental uncertainty and managerial performance. This indicates that environmental uncertainty affects managerial performance primarily through a direct relationship rather than indirectly through management accounting information systems.

Discussion

The Effect of Environmental Uncertainty on Managerial Performance in State-Owned Defense Industry Enterprises

The findings indicate that environmental uncertainty influences managerial performance in state-owned defense industry enterprises. Dynamic external conditions, such as regulatory changes, technological developments, and market competition, require managers to respond quickly and adapt their strategies to maintain organizational performance.

In uncertain environments, managerial effectiveness depends on the ability to adjust planning, coordination, and control activities. Managers are required to interpret environmental changes accurately and make strategic decisions that support organizational goals. This condition highlights the importance of managerial adaptability in facing external pressures.

These results are consistent with contingency theory, which emphasizes that managerial performance is shaped by the fit between environmental conditions and organizational responses. Overall, the study suggests that environmental uncertainty encourages managers to enhance strategic flexibility and responsiveness, thereby contributing to improved managerial performance in the defense industry context.

The Effect of Environmental Uncertainty on Management Accounting Information Systems

The findings indicate that environmental uncertainty does not have a direct influence on the management accounting information systems in state-owned defense industry enterprises. This suggests that changes and unpredictability in the external environment do not automatically lead to adjustments or improvements in the design and implementation of these systems.

This result implies that the effectiveness of management accounting information systems is largely determined by internal organizational factors. Managerial commitment, clear policies, adequate resource allocation, and technological readiness play a more critical role in ensuring that the systems function effectively. Standardized procedures and stable organizational structures help maintain system consistency despite external uncertainty.

These findings are consistent with prior studies suggesting that environmental uncertainty does not necessarily drive changes in management accounting information systems. In highly regulated and capital-intensive sectors such as the defense industry, internal strategic decisions and long-term investments appear to be more influential in shaping the effectiveness of management accounting information systems than external environmental dynamics.

The Effect of Management Accounting Information Systems on Managerial Performance

The findings indicate that management accounting information systems play an important role in influencing managerial performance in state-owned defense industry enterprises. Effective use of these systems supports managers in planning, coordinating, and controlling organizational activities, particularly in complex and dynamic operational environments.

The results suggest that the quality of management accounting information—such as relevance, timeliness, and integration enhances managerial decision-making and operational effectiveness. When managers are supported by reliable and comprehensive information

systems, they are better able to allocate resources, manage risks, and respond to organizational challenges.

These findings are consistent with previous studies emphasizing the importance of management accounting information systems in improving managerial performance. In the context of the defense industry, where operations are highly regulated and strategically sensitive, effective accounting information systems serve as a critical tool for supporting managerial responsibilities and achieving organizational objectives.

The Effect of Environmental Uncertainty on Managerial Performance through Management Accounting Information Systems

The findings indicate that management accounting information systems do not act as a significant mediator in the relationship between environmental uncertainty and managerial performance in state-owned defense industry enterprises. This suggests that environmental uncertainty does not indirectly influence managerial performance through changes in management accounting information systems.

This outcome implies that the effectiveness of management accounting information systems is primarily determined by internal organizational factors, such as managerial policies, technological readiness, and human resource capabilities. Well-established systems tend to remain stable despite external uncertainty, thereby limiting their role as a channel through which environmental changes affect managerial performance.

These findings support previous studies suggesting that in highly regulated and uncertain environments, managerial performance is more strongly influenced by leadership quality, adaptability, and strategic decision-making than by accounting information systems alone. Although management accounting information systems remain important as decision-support tools, they are not the primary mechanism linking environmental uncertainty to managerial performance in this context.

CONCLUSION

This study concludes that environmental uncertainty and management accounting information systems (MAIS) are important factors influencing managerial performance in Indonesian defense industry state-owned enterprises. The findings indicate that environmental uncertainty directly affects managerial performance, as managers' ability to plan, control, and make decisions is shaped by unstable external conditions, while MAIS contributes positively by providing structured, timely, and relevant information to support managerial functions. However, MAIS does not mediate the relationship between environmental uncertainty and managerial performance, suggesting that its effectiveness depends more on internal organizational readiness than on external pressures. From an industrial engineering and management perspective, the study highlights the role of information systems as operational support tools rather than adaptive mediators, emphasizing the need to strengthen internal system design, managerial competencies, and organizational processes to sustain performance in complex and highly regulated environments. Future research is recommended to explore additional mediating or moderating variables—such as organizational culture, leadership style, or technological capability—and to expand the study across different industries or organizational contexts to enhance generalizability.

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