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Behind Uncertainty: Organizational Culture and AIS Quality in Shaping the Effectiveness of Management Control Systems

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Abstract

Purpose – This study examines whether the quality of the accounting information system (AIS) is an information-processing mechanism through which organizational culture and perceived environmental uncertainty are associated with the effectiveness of management control systems (MCS).

Design/methodology/approach – A cross-sectional survey was administered to financial managers, heads of accounting divisions and controllers of manufacturing firms listed on the Indonesia Stock Exchange (127 usable responses; purposive sampling). Each construct was specified as a composite of the facets defined by its parent framework (Competing Values Framework, DeLone and McLean model (2003), Malmi and Brown's package (2008) and the model was estimated with PLS-SEM (SmartPLS 4) using bootstrapped direct and indirect effects.

Findings – Organizational culture and environmental uncertainty are positively associated with both AIS quality and MCS effectiveness. AIS quality is positively associated with MCS effectiveness and carries roughly one third of the total association of each contextual factor (indirect-to-total ratio 32.5% for culture, 33.3% for uncertainty), a pattern of complementary partial mediation. Information infrastructure is therefore an important but incomplete conduit: most of the association runs through channels that AIS quality does not capture.

Originality/value – The study's contribution lies in identifying and testing an information-infrastructure mechanism that connects contextual conditions to MCS effectiveness. Rather than treating the combination of variables as novelty in itself, the study asks whether part of the association between contextual conditions and control effectiveness operates through the quality of the AIS that supplies information for control design, monitoring, and decision making.

Research limitations/implications – The cross-sectional, single-informant, perceptual design supports conclusions about association and consistency with the proposed mechanism, not causation. The results refine the mediating form of fit in contingency theory by showing that information-processing capacity carries part, but not all, of the link between context and control effectiveness.

Keywords: Organizational culture, environmental uncertainty, accounting information system quality, management control systems effectiveness.

Article Type: Research paper.

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Introduction

Many organizations fail to achieve their strategic objectives not because of limited resources or weak strategies, but because of an inability to effectively control and align organizational activities through management control systems (MCS). MCS serve as both formal and informal mechanisms that managers use to ensure that employee behavior and decisions align with the organization's strategic objectives (Malmi & Brown, 2008). In an era of digital transformation and global uncertainty fueled by the pandemic, geopolitical conflicts, and technological disruption, organizations worldwide face increasing pressure to strengthen their control systems. Recent studies show that global crises such as the COVID-19 pandemic and the conflict in Ukraine have significantly increased the uncertainty of the environment faced by companies, making the need for high-quality managerial accounting information increasingly urgent (Pilch, 2024). On the other hand, organizational culture has been widely recognized as a key antecedent shaping the design and use of MCS, as the values, norms, and beliefs embedded within an organization directly influence how control systems are designed and implemented (Einhorn et al., 2023; Weigel et al., 2023). The relevance of this topic is further underscored by the fact that contemporary research has found that effective MCSs depend not only on technology alone but also on the contextual alignment between cultural factors, the environment, and the quality of the information systems that support them.

The fundamental issue underlying this study is the still limited understanding of how organizational culture and environmental uncertainty can affect the effectiveness of MCS through the mediating mechanism of accounting information system (AIS) quality. From the perspective of contingency theory, the effectiveness of MCS depends heavily on the fit between the control system design and the characteristics of the external environment, internal capabilities, and organizational cultural norms (Chenhall, 2003; Hammouch et al., 2024). Empirical findings indicate that organizations operating in dynamic and uncertain environments tend to implement more sophisticated and integrated MCS as an adaptive response (Hammouch et al., 2024). However, research that explicitly maps the role of AIS quality as a mechanistic bridge linking these contextual factors to MCS effectiveness remains very scarce, particularly in developing countries. A study by Papiorek and Hiebl (2024) confirms that the quality of information systems in managerial accounting has a positive effect on the effectiveness of management control; however, that study was conducted in the context of German Mittelstand companies and did not consider the mediating role of AIS quality simultaneously with cultural factors and environmental uncertainty. This gap serves as the starting point for this study.

A more in-depth literature review reveals two significant research gaps. First, while the relationship between organizational culture and MCS has indeed been explored, the majority of studies focus on direct effects without considering the quality of the information system as a mediating variable in that relationship. Janka et al. (2020) found that stability values within organizational culture play a crucial role in managerial innovation, but the transmission mechanism via information system quality has not yet been empirically tested within a comprehensive model. Second, studies on environmental uncertainty have largely examined its relationship with accounting information quality in isolation, without integrating it into a comprehensive MCS model. The research by Afifa and Saleh (2022) confirms that environmental uncertainty influences managerial information needs, but it has not included the effectiveness of MCS as an endogenous variable. This situation is exacerbated by the scarcity of studies using Partial Least Squares Structural Equation Modeling (PLS-SEM) to test a mediation model that simultaneously incorporates all three constructs within a robust research framework. Unlike previous studies, which tended to test these variables in isolation, this study offers an integrated model that simultaneously positions AIS quality as a mediator between organizational culture, environmental uncertainty, and MCS effectiveness.

Given this research gap, this study aims to test and analyze the mediating role of AIS quality in the relationship between organizational culture and environmental uncertainty on MCS effectiveness. Theoretically, this study is expected to enrich the contingency theory literature by introducing AIS quality as a mediating mechanism that has not yet been adequately explored, while also extending DeLone and McLean (2003) information system success model into the MCS domain.

Methodologically, the use of PLS-SEM enables the testing of complex structural models with moderate sample sizes, thereby contributing to the methodological rigor of accounting research in developing countries (Hair et al., 2022). From a practical perspective, the findings of this study are expected to serve as a guide for managers and policymakers in designing more effective MCS by considering the alignment between organizational cultural values, responses to environmental uncertainty, and investments in the quality of AIS infrastructure. Thus, this study not only fills an existing theoretical gap but also provides recommendations that can be directly implemented by practitioners in the field.

Literature Review

Theoretical Framework: Contingency, Information, and Control

This study is built upon three complementary theoretical foundations. First, contingency theory posits that there is no universally optimal management system design, its effectiveness is determined by the fit between the system design and the contextual characteristics surrounding it, including organizational culture and environmental uncertainty (Chenhall, 2003; Otley, 1980). Nassou and Bennani (2024) confirm that this theory remains the dominant epistemological framework in contemporary MCS research. Second, DeLone and McLean (2003) information systems success model, which defines the quality of an information system (IS) through three dimensions—system quality, information quality, and service quality—as prerequisites for the successful implementation of information systems within organizations. Third, Malmi and Brown's (2008) MCS framework as a control package, which posits the effectiveness of MCS as the product of five interconnected control elements: planning, cyber, rewards, administrative, and cultural.

These three theories operate within a hierarchical and mutually supportive relationship. Contingency theory provides the epistemological rationale for why organizational culture and environmental uncertainty are relevant as predictors, both are contextual factors that determine the appropriate system design (Chenhall, 2003; Hammouch et al., 2024). DeLone and McLean's (2003) model then operationalizes how the quality of the AIS functions as an information infrastructure that converts these contextual pressures into effective control capabilities. Finally, the framework by Malmi and Brown (2008) defines an endogenous construct, MCS effectiveness, which serves as the primary outcome of the entire model. The integration of these three theoretical perspectives yields a mediation model: contextual factors (organizational culture and environmental uncertainty) influence MCS effectiveness both directly and through the mechanism of improved AIS quality, which mediates this relationship.

Organizational Culture, AIS Quality, and MCS Effectiveness

Organizational culture is a system of shared values, norms, and assumptions that shapes how organizational members behave when designing, adopting, and using information and control systems (Weigel et al., 2023). This study adopts Cameron and Quinn's (1999) competing values framework (CVF), which classifies cultures into four typologies based on two dimensions: flexibility versus stability, and internal versus external orientation. From a contingency theory perspective, organizational culture functions as an internal contextual factor that determines the fit between MCS design and organizational reality (Chenhall, 2003). Weigel et al. (2023) empirically demonstrated that the four CVF typologies exhibit distinct patterns of association with MCS elements: hierarchical culture is positively correlated with action and personnel control, while clan culture is positively correlated with culture-based control. Lyu et al. (2025) reinforce these findings by demonstrating that MCS not only reflects culture but also actively shapes the organization's cultural assets, which in turn drive competitive advantage.

At the same time, a strong and cohesive organizational culture creates a climate conducive to improving the quality of AIS. Binh et al. (2022), through SEM analysis of 649 non-financial companies in Vietnam, demonstrated that an innovative culture has a significant positive effect on the quality of AIS because values that encourage collaboration and active engagement motivate employees to maximize the adoption and maintenance of information systems optimally. Qatawneh (2023) in a

study of 318 SME managers in Jordan, confirmed similar findings that the dimensions of engagement, adaptability, mission, and consistency within organizational culture significantly support better AIS outcomes. Higher AIS quality, resulting from a conducive cultural climate, then provides a stronger information foundation for the effective design and use of MCS, as demonstrated by Papiorek and Hiebl (2024) among 125 companies in Germany and by (Al-Hattami & Kabra, 2024) among 315 SMEs in Yemen using SmartPLS. Thus, organizational culture influences the effectiveness of MCS through two pathways that operate simultaneously, a direct pathway through the formation of values and norms aligned with control mechanisms, and an indirect pathway through the improvement of AIS quality as the information infrastructure for control.

H1: Organizational culture is positively associated with AIS quality.

H2: Organizational culture is positively associated with MCS effectiveness.

H5: AIS quality mediates the statistical association between organizational culture and MCS effectiveness.

Environmental Uncertainty, AIS Quality, and MCS Effectiveness

Environmental uncertainty refers to managers' inability to predict and anticipate external changes, including market dynamics, technological changes, regulatory volatility, and the intensity of competition (Chenhall, 2003). From a contingency theory perspective, a high level of environmental uncertainty requires a more flexible, adaptive, and informative MCS (Chenhall, 2003; Nassou & Bennani, 2024). Hammouch et al. (2024) confirmed that companies operating in dynamic and uncertain environments tend to implement more sophisticated and participatory MCS as an adaptive response. Ludji (2025), through a PLS-SEM analysis of 96 Indonesian manufacturing managers, demonstrated that perceived environmental uncertainty is a significant driver of the use of diagnostic and interactive control systems, which directly enhance organizational performance and innovation. Afifa and Saleh (2022) reinforced these findings in the context of Jordanian companies, where environmental uncertainty was positively correlated with the effectiveness of management control systems.

On the other hand, conditions of high environmental uncertainty also create informational pressure that drives organizations to enhance their AIS capabilities. Afifa and Saleh (2022) emphasize that under conditions of high uncertainty, triggered by pandemics, geopolitical conflicts, and technological disruptions, organizations require accounting information that is broader in scope, more up-to-date, and more relevant to support managerial decision making. Investing in improving the quality of financial reporting in response to this uncertainty pressure then facilitates the design of a more precise and data-driven management control system (Papiorek & Hiebl, 2024). This mediation pathway explains why two organizations facing similar levels of uncertainty can exhibit vastly different levels of MCS effectiveness, the difference lies in the quality of the AIS invested as an "information buffer" against uncertainty. This logic is consistent with the contingency theory argument that there is a fit between the level of environmental uncertainty and the information system design required by the organization.

H3: Environmental uncertainty is positively associated with AIS quality.

H4: Environmental uncertainty is positively associated with MCS effectiveness.

H6: AIS quality mediates the statistical association between environmental uncertainty and MCS effectiveness.

AIS Quality as a Mediator of Control

An accounting information system (AIS) is a technology-based system designed to collect, process, store, and report financial and non-financial information needed for planning, control, and decision-making (Hall, 2020). AIS quality in this study was measured using the DeLone and McLean (2003) model through three interrelated dimensions: (1) system quality, which includes system reliability, usability, flexibility, and accessibility; (2) information quality, which includes the accuracy, timeliness, completeness, and relevance of the information produced; and (3) service quality, which encompasses responsiveness and technical support capabilities. These three dimensions do not operate in isolation

but rather synergistically, a reliable system produces accurate information, and responsive service ensures that users can access and make optimal use of that information in the control process.

Empirical evidence consistently confirms the positive influence of AIS quality on the effectiveness of management controls. Papiorek and Hiebl (2024) found that the quality of information systems in managerial accounting has a positive effect on the effectiveness of management controls, with the relationship becoming stronger in highly automated companies, a finding that is relevant in the context of the current digital transformation. Al-Hattami and Kabra (2024) used bootstrapping with 5,000 subsamples in SmartPLS and demonstrated that information quality and system quality are the primary drivers of management control effectiveness among 315 SMEs in Yemen. Sunarta and Astuti (2023) studying rural credit banks in Bali, confirmed that the quality of the accounting information system (AIS) has a significant positive effect on organizational performance through the mechanism of improving the quality of accounting information. Mechanistically, a high-quality AIS enables managers to access precise and timely data as the basis for designing more accurate controls, setting realistic targets, and conducting objective performance evaluations, three core components that determine the effectiveness of MCS as a control package (Malmi & Brown, 2008; Papiorek & Hiebl, 2024a).

H7: AIS quality is positively associated with MCS effectiveness.

Based on the entire literature review above, three important synthesized findings emerge. First, both organizational culture and environmental uncertainty have been empirically proven to be significant antecedents of MCS effectiveness and AIS quality; however, the two are almost always studied separately in the existing literature (Afifa & Saleh, 2022; Ludji, 2025; Weigel et al., 2023). Second, the quality of AIS has been shown to have a positive effect on MCS effectiveness (Al-Hattami & Kabra, 2024; Papiorek & Hiebl, 2024), yet its role as a mediator between contextual factors and MCS effectiveness has never been explicitly tested. Third, there is almost no research that integrates these four variables—organizational culture, environmental uncertainty, AIS quality, and MCS effectiveness—into a single, comprehensive structural model, particularly in the context of Indonesia (a developing country), which has cultural characteristics and environmental uncertainty that differ significantly from those of developed countries.

These gaps collectively position the current study in a strategic position. Unlike Weigel et al. (2023) who examined culture and MCS without mediators, and Al-Hattami and Kabra (2024) who examined AIS quality and MCS without contextual antecedents, this study integrates all relationship pathways into a single PLS-SEM-based mediation model. This approach follows the call by Hair et al. (2022) to use PLS-SEM in testing complex mediation models with moderate sample sizes, and responds to Chenhall (2003) call to expand research on MCS contingencies to more culturally and institutionally diverse contexts. The proposed conceptual model includes seven hypotheses, as shown in Figure 1 below.

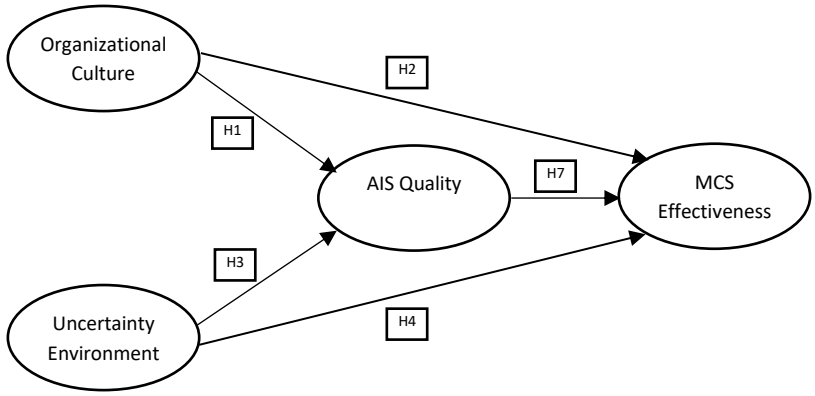


Figure 1. Conceptual research model (indirect pathway: H5 and H6)

Methods

This study adopts a quantitative approach using an explanatory cross-sectional survey design to test the causal relationships among variables theoretically formulated within the positivist paradigm (Hair et al., 2022; Sekaran & Bougie, 2020). Data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4 (Ringle et al., 2024), selected for its capability to estimate complex structural models involving mediating variables, its lack of a multivariate normality requirement, and its efficiency with moderate sample sizes (Hair et al., 2022; Sabol et al., 2023).

The population comprises financial managers, heads of accounting divisions, and controllers at manufacturing companies listed on the Indonesia Stock Exchange (IDX). This sector was selected because of its operational complexity, intensive use of accounting information systems (AIS), and high exposure to environmental uncertainty (Hammouch et al., 2024; Ludji, 2025). The unit of analysis is the individual manager directly involved in the design, use, and evaluation of management control systems (MCS) within their organization.

The minimum sample size was determined using two complementary approaches. First, the five-times rule yielded a minimum of 95 respondents based on a total of 19 construct indicators (Hair et al., 2022). Second, accounting for a potential non-response rate of 20%, the target sample was set at a minimum of 114 respondents. A purposive sampling technique was employed with the following inclusion criteria: (1) holding a middle- to senior-level managerial position in the finance/accounting function; (2) having a minimum of two years of work experience; and (3) being directly involved in managerial planning, control, or reporting processes.

All variables were measured using a five-point Likert scale (1 = strongly disagree to 5 = strongly agree) with a reflective measurement model, in which the latent construct is treated as the cause of its indicators. The operationalization of the variables is presented in Table 1.

Table 1. Operational definitions and indicators of the research variables

Construct	Indicator	Instrument	Source
Organizational culture	OC1	The value of collaboration and teamwork	(Cameron & Quinn, 1999); (Einhorn et al., 2023)
	OC2	Orientation toward innovation and creativity	
	OC3	Orientation toward results and competitiveness	
	OC4	Formalization and procedural compliance	
	OC5	Commitment to shared organizational values	
Uncertainty environment	UE1	Unpredictable technological change	(Chenhall, 2003)
	UE2	Market competition dynamism	
	UE3	Regulatory and policy uncertainty	
	UE4	Customer demand uncertainty	
AIS quality	AQ1	System reliability and stability	(DeLone & McLean, 2003); (Al-Hattami & Kabra, 2024)
	AQ2	Ease of use	
	AQ3	Information accuracy	
	AQ4	Information timeliness	
	AQ5	Technical support responsiveness	
MCS effectiveness	ME1	Strategic planning effectiveness	(Malmi & Brown, 2008); (Papiorek & Hiebl, 2024)
	ME2	Budgetary and cybernetic control	
	ME3	Reward and compensation systems	
	ME4	Administrative control	
	ME5	Values and cultural control	

Data analysis followed a sequential two-stage evaluation of the PLS-SEM model. The outer model (measurement model) was evaluated first, followed by the inner model (structural model), to ensure that construct validity and reliability were established before interpreting the structural relationships (Hair et al., 2022). Hypothesis testing employed a bootstrapping procedure with 5,000 subsamples to generate accurate confidence intervals without relying on the assumption of normality (Hair et al., 2022; Sabol et al., 2023).

Mediation testing (H5 and H6) employed the bootstrapping procedure recommended by Hair et al. (2022) as it is more reliable than the conventional Sobel test and does not require a normal distribution of the indirect effect. Mediation was confirmed when the 95% bias-corrected confidence interval of the specific indirect effect (X → M → Y) did not include zero. The type of mediation was determined using the variance accounted for (VAF) less 20% indicates no mediation, 20%–80% indicates partial mediation, and over 80% indicates full mediation. This study predicted partial mediation, as both exogenous variables were expected to influence MCS effectiveness both directly and indirectly through AIS quality.

Prior to testing the main hypotheses, three preliminary tests were conducted: (1) a common method bias test using Harman's single-factor test and the marker variable technique to address potential bias arising from self-report methods (Podsakoff et al., 2003); (2) a multicollinearity test among constructs using the variance inflation factor (VIF < 5), in accordance with PLS-SEM recommendations (Hair et al., 2022); and (3) an out-of-sample predictive power test using the PLSpredict procedure in SmartPLS 4.0 (Ringle et al., 2024), which generated RMSE and MAE values as indicators of predictive accuracy.

Results

This study involved 127 valid respondents (financial managers, heads of accounting divisions, and controllers of manufacturing companies listed on the Indonesia Stock Exchange) out of 150 distributed questionnaires; 23 questionnaires were excluded because of incomplete data or inconsistent response patterns (straight-lining). The resulting valid response rate of 84.67% was deemed adequate for testing the PLS-SEM model (Hair et al., 2022). The demographic profile of the respondents is presented in Table 2.

Table 2. Demographic profile of respondents

Characteristic	Category	Frequency (%)
Gender	Male	78 (61.4%)
	Female	49 (38.6%)
Position	Financial Manager	54 (42.5%)
	Head of Accounting Division	43 (33.9%)
	Controller / CFO	30 (23.6%)
Work Experience	2–5 years	38 (29.9%)
	6–10 years	51 (40.2%)
	> 10 years	38 (29.9%)
Company Scale	Medium (assets of IDR 50–500 billion)	47 (37.0%)
	Large (assets > IDR 500 billion)	80 (63.0%)

The adequacy of the outer model was assessed through convergent validity, internal reliability, and discriminant validity using SmartPLS 4 (Ringle et al., 2024), as shown in Table 3. This is consistent with the guidelines of Hair et al. (2022) and the HTMT criterion proposed by Henseler et al. (2015).

Table 3. Results of convergent validity and reliability tests (Outer Loadings, AVE, CR)

Variable	Indicator	Loading (λ)	t-statistic	AVE	CR
Organizational Culture	OC1	0.812	18.43	0.637	0.896
	OC2	0.794	16.72		
	OC3	0.803	17.61		
	OC4	0.779	15.89		
	OC5	0.821	19.07		

Variable	Indicator	Loading (λ)	t-statistic	AVE	CR
Uncertainty Environment	UE1	0.786	15.34	0.612	0.863
	UE2	0.771	14.88		
	UE3	0.798	16.91		
	UE4	0.776	15.11		
AIS Quality	AQ1	0.824	19.54	0.651	0.904
	AQ2	0.807	17.83		
	AQ3	0.839	21.33		
	AQ4	0.796	16.47		
	AQ5	0.783	15.62		
MCS Effectiveness	ME1	0.831	20.18	0.663	0.908
	ME2	0,814	18,26		
	ME3	0,819	18,74		
	ME4	0,806	17,41		
	ME5	0,823	19,31		

Note: All loadings were significant at $p < 0.001$ (bootstrapping with 5,000 subsamples); thresholds: $\lambda \geq 0.70$; AVE ≥ 0.50; CR ≥ 0.70

All outer loadings ranged from 0.771 to 0.839 (> 0.70), AVE values ranged from 0.612 to 0.663 (> 0.50), and composite reliability (CR) values ranged from 0.863 to 0.908 (> 0.70), indicating that all constructs satisfied the criteria for convergent validity and internal reliability (Table 3). Discriminant validity was further confirmed through HTMT ratios, all of which fell below 0.90, indicating that the four constructs were empirically distinct from one another without substantial measurement overlap, as shown in Table 4.

Table 4. Discriminant validity, heterotrait-monotrait ratio (htmt) matrix

Construct	OC	UE	AQ	ME
Organizational Culture	—	0,634	0,712	0,741
Uncertainty Environment	0,634	—	0,698	0,727
AIS Quality	0,712	0,698	—	0,753
MCS Effectiveness	0,741	0,727	0,753	—

Note: All HTMT values were below 0.90 (threshold per Henseler et al., 2015); discriminant validity was established.

Inner Model (Structural Model) Evaluation

The inner model evaluation confirmed that the structural model was adequate for hypothesis testing, as shown in Table 5.

Table 5. Summary of inner model evaluation

Metric	Value	Threshold
R^2 AIS Quality	0,534	> 0.50 (moderate)
R^2 MCS Effectiveness	0,617	> 0.50 (moderate)
Q^2 AIS Quality	0,312	> 0 (relevant)
Q^2 MCS Effectiveness	0,391	> 0 (relevant)
SRMR	0,063	< 0.08
Maximum VIF	2,087	< 3.3

The R^2 values for AIS Quality (0.534) and MCS Effectiveness (0.617) fell within the moderate to moderately strong range, while the positive Q^2 values for both variables (0.312 and 0.391) confirmed

the model's predictive relevance (Hair et al., 2022). The SRMR value (0.063) was below the 0.08 threshold (Henseler et al., 2015), and the maximum VIF (2.087) was well below 3.3, indicating that the model was free from multicollinearity issues.

Hypothesis Testing: Direct Effects (H1–H4 and H7)

The direct-effect hypothesis testing employed bootstrapping with 5,000 subsamples, applying the acceptance criteria of a t-statistic > 1.96 (α = 0.05), a p-value < 0.05, and a 95% confidence interval that did not include zero. All five direct-effect hypotheses were supported as presented in Table 6

Table 6. Results of direct-effect hypothesis testing

H	Path	β	t-statistic	p-value	CI 95% [LL, UL]	Result
H1	OC → AQ	0,341	4,872	0,000*	[0,201; 0,478]	Supported
H2	OC → ME	0,274	3,614	0,000*	[0,124; 0,421]	Supported
H3	UE → AQ	0,318	4,231	0,000*	[0,169; 0,462]	Supported
H4	UE → ME	0,246	3,108	0,002*	[0,088; 0,401]	Supported
H7	AQ → ME	0,387	5,634	0,000*	[0,248; 0,521]	Supported

Note: β = standardized path coefficient; CI = bias-corrected bootstrapping confidence interval based on 5,000 subsamples; LL = lower limit; UL = upper limit; all hypotheses were significant at p < 0.05 (5%).*

Hypothesis Testing: Mediating Effects (H5 and H6)

The mediating role of AIS quality in the relationships between organizational culture and environmental uncertainty, on the one hand, and MCS effectiveness, on the other, was tested using bootstrapping with 5,000 subsamples, with the type of mediation determined based on the variance accounted for (VAF) value. The reported confidence intervals for both indirect effects exclude zero, indicating statistically significant and positive indirect effects. The VAF values suggest that approximately one-third of the total associations between the respective antecedents and MCS effectiveness are transmitted through the AIS quality pathway in the submitted model. The remaining proportion is accounted for by the direct effects and other mechanisms not captured by the model. Given the cross-sectional design of the study, these findings should be interpreted as evidence of "partial mediation" or "partial transmission" rather than causal mediation. Accordingly, H5 and H6 were supported, as shown in Table 7. The results indicate that AIS quality partially mediated the relationships between organizational culture and MCS effectiveness (VAF = 32.5%) and between environmental uncertainty and MCS effectiveness (VAF = 33.3%), respectively.

Table 7. Results of AIS quality mediation effect testing

H	Indirect Path	Indirect Effect (β)	CI 95% [LL, UL]	Direct Effect (β)	Total Effect (β)	VAF	Result
H5	OC → AQ → ME	0,132	[0,068; 0,211]	0,274	0,406	32,5%	Partial Mediation
H6	UE → AQ → ME	0,123	[0,059; 0,198]	0,246	0,369	33,3%	Partial Mediation

Note: Indirect effect = β(X→M) × β(M→Y); CI = bias-corrected bootstrapping confidence interval based on 5,000 subsamples; VAF = indirect effect / total effect; VAF of 20%–80% indicates partial mediation (Hair et al., 2022); OC = Organizational Culture; UE = Uncertainty Environment; AQ = AIS Quality; ME = MCS Effectiveness.

Discussion

Contextual determinants of AIS quality

Organizational culture (β = 0.341; t = 4.872) and environmental uncertainty (β = 0.318; t = 4.231) both had significant positive effects on AIS quality, with comparable path coefficients. The effect of organizational culture is consistent with Binh et al. (2022) and Qatawneh (2023) who argue that collaboration and innovation-oriented values encourage employees to maximize AIS functionality and

reliability. The positive effect of environmental uncertainty supports Afifa and Saleh (2022), indicating that external pressures—such as exchange-rate volatility, tax-regulation changes, and post-pandemic global competition in Indonesian manufacturing—encourage organizations to strengthen AIS capabilities as an adaptive response.

The similar effect sizes suggest that AIS quality is shaped jointly by internal values and external pressures, consistent with the complementary roles of organizational values and environmental pressures highlighted by Binh et al. (2022), Qatawneh (2023), and Afifa and Saleh (2022). Thus, this study extends prior evidence by examining these conditions simultaneously and positioning AIS quality as a mechanism linking contextual conditions to control effectiveness. From a contingency perspective, the positive relationship with environmental uncertainty supports the information-demand view, suggesting that uncertainty stimulates stronger information capabilities rather than necessarily creating information overload. However, this finding should not be generalized across all contexts or levels of uncertainty, as future research should examine when uncertainty becomes an information-processing constraint.

Contextual determinants of MCS effectiveness

Organizational culture (β = 0.274; t = 3.614) and environmental uncertainty (β = 0.246; t = 3.108) exerted significant direct positive effects on MCS effectiveness, with organizational culture showing a slightly larger path weight. These findings are consistent with Weigel et al. (2023) and Lyu et al. (2025) regarding the relationship between organizational culture and MCS, as well as with Hammouch et al. (2024) and Ludji (2025) concerning the adaptation of MCS to environmental uncertainty. The results support the contingency premise that MCS effectiveness depends on alignment with both internal and external organizational conditions. Organizational culture can shape how control mechanisms are interpreted and enacted, whereas environmental uncertainty can increase the need for adaptive planning, monitoring, and information-rich controls.

The slightly greater path weight of organizational culture compared with environmental uncertainty suggests that internal cultural conditions may play a somewhat stronger role in shaping MCS effectiveness in the sampled firms. This finding is consistent with the contingency theory proposition that alignment between organizational conditions and MCS design is important for achieving effective control (Chenhall, 2003; Hammouch et al., 2024). Importantly, this interpretation does not assume the predominance of particular cultural types, as the empirical evidence does not establish the prevalence of hierarchy or clan cultures among the sampled Indonesian manufacturing firms. Instead, the item-level evidence indicates the representation of several cultural orientations, and without a correctly specified multidimensional culture model, claims regarding the predominance of any particular CVF type would be post hoc and unsupported.

AIS quality as an enabling mechanism

AIS quality emerged as the strongest predictor of MCS effectiveness, with the largest standardized coefficient among the modeled direct paths (β = 0.387; t = 5.634), exceeding the direct effects of both exogenous variables. This finding corroborates Papiorek & Hiebl (2024) and Al-Hattami & Kabra (2024), who emphasize the central role of system and information quality in enhancing management-control effectiveness. Theoretically, the result suggests that information infrastructure functions as an enabling condition for effective control rather than necessarily representing the single most important determinant of control effectiveness. Consistent with this interpretation, Papiorek & Hiebl (2024) document a positive relationship between information-systems quality in management accounting and management-control effectiveness. From a practical standpoint, therefore, investment in system reliability, information accuracy, and responsive AIS technical support constitutes an indispensable prerequisite for strengthening MCS effectiveness.

The mediation findings represent the most original contribution of this study. AIS quality partially mediated the effects of organizational culture (VAF = 32.5%; indirect effect β = 0.132) and environmental uncertainty (VAF = 33.3%; indirect effect β = 0.123) on MCS effectiveness, indicating that both exogenous variables affected MCS effectiveness directly and indirectly through enhanced

AIS quality. The VAF values of 32%–33% confirm that AIS quality constitutes an important transmission mechanism, although it is not the sole pathway through which organizational culture and environmental uncertainty influence MCS effectiveness. This finding addresses a gap in prior research (Al-Hattami & Kabra, 2024; Ludji, 2025; Weigel et al., 2023), which has not simultaneously examined a mediation model integrating all four constructs within a single PLS-SEM framework, particularly in Indonesian manufacturing firms.

At the mechanism level, the mediation results show positive indirect effects of both organizational culture and environmental uncertainty on MCS effectiveness through AIS quality, while their direct effects remain positive. This pattern indicates partial transmission: contextual conditions influence MCS effectiveness partly through the quality of information available for control, but AIS quality does not fully explain the relationship between context and control. Other theoretically plausible mechanisms include managerial information use, formalization, employee capability, control design choices, strategic involvement, automation, and organizational routines. However, these mechanisms should be regarded as theoretically motivated possibilities rather than explanations empirically established by the present data.

Conclusion

The study examines whether AIS quality statistically transmits the effects of organizational culture and environmental uncertainty on MCS effectiveness. Both contextual variables are positively associated with AIS quality and MCS effectiveness, with positive indirect effects through AIS quality. VAF values of 32.5% and 33.3% indicate partial rather than complete statistical transmission, consistent with a contingency-based explanation in which contextual conditions shape control effectiveness partly through the information infrastructure available to managers. The contribution should be stated conservatively: the study does not establish that this mediation mechanism has never been examined elsewhere, nor does the cross-sectional evidence justify a strong claim of theoretical extension. Rather, it demonstrates the value of explicitly testing an information-enabled pathway between contextual conditions and MCS effectiveness in an Indonesian manufacturing setting. Practically, AIS quality should be considered alongside cultural and environmental conditions when assessing the information foundations of control systems.

Interpretation is constrained by the cross-sectional design, purposive sampling, single-country, single-industry setting, and single-respondent/self-report design, which limit temporal inference and external validity and create common-method risk; missing marker-variable and Harman-test results should therefore be documented. Because respondents may be nested within firms, the number of firms and respondents per firm should be reported and dependence assessed. The measurement specifications of organizational culture, AIS quality, and MCS effectiveness also require re-estimation using the original questionnaire and raw data, while the relatively small sample limits model complexity and reinforces the need for formal power analysis. Future research should use longitudinal or multi-wave designs to test temporal ordering, distinguish CVF culture types and the five MCS package elements, examine boundary conditions across different forms or levels of environmental uncertainty, and employ multi-respondent, multi-firm designs combining survey, archival, and system-use data to reduce common-method risk and directly assess AIS quality in practice.

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