

BLOCKCHAIN TECHNOLOGY AND SUSTAINABLE PERFORMANCE: THE ROLE OF MANAGEMENT ACCOUNTING SYSTEMS AND DIGITAL TRANSFORMATION IN ASEAN-6

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ABSTRAK

Meskipun adopsi teknologi blockchain dalam organisasi semakin meningkat, bukti empiris yang menjelaskan bagaimana teknologi ini berkontribusi terhadap kinerja keberlanjutan masih terbatas, khususnya di negara berkembang. Penelitian ini bertujuan menganalisis mekanisme organisasi melalui teknologi blockchain dalam memengaruhi kinerja keberlanjutan dengan menguji peran mediasi sistem akuntansi manajemen serta peran moderasi transformasi digital pada perusahaan di kawasan ASEAN-6. Data dikumpulkan dari 230 profesional manajerial dan akuntansi pada perusahaan dengan intensitas digital tinggi di enam negara ASEAN melalui kuesioner terstruktur. Hipotesis penelitian diuji menggunakan partial least squares structural equation modeling (PLS-SEM) dengan analisis mediasi dan moderasi. Hasil penelitian menunjukkan bahwa teknologi blockchain berpengaruh signifikan terhadap kinerja keberlanjutan melalui sistem akuntansi manajemen, yang menunjukkan adanya efek mediasi parsial yang signifikan. Namun demikian, transformasi digital tidak secara signifikan memoderasi hubungan antara sistem akuntansi manajemen dan kinerja keberlanjutan. Temuan ini memberikan kontribusi pada literatur dengan memvalidasi kerangka moderated mediation yang menghubungkan teknologi blockchain, sistem akuntansi manajemen, dan kinerja keberlanjutan dalam konteks multi-negara ASEAN. Secara praktis, hasil penelitian ini menunjukkan bahwa organisasi perlu memperkuat sistem akuntansi manajemen untuk memaksimalkan pemanfaatan data yang dihasilkan oleh teknologi blockchain dalam pengambilan keputusan yang berorientasi pada keberlanjutan.

Kata Kunci: teknologi blockchain, transformasi digital, sistem akuntansi manajemen, kinerja keberlanjutan

ABSTRACT

Despite the increasing adoption of blockchain technology in organizations, empirical research elucidating the role of blockchain technology in enhancing sustainable performance is currently scant, especially within the context of emerging economies. This investigation seeks to analyze the structural frameworks through which blockchain technology impacts sustainable performance will be analyzed by exploring the mediating function of management accounting systems alongside the moderating influence of digital transformation in ASEAN-6 firms. Data were collected from 230 managerial and accounting professionals in digital-intensive

firms across six ASEAN countries using a structured questionnaire. The proposed hypotheses were tested using partial least squares structural equation modeling (PLS-SEM) with mediation and moderation analysis. The results show that blockchain technology significantly enhances sustainable performance through management accounting systems, indicating a significant partial mediation effect. However, digital transformation does not substantially influence the correlation between management accounting systems and sustainable performance. These findings contribute to the literature by validating a moderated mediation framework linking blockchain technology, management accounting frameworks, and sustainable organizational performance in a multi-country ASEAN context. Practically, the results suggest that organizations should complement blockchain adoption with strong management accounting systems to effectively leverage blockchain-generated information for sustainability-oriented decision-making.

Keywords: blockchain technology, digital transformation, management accounting systems, sustainable performance

1. Introduction

The swift progression of digital technologies has profoundly altered how organizations design internal systems to enhance competitiveness and achieve long-term sustainability. Among these technological advancements, blockchain technology has surfaced as a revolutionary innovation owing to its capacity to enhance transparency, traceability, data integrity, and trust within both organizational and inter-organizational processes (Prasadhita, 2023; Salehi & Khodabandeh Oghaz, 2025). These characteristics have made blockchain increasingly relevant for organizations seeking to improve accountability and sustainability performance in complex business environments.

Despite these technological advantages, the correlation between the implementation of blockchain technology and the attainment of sustainable performance metrics remains insufficiently understood. Existing studies largely highlight the capability of blockchain technology to augment operational efficacy and information reliability, yet empirical evidence explaining the organizational mechanisms through which blockchain-enabled information contributes to sustainable performance that encompasses the economic, environmental, and social dimensions remains limited and fragmented (Jena, 2024; Ponte & Bednárová, 2019). Understanding these mechanisms is theoretically important because digital technologies rarely generate performance improvements independently; rather, their value depends on the methodologies employed by organizations to amalgamate technological resources with intrinsic capabilities and managerial frameworks.

Much of the existing literature examining blockchain and organizational performance treats blockchain technology as a standalone technological artifact. From this perspective, blockchain adoption is often assumed to automatically generate performance benefits. However, such a view overlooks the internal organizational mechanisms required to transform blockchain-enabled information into meaningful managerial insights (Jena, 2024). Consequently, the causal pathway linking blockchain adoption to sustainability outcomes remains underexplored.

Recent studies have begun to acknowledge the importance of internal systems that promote the incorporation of digital technologies within managerial decision-making

frameworks. Nevertheless, empirical research examining the internal pathways through which blockchain-enabled information contributes to sustainable performance remains scarce. In particular, the role of management accounting systems (MAS) as an information-processing mechanism capable of converting blockchain-generated data into sustainability-oriented managerial decisions has received limited empirical attention (Pizzi et al., 2022).

Furthermore, existing empirical evidence remains largely confined to single-country contexts. Such limitations raise concerns regarding the external validity and generalizability of prior findings, particularly in regions characterized by substantial variation in digital maturity, institutional environments, and technological infrastructure. As a result, it remains unclear whether the proposed relationships between blockchain technology, management accounting systems, digital transformation, and sustainable performance are integral components of contemporary organizational strategy remain valid across heterogeneous institutional contexts.

Utilizing the resource-based view (RBV), blockchain technology may be conceptualized as a pivotal strategic organizational asset that enhances competitive advantage when effectively combined with complementary capabilities. From this perspective, the performance benefits of blockchain are unlikely to emerge solely from technological the process of adoption, however, is contingent upon the organization's capacity to effectively utilize its resources blockchain-generated information through internal systems and managerial processes.

In this context, management accounting systems represent a critical organizational capability that enables firms to process, interpret, and utilize information for planning, control, and performance evaluation. MAS can therefore function as an information-integration mechanism that translates blockchain-enabled data into actionable managerial insights. By integrating high-quality data generated by blockchain technologies into managerial planning and performance evaluation processes, MAS enables organizations to convert technological transparency into measurable sustainability outcomes.

However, the effectiveness of this mechanism may depend on the firm's broader digital transformation capability. From a dynamic capability perspective, digital transformation reflects the capacity of an organization to assimilate digital technologies within its business processes, structural frameworks, and decision-making protocols is of paramount importance. Consequently, organizations exhibiting advanced degrees of digital transformation are more adept at leveraging blockchain-derived data, thereby enhancing the efficacy of management accounting systems in facilitating decision-making that prioritizes sustainability.

Recent empirical work by (Nguyen et al., 2025) proposes a moderated mediation framework in which management accounting systems serve as intermediaries in the interplay between blockchain technology and sustainable performance metrics, while digital transformation strengthens the effectiveness of this mechanism. While this framework offers valuable insights into technology-enabled value creation, empirical evidence supporting this model remains limited to a single-country context.

Addressing these limitations, the present study extends the moderated mediation framework developed by (Nguyen et al., 2025) to the ASEAN-6 economies, namely Indonesia, Malaysia, Thailand, the Philippines, Singapore, and Vietnam. These countries

exhibit substantial variation in digital infrastructure, regulatory environments, and organizational capabilities, while simultaneously sharing regional commitments to digital transformation and sustainable development (Rogerson & Parry, 2020).

By employing the same theoretical framework, variables, and analytical methodology, this study conducts a contextual replication in a multi-country setting. Beyond simple replication, this study provides a more rigorous test of the proposed moderated mediation mechanism across heterogeneous institutional environments characterized by varying levels of digital maturity and regulatory development (Park & Li, 2021).

This study makes three main contributions. First, it advances blockchain and accounting research by empirically validating the internal accounting mechanisms linking blockchain technology to sustainable performance across diverse national contexts (Dyball & Seethamraju, 2025). Second, through the analysis of the contingent function of digital transformation in a multi-country environment, the study deepens theoretical understanding of how organizational capabilities shape technology-driven value creation (Baig & Yadegaridehkordi, 2024). Third, by focusing on the ASEAN-6 region, the study provides novel regional insights that enhance the external validity of prior research and provide substantial insights for administrators and legislative authorities endeavoring to promote blockchain-enabled sustainability initiatives in emerging and transitional economies (Cricelli et al., 2025).

2. Theoretical Framework dan Hypothesis Development

This study is situated within three synergistic theoretical frameworks: the resource-based view (RBV), the capability-based theory, and the dynamic capability perspective. The integration of these theoretical perspectives is necessary because each explains a different stage of the value creation process linking digital technologies to organizational performance. The RBV explains how technological resources such as blockchain create potential strategic value, capability-based theory explains how internal organizational systems convert these resources into actionable managerial capabilities, and the dynamic capability perspective explains why the effectiveness of these capabilities may vary depending on an organization's digital transformation maturity.

From the resource-based view (RBV) posits that competitive advantage emerges from the ownership and strategic utilization of resources that are valuable, rare, inimitable, and non-substitutable (Alazab et al., 2020; Rejeb et al., 2019). In this framework, blockchain technology may be perceived as a strategic technological resource characterized by immutability, transparency, traceability, and decentralized verification. These features significantly enhance the quality, reliability, and security of organizational data (Bui & Fowler, 2019). However, the RBV emphasizes that the value of technological resources is realized only when organizations possess complementary capabilities capable of interpreting and utilizing these resources effectively. Therefore, blockchain technology alone is unlikely to generate sustainable performance advantages without supportive internal systems (Bodkhe et al., 2020).

From a capability-based perspective, management accounting systems (MAS) represent a critical organizational capability that enables firms to transform raw data into structured information for planning, control, and performance evaluation (Shah et al.,

2023). In technology-intensive environments, The Multi-Agent System (MAS) assumes an essential function in the amalgamation of extensive, real-time data streams into structured analytical frameworks. Consequently, MAS functions as the organizational mechanism that converts blockchain-generated transparency and traceability into actionable managerial insights that support sustainability-oriented decision-making (Polas et al., 2025).

The dynamic capability perspective elucidates the rationale behind the potential variability in the efficacy of this mechanism among different firms. Dynamic capabilities pertain to an organization's competency to sense technological opportunities, seize them through strategic actions, and reconfigure internal processes accordingly (Chandan et al., 2023). Digital transformation represents such a dynamic capability because it reflects the extent to which organizations integrate digital technologies into their operational processes, managerial routines, and decision-making structures (Liang et al., 2024). Firms with higher levels of digital transformation are therefore better positioned to adapt their accounting systems, enhance data analytics capabilities, and align technological innovations with sustainability strategies (Al-Okaily et al., 2023).

Grounded in the RBV, the utilization of blockchain technology significantly improves the quality, transparency, and traceability of organizational data (Upadhyay et al., 2021). The introduction of blockchain-enabled data infrastructures fundamentally alters how information is generated, verified, and stored within organizations (Nandi et al., 2020). As blockchain systems produce immutable and real-time transaction records, organizations require internal systems capable of processing and interpreting this information effectively.

Management accounting systems must therefore evolve to accommodate blockchain-enabled data environments. Firms adopting blockchain technology are likely to upgrade their accounting information systems to integrate blockchain-generated data into budgeting, cost management, and performance evaluation processes (Rusch et al., 2022). Prior research findings suggest that the implementation of advanced digital technologies often leads to the redesign and enhancement of management accounting practices, particularly in relation to data integration and analytical capabilities (Krakowski et al., 2022). Consequently, the integration of blockchain technology is anticipated to stimulate improvements in management accounting systems by increasing the demand for more advanced data-processing and performance-monitoring capabilities.

H1: Blockchain technology positively affects management accounting systems.

Management accounting systems function as a crucial element in harmonizing organizational operations with strategic sustainability goals (Polas et al., 2025). They provide timely and relevant information on costs, resource utilization, and performance outcomes, which supports informed decision-making that balances economic efficiency with environmental and social considerations. From a capability-based viewpoint, MAS facilitates the coordination of organizational resources toward the emphasis should be placed on the creation of enduring value instead of solely concentrating on immediate financial profit (Franke & Hiebl, 2022).

In the realm of sustainability, robust management accounting systems enable firms to closely monitor sustainability-related indicators, evaluate trade-offs among competing

objectives, and enhance accountability in decision-making processes (Polas et al., 2025). Empirical research indicates organizations that possess sophisticated accounting systems are more adept at integrate sustainability concerns into managerial practices and performance evaluation frameworks, resulting in improved sustainable performance (Franke & Hiebl, 2022). Hence, effective management accounting systems are anticipated to yield beneficial contributions to sustainable performance.

H2: Management accounting systems positively affect sustainable performance.

While the indirect role of blockchain through organizational capabilities is central, blockchain technology may also exert a direct influence on sustainable performance. Blockchain-enabled transparency and traceability can directly improve sustainability outcomes by reducing information asymmetry, enhancing supply chain accountability, and strengthening compliance with ecological and societal governance frameworks (Chowdhury et al., 2022).

For example, blockchain-based tracking systems enable organizations to monitor resource usage, verify sustainable sourcing practices, and ensure transparent reporting of environmental impacts. These capabilities can directly improve operational efficiency, reduce waste, and strengthen stakeholder trust (Ioku et al., 2024).. Therefore, even in the absence of sophisticated internal accounting capabilities, blockchain technology may still contribute to sustainability outcomes by improving transparency and accountability across organizational processes.

H3: Blockchain technology positively affects sustainable performance.

The effectiveness of management accounting systems in translating technological resources into tangible performance outcomes is likely to depend on an organization's broader digital context (H. Wang et al., 2024). Digital transformation represents the dynamic capability of an organization to assimilate digital technologies into its business processes, organizational structures, and managerial routines. Organizations that demonstrate higher levels of digital transformation are better positioned to reconfigure their accounting systems, enhance data analytics, and harness technology-enabled information for strategic decision-making (Abdelhalim, 2024).

Digital transformation is expected to strengthen the correlation between management accounting frameworks and sustainable performance by facilitating more flexible, responsive, and data-driven managerial practices (Ellström et al., 2021). In firms characterized by significant digital maturity, MAS is more likely to leverage blockchain-enabled information effectively to support sustainability-oriented decisions. Conversely, in organizations with lower the degree of digital transformation may limit the prospective advantages associated with sophisticated accounting systems. Therefore, it is posited that digital transformation serves as a moderating variable in the relationship between Management Accounting Systems (MAS) and sustainable organizational performance.

H4: Digital transformation positively influences the correlation between management accounting systems and sustainable performance, whereby the association is amplified at higher levels of digital transformation.

Integrating the preceding arguments, RBV and capability-based theories suggest that the interplay between blockchain technology and sustainable organizational performance predominantly operates through intrinsic organizational competencies. Blockchain technology augments the accessibility and caliber of information; however, it is the management accounting systems that elucidate and implement this information effectively for managerial decision-making (Oláh et al., 2020). Consequently, MAS serves as a crucial intermediary mechanism linking the adoption of blockchain technology to the resulting sustainability outcomes.

When firms adopt blockchain technology, enhancements in management accounting systems facilitate more effective monitoring, control, and evaluation of sustainability-related activities, leading to improved sustainable performance outcomes. This mediation logic aligns with prior research highlighting the role of accounting systems as conduits through which technological resources exert their influence on organizational outcomes (Cricelli et al., 2025). Hence, management accounting systems are expected to mediate the correlation between blockchain technology and sustainable performance.

H5: Management accounting systems serve as intermediaries in the correlation between blockchain technology and sustainable performance.

A theoretical framework delineating the interconnections among the variables is presented. in Figure 1.

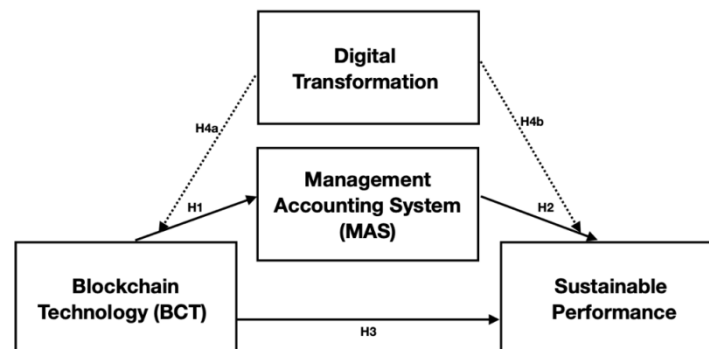


Figure 1. Research Framework

3. Research Method

3.1. Data and Sample

This research utilizes a quantitative methodology, specifically a survey-oriented research framework, to investigate the interconnections between blockchain technology, management accounting systems, digital transformation, and sustainable performance. The empirical context focuses on digital-intensive firms operating in ASEAN-6 economies, namely Indonesia, Malaysia, Thailand, the Philippines, Singapore, and Vietnam. Digital-intensive firms are selected because blockchain technology and advanced management accounting practices are more inclined to be embraced and assimilated within institutions that rely heavily on digital infrastructures and data-driven processes. Accordingly, this comprehensive multi-sector methodology augments the external validity of the results while aligning with antecedent research in the domains of blockchain technology and accounting.

The target population comprises firms from various digital-intensive sectors encompassing sophisticated manufacturing, logistics and supply chain management, financial services and financial technology, as well as information systems and communication technology (ICT), and digitally enabled energy and utility companies. Focusing on multiple sectors is methodologically appropriate, as blockchain technology and sustainable performance are not industry-specific phenomena and have been widely applied across different organizational contexts. Moreover, adopting a multi-sector sample aligns with the objective of replicating and extending prior studies by assessing the robustness of the proposed model across heterogeneous organizational settings.

A purposive sampling technique is employed, as not all firms have adopted blockchain technology or possess sufficiently developed management accounting systems and digital transformation capabilities. This sampling approach is widely accepted as best practice in technology-oriented survey research and is commonly applied in accounting and information systems studies. To be part of the sample, firms were required to have implemented blockchain technology or advanced digital systems, and respondents were required to occupy roles that provide adequate knowledge of the firm's accounting systems, digital initiatives, and performance outcomes.

The respondents targeted in this study include finance managers, management accountants, controllers, senior accountants, digital transformation managers, and IT managers involved in internal reporting and decision-support systems. To ensure the reliability of responses, participants were required to have a minimum of two to three years of professional experience and to be directly involved in management accounting activities, digital or blockchain-related initiatives, and organizational performance evaluation. These criteria ensure that respondents possess sufficient expertise to accurately assess the constructs examined in this study.

Data were collected over the period January 2025 to April 2025 using a structured questionnaire. A total of 480 questionnaires were distributed electronically to potential respondents across the ASEAN-6 countries. Of these, 247 questionnaires were returned, and after data screening procedures to address incomplete and inconsistent responses, 228 valid questionnaires were retained for subsequent analytical processes. This specific sample size exceeds the requisite criteria established for partial least squares structural equation modeling (PLS-SEM), thereby satisfying both the ten-times rule and the recommended benchmarks for complex models that encompass mediation and moderation effects.

3.2. Variable Measurement

All constructs in the present investigation were assessed utilizing multi-item scales that were derived from previous empirical research to ensure both content validity and alignment with the extant literature. A seven-point Likert scale was employed for each measurement item, with a range from 1 = strongly disagree to 7 = strongly agree. The utilization of a seven-point Likert scale is deemed appropriate for capturing the nuances of respondents' perceptions with enhanced sensitivity and has been extensively utilized in the fields of accounting, information systems, and sustainability research.

The measurement items were adapted from well-established studies and slightly reworded where necessary to fit the organizational and regional context of ASEAN-6

economies, without altering the original conceptual meaning of the constructs. All items were reviewed to ensure clarity, relevance, and consistency with the variables examined. The questionnaire was originally developed in English and subjected to careful review to ensure that respondents clearly understood each item.

To ensure content validity, the measurement items were reviewed by academic experts in accounting and information systems as well as practitioners with experience in management accounting and digital transformation. A pre-test was conducted to evaluate the clarity, relevance, and wording of the questionnaire items. Based on the feedback obtained, minor revisions were made to improve item clarity while preserving the original conceptual meaning of the constructs.

Table 1. Variable Measurement

Variable	Measurement Items	Scale	Source
Blockchain Technology (BCT)	1. The firm uses blockchain technology to enhance data transparency. 2. Blockchain systems improve transaction traceability. 3. Blockchain technology increases data reliability and security.	Likert 1–7	(Abad-Segura et al., 2024; Mi, 2024; Nguyen et al., 2025; H. Wang et al., 2024)
Management Accounting Systems (MAS)	1. Accounting information supports managerial decision-making. 2. MAS provides timely information for planning and control. 3. MAS integrates operational and strategic performance data.	Likert 1–7	(Dashkevich et al., 2024; Nguyen et al., 2025; Schaltegger et al., 2022)
Digital Transformation (DT)	1. Digital technologies are widely integrated into business processes. 2. Digital initiatives enhance organizational flexibility. 3. Management actively supports digital transformation.	Likert 1–7	(Nguyen et al., 2025; Simamora et al., 2024; Xiu-zhi & Bu, 2024)
Sustainable Performance (SP)	1. The firm achieves strong financial performance. 2. The firm reduces its environmental impact. 3. The firm demonstrates strong social responsibility.	Likert 1–7	(Hao et al., 2019; Hina et al., 2024; Nguyen et al., 2025)

3.3. Data Analysis

The empirical model in this study is estimated using Partial Least Squares Structural Equation Modeling (PLS-SEM). PLS-SEM is an appropriate analytical technique for this research for several reasons. First, the proposed model is relatively complex, incorporating both mediation and moderation effects. Second, PLS-SEM is suitable for predictive-oriented research and does not require strict assumptions of multivariate normality. Third, the method performs well with medium sample sizes and is widely applied in accounting, information systems, and sustainability research (Hair et al., 2019). The data analysis was conducted using SmartPLS software. The analytical procedure followed a two-stage approach, consisting of the assessment of the measurement model and the structural model, as recommended in prior PLS-SEM literature.

In the first stage, the measurement model underwent a rigorous evaluation to determine the reliability and validity of the constructs in question. The assessment of internal consistency reliability was conducted employing Cronbach's alpha in conjunction with composite reliability metrics. Convergent validity was investigated through the analysis of factor loadings and the average variance extracted (AVE), whereas discriminant validity was scrutinized using established methodological criteria. Only measurement items meeting the recommended thresholds were retained for further analysis.

In the subsequent phase, the structural model underwent a rigorous evaluation to examine the validity of the proposed hypotheses. The process of hypothesis testing was executed utilizing a non-parametric bootstrapping methodology comprising 5,000 subsamples, which aligns with the established conventions in PLS-SEM research. The statistical significance of the path coefficients was assessed through the analysis of t-values and p-values, utilizing a predetermined significance threshold of $p < 0.05$ (Hair et al., 2019).

To test the mediating role of management accounting systems, the indirect effect of blockchain technology on sustainable performance through management accounting systems was examined using the bootstrapping approach. Mediation was confirmed when the indirect effect was statistically significant. The presence of partial or full mediation was determined by comparing the significance of the direct and indirect effects.

The moderating effect of digital transformation was tested by creating an interaction term between management accounting systems and digital transformation. This interaction term was included in the structural model to assess whether digital transformation strengthens or weakens the relationship between management accounting systems and sustainable performance. A statistically significant interaction coefficient indicates the presence of a moderating effect.

The empirical relationships among the variables are specified in the following equations:

Equation (1): Mediator Model

$$MAS = \beta_0 + \beta_1 BCT + \varepsilon_1$$

Equation (2): Outcome Model

$$SP = \beta_0 + \beta_1 BCT + \beta_2 MAS + \beta_3 DT + \beta_4 (MAS \times DT) + \varepsilon_2$$

where *BCT* denotes blockchain technology, *MAS* represents management accounting systems, *DT* refers to digital transformation, and *SP* indicates sustainable performance. The interaction term ($MAS \times DT$) captures the moderating effect of digital transformation on the relationship between management accounting systems and sustainable performance.

To ensure the robustness of the empirical findings, additional robustness checks were conducted. First, the stability of the measurement model was examined using alternative reliability and validity assessments, including comparisons between Cronbach's alpha and composite reliability, as well as alternative discriminant validity criteria. Second, subsample analyses were performed by grouping firms based on country-level digital maturity within the ASEAN-6 economies. The structural relationships were re-estimated for each subsample to assess the consistency of the hypothesized effects.

The results of these robustness tests indicate that the direction, magnitude, and statistical significance of the key relationships remain largely consistent with the main findings. These results suggest that the conclusions of this study are robust to alternative model specifications and sample compositions, thereby enhancing the reliability and generalizability of the empirical evidence.

4. Results and Discussion

4.1. Respondent Profile

A total of 480 questionnaires were distributed to potential respondents across ASEAN-6 economies. Of these, 260 questionnaires were returned. After data screening to remove incomplete and inconsistent responses, 230 valid questionnaires were retained for further analysis.

Table 2. Respondent Profile

Characteristic	Category	Frequency	Percentage (%)
Gender	Male	134	58.3
	Female	96	41.7
Position	Finance Manager	58	25.2
	Management Accountant	64	27.8
	Controller / Senior Accountant	41	17.8
	Digital Transformation / IT Manager	67	29.2
Work Experience	2–5 years	72	31.3
	6–10 years	91	39.6
	More than 10 years	67	29.1
Country	Indonesia	54	23.5
	Malaysia	41	17.8
	Thailand	36	15.7
	Philippines	32	13.9
	Singapore	35	15.2
	Vietnam	32	13.9

Characteristic	Category	Frequency	Percentage (%)
Industry Sector	Manufacturing	56	24.3
	Logistics & Supply Chain	43	18.7
	Financial Services / Fintech	49	21.3
	ICT	52	22.6
	Energy & Utilities	30	13.1

The distribution of respondents across ASEAN-6 countries provides an important contextual basis for interpreting the empirical findings. Indonesia accounts for the largest share of respondents (23.5%), followed by Malaysia (17.8%), Thailand (15.7%), Singapore (15.2%), and both the Philippines and Vietnam (13.9%). This distribution reflects the diversity of digital development levels and institutional environments within the ASEAN region. Countries such as Singapore and Malaysia are characterized by relatively advanced digital infrastructures and regulatory frameworks, whereas other ASEAN economies are still undergoing transitional stages of digital transformation and sustainability governance. This heterogeneity provides a meaningful context for examining how blockchain technology, management accounting systems, and digital transformation interact to influence sustainable performance.

4.2. Non-Response Bias Test

To assess the potential presence of non-response bias, an early-late response comparison test was conducted following the procedure recommended by Armstrong and Overton (1977). The first 25% of returned questionnaires were classified as early responses, while the last 25% were classified as late responses. Independent sample t-tests were conducted to assess the mean values of the primary study variables across the two distinct groups. The findings reveal that no statistically significant differences were detected between early and late respondents with respect to the principal constructs ($p > 0.05$). Such results imply that non-response bias is improbable to represent a substantial risk to the integrity of the study.

Table 3. Non-response Bias Test

Variable	Early Mean	Late Mean	p-value
BCT	5.24	5.18	0.42
MAS	5.31	5.37	0.39
DT	5.49	5.44	0.45
SP	5.16	5.20	0.47

4.3. Descriptive Statistics

Table 4 delineates the descriptive statistics pertaining to the variables under examination, encompassing the mean and standard deviation. The results indicate that respondents generally perceive a moderate to high level of adoption and implementation across all constructs examined. Digital Transformation (DT) exhibits the highest mean

value (Mean = 5.47), suggesting that firms in the ASEAN-6 economies have made substantial progress in integrating digital technologies into their business processes. Management Accounting Systems (MAS) also shows a relatively high mean (Mean = 5.34), indicating that accounting information systems are perceived to effectively support managerial planning and decision-making.

Table 4. Descriptive Statistics

Construct	Mean	Standard Deviation
BCT	5.21	0.89
MAS	5.34	0.83
DT	5.47	0.91
SP	5.18	0.87

The mean values for Blockchain Technology (BCT) (Mean = 5.21) and Sustainable Performance (SP) (Mean=5.18) further suggest that blockchain adoption and sustainability-related outcomes are moderately well developed among the sampled firms. The standard deviation values, ranging from 0.83 to 0.91, indicate an acceptable level of variability in responses, reflecting meaningful differences in organizational practices across firms. Overall, these descriptive statistics suggest that the data are suitable for subsequent PLS-SEM analysis, providing sufficient dispersion to examine the proposed relationships.

4.4. Measurement Model Assessment

The measurement model was meticulously examined to ascertain the reliability and validity of the constructs prior to the assessment of the structural relationships. In accordance with the established guidelines of Partial Least Squares Structural Equation Modeling (PLS-SEM), the evaluation encompasses internal consistency reliability, convergent validity, and discriminant validity.

Table 5. Measurement Model Assessment

Construct	Indicator	Loading	Cronbach Alpha	CR	AVE
BCT	BCT1	0.775	0.79	0.88	0.71
	BCT2	0.844			
	BCT3	0.823			
MAS	MAS1	0.827	0.86	0.91	0.78
	MAS2	0.870			
	MAS3	0.863			
DT	DT1	0.842	0.85	0.91	0.77
	DT2	0.865			
	DT3	0.862			
SP	SP1	0.802	0.81	0.88	0.70
	SP2	0.798			
	SP3	0.848			

As shown in Table 4, all indicator loadings exceed the recommended threshold of 0.70, indicating strong indicator reliability. Furthermore, Cronbach's alpha and composite the reliability coefficients for all constructs are above the threshold of 0.70, thereby affirming an acceptable level of internal consistency reliability. Furthermore, the average variance extracted (AVE) values surpass the requisite minimum of 0.50, signifying sufficient convergent validity.

The assessment of discriminant validity was conducted utilizing the Heterotrait–Monotrait (HTMT) ratio of correlations. All HTMT values fall below the advised limit of 0.85, suggesting that each construct is empirically differentiated from the others. These findings substantiate that the measurement model exhibits satisfactory reliability and validity, rendering it appropriate for subsequent analyses of the structural model.

4.5. Structural Model Assessment

Upon validating the sufficiency of the measurement model, the structural model was assessed to investigate the proposed interrelations among blockchain technology (BCT), management accounting systems (MAS), digital transformation (DT), and sustainable performance (SP). The analysis was conducted using partial least squares structural equation modeling (PLS-SEM) with a bootstrapping procedure of 5,000 subsamples to assess the significance of the structural relationships.

Figure 2 presents the standardized structural model results, including the estimated path coefficients and coefficients of determination (R^2) for the endogenous constructs.

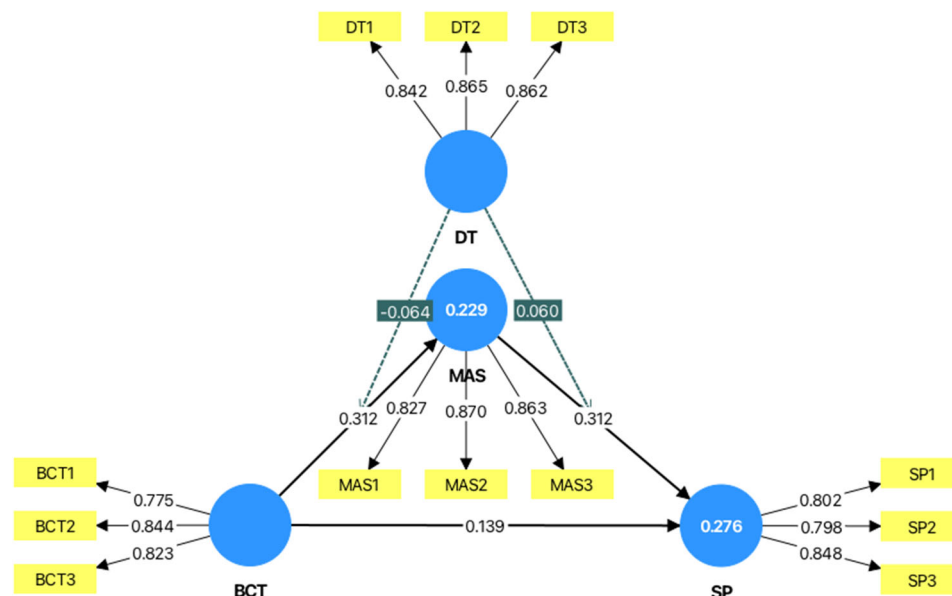


Figure 2. Structural Results

As illustrated in Figure 2, blockchain technology exerts a positive and significant effect on management accounting systems, suggesting that the adoption of blockchain-enabled technologies enhances internal accounting capabilities. In turn, management accounting systems significantly improve sustainable performance, highlighting their important role in translating technological resources into sustainability-related organizational outcomes.

The direct effect of blockchain technology on sustainable performance is positive but relatively weaker, indicating that blockchain adoption alone does not substantially improve sustainability performance unless supported by internal organizational mechanisms. Furthermore, the interaction effect involving digital transformation appears relatively small, suggesting that digital transformation functions more as an enabling condition rather than a dominant factor strengthening the relationship between management accounting systems and sustainable performance.

The explanatory power of the model was evaluated using the coefficient of determination (R^2). As presented in Table 6, blockchain technology explains approximately 22.9% of the variance in management accounting systems, while blockchain technology, management accounting systems, and digital transformation jointly explain 27.6% of the variance in sustainable performance. These values indicate a moderate level of explanatory power, which is considered acceptable in organizational and accounting research.

Table 6. Coefficient of Determination (R^2)

Construct	R^2
Management Accounting Systems (MAS)	0.229
Sustainable Performance (SP)	0.276

To evaluate the overall adequacy of the proposed structural model, the standardized root mean square residual (SRMR) and the normed fit index (NFI) were examined. These indices are commonly used in PLS-SEM to assess model fit by comparing the observed correlation matrix with the model-implied correlation matrix. The results indicate that the SRMR value is below the recommended threshold of 0.08, while the NFI value exceeds the recommended threshold of 0.90, indicating that the structural model demonstrates an acceptable level of goodness-of-fit. Based on these model fit indicators, the structural model demonstrates an adequate level of goodness-of-fit. Therefore, the analysis proceeds to evaluate the structural relationships and hypothesis testing.

Table 7. Model Fit Indices

Model Fit Indicator	Value	Recommended Threshold	Interpretation
SRMR	0.061	< 0.08	Good Fit
NFI	0.92	> 0.90	Acceptable Fit

The significance of the structural paths was assessed using a bootstrapping procedure with 5,000 subsamples. The structural model results indicate that blockchain technology significantly enhances management accounting systems ($\beta = 0.312$, $p < 0.001$), suggesting that blockchain adoption strengthens internal accounting capabilities. In turn, management accounting systems significantly improve sustainable performance ($\beta = 0.312$, $p < 0.001$), supporting the argument that accounting systems serve as a key mechanism through which technological resources translate into sustainability outcomes.

The findings collectively suggest that blockchain technology exerts a beneficial and statistically significant influence on management accounting systems, thereby implying that the integration of blockchain-enabled frameworks augments the efficacy of internal accounting functionalities. Furthermore, management accounting systems demonstrate a favorable and statistically significant impact on sustainable performance, thereby reinforcing the assertion that accounting information is instrumental in converting technological assets into sustainability-oriented results.

The direct effect of blockchain technology on sustainable performance is positive but relatively weak, indicating that blockchain alone does not strongly improve sustainable performance unless supported by internal organizational mechanisms. Furthermore, the interaction effects involving digital transformation show relatively small coefficients, suggesting that digital transformation acts as an enabling condition rather than a dominant driver in strengthening the examined relationships.

Table 8. Structural Model Results and Hypothesis Testing

Path	β	t-value	p-value	Result
BCT $\rightarrow$ MAS	0.312	4.286	<0.001	Supported
MAS $\rightarrow$ SP	0.312	3.914	<0.001	Supported
BCT $\rightarrow$ SP	0.139	2.041	0.041	Supported
MAS $\times$ DT $\rightarrow$ SP	0.060	1.712	0.087	Not Supported
BCT $\rightarrow$ MAS $\rightarrow$ SP	0.097	3.126	0.002	Supported

4.6. Moderation Analysis

To examine the moderating role of Digital Transformation (DT) in the relationship between Management Accounting Systems (MAS) and Sustainable Performance (SP), an interaction term (MAS $\times$ DT) was incorporated into the structural model. The moderation effect was assessed using a bootstrapping procedure with 5,000 subsamples, consistent with the estimation approach applied in the main structural analysis.

The results indicate that the interaction effect between management accounting systems and digital transformation on sustainable performance is positive but not statistically significant ($\beta = 0.060$, $t = 1.712$, $p = 0.087$). Therefore, H4 is not supported at the conventional significance level ($p < 0.05$). This finding suggests that while digital transformation may enhance the effectiveness of management accounting systems, its moderating influence is relatively weak within the sampled firms.

The absence of a strong moderation effect does not undermine the relevance of digital transformation. Instead, it indicates that digital transformation functions more as an enabling organizational condition rather than as a factor that substantially amplifies the impact of management accounting systems on sustainable performance. In the ASEAN-6 context, many firms may still be at transitional stages of digital maturity, where digital initiatives support internal processes but have not yet fully altered the strategic role of management accounting systems.

The absence of a statistically significant moderating effect may also be related to differences in digital maturity levels across firms and countries within the ASEAN-6

region. While some organizations operate in digitally advanced environments with strong technological infrastructures, others remain in early stages of digital transformation. This variation in digital maturity may weaken the overall moderating effect when analyzed within a multi-country sample, as firms at lower levels of digital maturity may not yet possess the organizational capabilities required to fully leverage digital transformation in strengthening the MAS–performance relationship.

4.7. Mediation Analysis

To examine the mediating role of Management Accounting Systems (MAS) in the relationship between Blockchain Technology (BCT) and Sustainable Performance (SP), a bootstrapping mediation analysis was conducted following established PLS-SEM procedures. The significance of the indirect effect was assessed using 5,000 bootstrap resamples, as recommended for mediation testing in variance-based structural equation modeling.

The results indicate that the indirect effect of blockchain technology on sustainable performance through management accounting systems is positive and statistically significant ($\beta = 0.097$, $t = 3.126$, $p = 0.002$). This finding provides empirical support for H5, confirming that management accounting systems function as a mediating mechanism through which blockchain-enabled resources are translated into sustainability-related outcomes.

Importantly, the direct effect of blockchain technology on sustainable performance remains significant after the inclusion of the mediator, although its magnitude is relatively modest ($\beta = 0.139$, $p < 0.05$). This pattern indicates the presence of partial mediation, suggesting that while blockchain technology can directly influence sustainable performance, a substantial portion of its impact operates indirectly through enhanced management accounting systems.

These findings highlight the critical role of internal accounting capabilities in leveraging blockchain technology. Rather than acting as a standalone driver of sustainable performance, blockchain technology appears to generate value primarily when its data transparency and traceability features are effectively integrated into managerial planning, control, and performance evaluation processes. Consequently, management accounting systems serve as a key organizational capability that enables firms to convert technological resources into meaningful sustainability outcomes.

4.8. Robustness Test

To assess the robustness of the empirical findings, several additional analyses were conducted to ensure that the main results are not sensitive to alternative model specifications or estimation procedures. These robustness checks aim to strengthen the credibility of the conclusions drawn from the PLS-SEM analysis.

First, the structural model was re-estimated using alternative standardization procedures for the interaction term, including mean-centered and standardized indicators. The results remain qualitatively unchanged, with the direct effects of blockchain technology on management accounting systems and sustainable performance, as well as the mediating role of management accounting systems, retaining their significance and direction.

Second, a sub-sample analysis was performed by separating firms operating in more digitally advanced environments from those in less digitally mature contexts. The results indicate that the key relationships among blockchain technology, management accounting systems, and sustainable performance are consistent across sub-samples, indicating that the results are not influenced by a particular group of firms or countries within the ASEAN-6 sample. Third, the model was estimated with additional control variables, including firm size and industry sector. The inclusion of these controls does not materially alter the magnitude or the importance of the principal path coefficients provides additional validation for the robustness of the suggested associations.

4.9. Discussion

Blockchain Technology and Management Accounting Systems

The empirical results provide strong support for Hypothesis 1 (H1), demonstrating that blockchain technology exerts a positive and significant effect on management accounting systems (MAS). This finding suggests that blockchain adoption enhances the informational infrastructure underlying management accounting by improving data transparency, traceability, reliability, and security. From a Resource-Based View (RBV) perspective, blockchain technology constitutes a valuable and potentially rare technological resource; however, its contribution to organizational performance is realized only when it is embedded within internal organizational systems and routines.

This result is theoretically consistent with the capability-based view, which argues that technological resources do not generate value in isolation but must be transformed into organizational capabilities through complementary systems (Abad-Segura et al., 2024). In this regard, management accounting systems serve as a critical organizational capability that enables firms to convert blockchain-generated data into decision-relevant information for planning, control, and performance evaluation.

Empirically, the findings corroborate and extend prior studies that emphasize the enabling role of blockchain in accounting and information systems. For instance, (Salehi & Khodabandeh Oghaz, 2025; H. Wang et al., 2024) argue that blockchain improves data integrity and auditability, which are essential inputs for effective accounting systems. Similarly, (Dyball & Seethamraju, 2025; Jena, 2024) provide evidence that blockchain adoption enhances accounting transparency and information quality. More recently, (Nguyen et al., 2025) document a significant positive relationship between blockchain technology and MAS within a single-country setting. The present study extends these findings by demonstrating that this relationship remains robust across multiple ASEAN-6 economies, thereby strengthening the external validity of prior research.

Importantly, the ASEAN-6 context provides a theoretically meaningful setting for interpreting this relationship. Firms in emerging and transitional economies often face challenges related to information asymmetry, fragmented data systems, and weak internal controls. Blockchain technology helps mitigate these constraints by offering a decentralized and immutable data architecture, which, when integrated into management accounting systems, enhances the reliability and timeliness of internal reports. This explains why the impact of blockchain on MAS is particularly salient in the ASEAN-6 context, where improvements in accounting infrastructure can yield substantial marginal benefits.

The ASEAN context provides a particularly relevant setting for examining these relationships because the region is characterized by substantial heterogeneity in digital infrastructure development, institutional quality, and sustainability regulatory frameworks. While countries such as Singapore and Malaysia have relatively advanced digital ecosystems and regulatory systems, other ASEAN economies are still developing their technological and institutional infrastructures.

Furthermore, the findings suggest that blockchain adoption alone is insufficient to improve managerial decision-making unless firms simultaneously strengthen their management accounting systems. **Managerial Implications.** These findings suggest that managers should not perceive blockchain adoption solely as a technological investment. Instead, organizations must strengthen their management accounting systems to ensure that blockchain-generated data can be effectively integrated into planning, control, and sustainability reporting processes. **Policy Implications.** For policymakers in ASEAN economies, the findings highlight the importance of supporting the development of digital accounting infrastructures and managerial capabilities alongside initiatives promoting blockchain adoption.

Management Accounting Systems and Sustainable Performance

The empirical results provide strong support for Hypothesis 2 (H2), demonstrating that management accounting systems (MAS) have a positive and significant influence on sustainable performance. This finding indicates that MAS play a pivotal role in enabling firms to balance and integrate economic, environmental, and social objectives, rather than prioritizing short-term financial outcomes alone.

From a resource-based and capability-based perspective, management accounting systems represent an organizational capability that allows firms to sense, process, and utilize information for strategic decision-making. Unlike technological resources, which are often imitable, MAS are deeply embedded in organizational routines, managerial expertise, and control processes, making them difficult to replicate. As such, MAS facilitate the effective allocation of resources toward sustainability initiatives by providing performance metrics, cost information, and control mechanisms that align operational activities with long-term sustainability goals (Chowdhury et al., 2022; Dashkevich et al., 2024).

This result is consistent with a growing body of empirical literature. Prior studies have shown that management accounting practices such as strategic performance measurement systems and sustainability-oriented control systems are positively associated with environmental and social performance (Chowdhury et al., 2022; Ellström et al., 2021; Franke & Hiebl, 2022) highlight that firms with advanced management accounting systems are better equipped to integrate sustainability metrics into strategic planning and performance evaluation. Recently, (Nguyen et al., 2025) provide empirical evidence that MAS significantly enhance sustainable performance by enabling organizations to translate complex operational data into actionable sustainability insights.

The present study extends these findings by confirming the robustness of the MAS–sustainable performance relationship within the ASEAN-6 context, which is characterized by heterogeneous institutional environments and varying levels of sustainability regulation. Given the substantial institutional diversity within ASEAN economies, internal

management accounting systems become particularly important for guiding sustainability-oriented managerial decision-making, especially in environments where sustainability regulations and reporting standards are still evolving.

Moreover, the findings suggest that MAS serve as a bridging mechanism between operational activities and strategic sustainability objectives. **Managerial Implications.** Managers should invest in developing integrated management accounting systems that incorporate both financial and non-financial sustainability indicators to support long-term decision-making. **Policy Implications.** Policymakers should encourage the development of sustainability-oriented accounting frameworks and digital reporting infrastructures to support firms in monitoring environmental and social performance.

Direct Effect of Blockchain Technology on Sustainable Performance

The empirical findings provide support for Hypothesis 3 (H3), indicating that blockchain technology has a positive but relatively modest direct effect on sustainable performance. This result suggests that while blockchain adoption contributes to improved transparency, monitoring, and compliance key elements of sustainability outcomes its standalone impact remains limited when not accompanied by complementary organizational capabilities.

From a Resource-Based View (RBV) perspective, this finding reinforces the argument that technological resources such as blockchain are necessary but not sufficient to generate sustained performance advantages. Blockchain technology enhances information availability and data integrity; however, without being embedded in firm-specific routines, control mechanisms, and decision-making processes, its contribution to sustainability remains constrained (Arvidsson & Dumay, 2021; Sætra, 2021). This aligns with the capability-based view, which emphasizes that value creation arises from the interaction between resources and organizational capabilities rather than from technology adoption alone.

Empirically, the modest direct effect observed in this study is consistent with prior research reporting mixed or context-dependent impacts of blockchain on sustainability outcomes. For example, (Sætra, 2021; Sciarelli et al., 2021) argue that blockchain-driven transparency does not automatically translate into improved environmental or social performance unless firms possess adequate governance and managerial structures. Similarly, (Qian et al., 2023) find that blockchain adoption improves ESG-related transparency, but its effect on actual sustainability performance is contingent on internal managerial practices. In contrast, (Nguyen et al., 2025) report a relatively stronger direct effect in a single-country setting, suggesting that contextual factors play a critical role in shaping this relationship.

The weaker direct effect in the ASEAN-6 context can be explained by several institutional and organizational characteristics. ASEAN economies exhibit significant differences in digital infrastructure, sustainability regulations, and institutional enforcement mechanisms. As a result, blockchain adoption may improve transparency and reporting practices but may not automatically translate into substantial sustainability improvements unless supported by internal organizational capabilities.

Managers should recognize that blockchain technology alone is insufficient to achieve sustainability objectives. Instead, blockchain initiatives should be integrated with internal

governance systems, sustainability reporting mechanisms, and management accounting practices. Policy Implications. Policymakers should complement blockchain innovation policies with initiatives aimed at strengthening sustainability governance frameworks and digital capability development across ASEAN economies.

Moderating Role of Digital Transformation

Contrary to the proposed expectation, the empirical results indicate that Hypothesis 4 (H4) is not supported, as the moderating effect of digital transformation on the relationship between management accounting systems (MAS) and sustainable performance is positive but not statistically significant. This finding suggests that digital transformation does not substantially strengthen the impact of management accounting systems on sustainability outcomes within the sampled ASEAN-6 firms.

From a capability-based perspective, this result implies that digital transformation should not be viewed as an immediately value-amplifying capability but rather as a contextual or enabling condition whose effects depend on the maturity and alignment of complementary organizational capabilities. While digital transformation enhances technological infrastructure and data availability, it does not automatically alter the strategic use of management accounting systems unless firms possess advanced analytical competencies and governance structures (Simamora et al., 2024).

Empirically, this finding is consistent with prior studies reporting mixed or non-significant moderating effects of digital transformation on performance-related relationships. For instance (Simamora et al., 2024; Xiu-zhi & Bu, 2024) argue that digital transformation often unfolds in incremental stages, with early phases focused on process automation rather than strategic integration. Similarly, (Li et al., 2023) find that digital initiatives do not necessarily enhance performance unless supported by organizational learning and decision-making capabilities. In the accounting domain, (Abu Afifa et al., 2025) highlight that digital tools improve information availability but do not fundamentally change accounting system effectiveness without managerial reinterpretation and strategic use.

The divergence from (Nguyen et al., 2025) who report a significant moderating role of digital transformation can be explained by differences in institutional and contextual settings. The ASEAN region is characterized by substantial variation in digital maturity and technological readiness across countries and industries. While some firms operate in advanced digital environments, others remain in earlier stages of digital transformation. This heterogeneity may weaken the overall moderating effect of digital transformation in a multi-country analysis. Organizations should view digital transformation as a long-term capability-building process rather than an immediate performance-enhancing mechanism. Investments in digital skills, analytics capabilities, and organizational learning are required before digital transformation can fully support management accounting systems. Policy Implications. Regional policymakers should focus on reducing digital infrastructure gaps across ASEAN countries to support more effective digital transformation and technology adoption.

Mediating Role of Management Accounting Systems

The mediation analysis provides strong empirical support for Hypothesis 5 (H5), confirming that management accounting systems (MAS) partially mediate the relationship

between blockchain technology and sustainable performance. The significant indirect effect demonstrates that blockchain technology enhances sustainable performance primarily by strengthening internal accounting capabilities rather than acting as an autonomous driver of sustainability outcomes.

From a Resource-Based View (RBV) perspective, this finding reinforces the central proposition that technological resources such as blockchain do not generate sustainable performance advantages unless they are embedded within firm-specific capabilities. Blockchain technology improves data transparency, traceability, and integrity; however, it is the presence of effective management accounting systems that enables organizations to interpret, control, and strategically deploy this information toward sustainability objectives (Kshetri, 2018; Ko et al., 2018). In this sense, MAS function as a value-conversion mechanism that transforms technological inputs into organizational outcomes.

This result is consistent with and extends prior empirical studies emphasizing the mediating role of accounting and control systems in technology–performance relationships. For example, (Dutta et al., 2020; Hao et al., 2019) argue that digital technologies enhance sustainability outcomes only when supported by internal control and measurement systems. Similarly, (Hina et al., 2024; Nguyen et al., 2025) show that management accounting practices play a pivotal role in converting digital transparency into actionable sustainability insights. More broadly, (Ko et al., 2018; Yli-Huumo et al., 2016) highlight that blockchain’s organizational value emerges through complementary managerial processes rather than through technological adoption alone.

The partial nature of the mediation provides additional theoretical insight. While the direct effect of blockchain technology on sustainable performance remains significant, its magnitude is relatively limited compared to the indirect pathway through MAS. This pattern suggests that blockchain may contribute directly to compliance, monitoring, and reporting functions, but its strategic sustainability impact is largely realized through enhanced management accounting practices. This finding aligns with capability-based theory, which posits that deeply embedded organizational capabilities exert a stronger and more enduring influence on performance than isolated technological resources.

The ASEAN-6 context further amplifies the importance of this mediating mechanism. In emerging ASEAN economies where sustainability regulations and reporting standards are still evolving, internal accounting systems become a key mechanism enabling organizations to translate blockchain-generated information into meaningful sustainability outcomes. Firms should prioritize the development of advanced management accounting systems capable of integrating blockchain-generated data into sustainability reporting and performance evaluation processes. Policy Implications. Governments and regulatory institutions should promote the development of digital accounting standards and sustainability reporting guidelines to enhance the effectiveness of blockchain-enabled transparency initiatives.

5. Conclusion, Implications, and Limitations

This study examines how blockchain technology influences sustainable performance by integrating resource-based and capability-based perspectives within ASEAN-6 economies. The findings indicate that blockchain technology contributes to sustainable

performance primarily through management accounting systems, which function as a critical organizational capability that transforms blockchain-enabled transparency and traceability into actionable economic, environmental, and social outcomes. While blockchain also exhibits a modest direct effect, its strategic value is largely realized through internal accounting mechanisms rather than through standalone technological adoption.

The novelty of this study lies in its empirical validation of a moderated mediation framework in a multi-country emerging economy context, extending prior single-country research. By explicitly identifying management accounting systems as a value-conversion mechanism and demonstrating the context-dependent role of digital transformation, the study advances theoretical understanding of how digital technologies interact with organizational capabilities to drive sustainable performance.

From a theoretical perspective, the empirical evidence substantiates the assertion that technological assets, in isolation, are inadequate for the cultivation of enduring performance advantages in the absence of synergistic internal competencies. The outcomes underscore the significance of the amalgamation of digital technologies with organizational information systems to facilitate decision-making processes that are oriented towards sustainability.

From a practical perspective, managers should not view blockchain adoption solely as a technological initiative but should simultaneously strengthen management accounting systems to effectively utilize blockchain-generated information for sustainability-related decisions. For policymakers, particularly in ASEAN-6 economies, the findings emphasize the need to complement digital transformation initiatives with policies that support organizational capability development and sustainability-oriented accounting practices.

Despite these contributions, this study has several limitations. First, the sample is limited to digital-intensive firms operating in ASEAN-6 economies, which may restrict the generalizability of the findings to other industries or regions. In addition, the sampling approach may introduce potential sampling bias because the respondents were primarily drawn from firms with relatively higher levels of digital adoption. Second, the cross-sectional nature of the data limits the ability to capture dynamic changes in digital transformation and sustainability practices over time. Furthermore, the multi-country nature of the sample introduces potential heterogeneity across national contexts, including differences in institutional environments, digital infrastructure development, and sustainability regulations, which may influence the observed relationships.

Future research could extend this study in several ways. First, future studies should examine the mediating mechanisms linking blockchain technology and sustainable performance in firms with lower levels of digital maturity, where the effectiveness of management accounting systems may differ significantly. Second, future research may investigate country-level institutional moderators such as regulatory quality, digital infrastructure development, or sustainability governance frameworks to better understand how national environments influence technology-driven sustainability outcomes.

Third, future research could examine additional mediating mechanisms beyond management accounting systems, such as organizational learning, data analytics capabilities, or supply chain transparency, which may also explain how blockchain

technologies contribute to sustainable performance. Fourth, future studies could explore alternative moderating variables including digital maturity, organizational culture, governance mechanisms, or ESG-oriented leadership practices to better capture the contextual conditions shaping blockchain-enabled sustainability initiatives.

Finally, longitudinal or multi-level research designs are recommended to capture the dynamic interactions between digital technologies, organizational capabilities, and sustainability performance over time. A longitudinal approach could provide deeper insights into how blockchain adoption evolves and influences sustainability practices, while multi-level analysis may help examine how firm-level capabilities interact with country-level institutional environments across ASEAN economies.

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Conflict of Interest Statement

The authors declare that there are no conflicts of interest regarding the publication of this article.

Data Availability Statement

The datasets generated and/or analyzed during the current study are not publicly available due to confidentiality considerations but are available from the corresponding author upon reasonable request.

Author Contributions

Muhammad Rizal Satria contributed to the conceptualization, research design, methodology development, data analysis, and manuscript drafting.

Mubassiran contributed to data collection, literature review, and manuscript revision. Both authors reviewed and approved the final version of the manuscript.

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