Journal of Business and Trade Economics | **Volume: 11 / N°: 02 (2026), p 225-237**

Big Data Analytics Capability and Managerial Decision Quality: The Mediating Role of Management Accounting Systems

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Received: 23-02-2026 Accepted: 21-09-2026 Published: 30-09-2026

Abstract :

This study examines whether Management Accounting Systems (MAS) sophistication mediates the relationship between Big Data Analytics Capability (BDAC) and Managerial Decision Quality (MDQ) among publicly listed Malaysian firms. Primary data were collected from 312 senior managers and CFOs across 156 Bursa Malaysia-listed companies and analysed using PLS-SEM. Results confirm that BDAC significantly enhances MDQ ($p < 0.001$) and MAS sophistication ($p < 0.001$). MAS sophistication partially mediates the BDAC–MDQ relationship (indirect effect: $\beta = 0.187$, VAF = 30.3%), establishing it as the key mechanism through which analytics investments translate into superior managerial decision outcomes.

Multi-group analysis reveals stronger BDAC–MAS effects for larger firms and financial sector organisations. These findings are among the first to empirically establish MAS as a statistically significant mediator in the BDAC–MDQ nexus within an emerging market context, contributing to the information systems, management accounting, and strategic decision-making literature.

Keywords: *Big Data Analytics Capability, Management Accounting Systems, Managerial Decision Quality, PLS-SEM, Malaysia, Emerging Markets*

Jel Classification Codes: *M41, M15, O32, C30*

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1. INTRODUCTION :

Digital transformation in business operations has brought about a seismic change in the way organisations generate, process and utilize information for strategic and operational decision-making. Of the significant technological revolutions of the last decade, Big Data Analytics Capability (BDAC)—defined as the organisation's ability to collect, integrate, analyse and use large-scale, heterogeneous, and high-velocity datasets to gain actionable insights—is among the most consequential (Wamba et al., 2017). The advent of enterprise resource planning systems, cloud computing infrastructure and AI-driven analytics platforms have transformed BDAC from a technical skill to a strategic competitive advantage (Chen et al., 2012; Oesterreich et al., 2022). In spite of considerable investment in big data infrastructure by organizations, empirical evidence has not consistently shown that BDAC is directly linked to better managerial decision quality (MDQ). MDQ, which is the degree of correct, timely, relevant and strategically appropriate management decisions (Chenhall & Morris, 1986), is influenced through more than just data availability, also on the quality of the information systems and data processing, analysis and reporting systems. This insight then gives rise to the seminal research question which is: Do MAS constitute a key channel through which BDAC affects quality of decision-making? Management Accounting Systems are a structured information system and can provide organizational planning, control and decision making services with financial and non-financial data (Chenhall, 2003; Otley, 1999). Modern MAS — especially broad, high aggregation, timely reporting, and cross-functional integration — are theoretically well-prepared for converting raw analytics outputs from big data platforms into decision-relevant information. However, the empirical literature has yet to analyze whether the sophistication of the MAS mediates the relationship between BDAC and MDQ, especially in emerging economies, where data infrastructure and accounting maturity are not mutually exclusive but coexist with differing configurations. Three interrelated gaps in the extant literature motivate this study. First, a number of research studies had investigated on the relationship between BDAC and organizational performance more widely (Akter et al., 2016; Oesterreich et al., 2022; Al-Hawary et al., 2024), but empirical studies linking BDAC to MDQ is still scarce. Second, MAS has been speculated as a potential confounder of information performance associations but its mediating effect in the BDAC–MDQ relationship has not been empirically proven with rigorous structural equation modelling. Third, the majority of the available BDAC studies are either based on North American or European samples without considering the specific conditions of these correlations in emerging markets like Malaysia (Mardini et al., 2022; Lutfi et al., 2022). Employing primary survey data sampled from 156 firms on Bursa Malaysia (n = 312 respondents) and Partial Least Squares Structural Equation Modelling (PLS-SEM), this paper makes three major contributions: 1) It is highly reliable empirical evidence that BDAC has a significant positive effect on MDQ; 2) It shows MAS sophistication is key to mediation of the relationship, as well as also a good partial mediator, and finally 3) Provides contextual insights for organisations and policymakers in Southeast Asia and similar emerging-market environments. The remainder of this paper is structured as follows. Section 2 reviews the relevant literature and identifies the research gaps. Section 3 presents the theoretical framework and develops the study hypotheses. Section 4 describes the research methodology. Section 5 reports the empirical results. Section 6 discusses the findings and their implications. Section 7 concludes with limitations and directions for future research.

1.1 Research Objectives:

Building on the research gaps identified above, this study pursues three specific and interrelated research objectives:

1. To examine the direct effect of Big Data Analytics Capability (BDAC) on Management Accounting Systems (MAS) sophistication in publicly listed Malaysian firms.
2. To assess the direct impact of BDAC on Managerial Decision Quality (MDQ) within an emerging market context.
3. To test empirically whether MAS sophistication mediates the relationship between BDAC and MDQ, thereby identifying the structural mechanism linking data analytics investment to decision quality outcomes.

These objectives correspond directly to hypotheses H1 through H4 developed in Section 3 and collectively address the three gaps identified in the literature above.

2. Literature Review and Research Gap :

2.1 Big Data Analytics Capability (BDAC) :

Big Data Analytics Capability covers the technical infrastructure, human talent, and organisational processes necessary to acquire, store, process, and analyse large-scale data to produce actionable business intelligence (Akter et al., 2016). Davenport (2006) was one of the first to theorise the strategic importance of data analytics, suggesting that companies that possessed advanced analytical competencies would outperform competitors by increasing decision speed and accuracy. Later meta-analytic work corroborated this statement: Oesterreich et al. (2022) who summarized 125 firm-level studies in 26 countries and found strong positive impact of BDAC on performance in the context of organisations with social dimensions —human resources, management capabilities, and organisational culture —being more influential than technical ones. Similarly, Franke and Hiebl (2023), based on US firm data, found that data analytic abilities of management accountants have a significant moderating effect in the relationship between big data and decision quality. At the component level, researchers have decomposed BDAC into tangible (infrastructure, data quality) and intangible (human skills, organisational culture) dimensions (Akter et al., 2016; Mikalef et al., 2020). Huynh et al. (2023), in a systematic review of BDAC research spanning 2011–2022, highlighted fragmentation in BDAC conceptualisation and advocated for more integrative frameworks linking BDAC to more concrete downstream outcomes such as decision quality. This is the very call that our study responds to. Furthermore, Lutfi et al. (2022) empirically demonstrated in a study of Jordanian SMEs that technological, organisational, and environmental factors in combination influence BDAC adoption, and that government support and organisational readiness emerged as important antecedents, which is particularly applicable to the MENA and emerging market context.

2.2 Management Accounting Systems (MAS) :

Management Accounting Systems are built specifically to allow formal mechanisms for the generation, distribution and use of financial and non-financial information to support planning, control and decision-making in management (Chenhall & Morris, 1986). MAS quality was operationalised on four facets, according to the foundational typology proposed by Chenhall and Morris (1986): (1) Scope – breadth and external orientation of information provided; (2) Timeliness – frequency and speed of information delivery; (3) Aggregation – summarisation and cross-functionally integrated information; and (4) Integration – the coordination of information across organisational subunits. This framework has been previously researched and validated and has been applied across different studies in the sector (Abernethy & Bouwens, 2005; Hyvönen, 2007; Mardini et al., 2022). Modern advancements in both ERP and BI systems have vastly increased the capabilities of MAS, providing real-time reporting, predictive analytics, and multi-dimensional data integration (Yigitbasioglu & Velcu, 2012). Lem (2024), in one study using textual analysis of firm disclosures published in Contemporary Accounting Research, discovered that a data analytics strategy is related to more accurate management forecasts and higher operating efficiencies, suggesting that MAS-enabling data

tactics bring about measurable gains in internal information quality. This result fills the missing link between BDAC investments and MAS success on a large-scale archival setting that adds support to and augments the basic survey evidence in this paper.

2.3 Managerial Decision Quality (MDQ) :

Managerial Decision Quality is the extent to which managerial decisions are accurate, fully informed, timely, and aligned with organizational aims (Chenhall & Morris, 1986; Anthony & Govindarajan, 2007). Recent research has critically reconsidered MDQ in relation to digital transformation: Franke and Hiebl (2023) found data-driven culture and data quality to be significant predictors of decision quality in United States businesses. Li et al. (2022) conducted a panel data study published in Technological Forecasting and Social Change and conclude that big data analytics use positively and significantly predicts decision-making quality in organizations, supporting the primary framework investigated in this study through empirical evidence. In the Arab world, Al-Hawary et al. (2024) explored how BDAC influenced decision-making within the Jordanian telecommunications sector, finding a significant positive relationship; technology capability emerged as the most influential factor. Al-Dmour et al. (2023) examined the impacts of big data analytics techniques on banking performance in Jordanian commercial banks, and observed a positive link between structured BDA frameworks and organisational decision-making effectiveness. These research works ground the connections considered herein in country-specific empirical studies.

2.4 Research Gap Identification :

A literature review reveals three interrelated gaps. First, although the BDAC–organisational performance relationship has been well researched (Akter et al., 2016; Oesterreich et al., 2022; Huynh et al., 2023), the specific mechanism connecting BDAC to MDQ as a separate construct has not been comprehensively investigated. Previous studies have confused MDQ with operational efficiency indicators, which has obscured the distinct BDAC–MDQ pathway. Second, MAS has previously been proposed as a potential mediator of information-performance relationships (Abernethy & Bouwens, 2005; Hyvönen, 2007; Lem, 2024), but there is no empirical test that MAS acts as a structural mediator in the relationship between BDAC–MDQ using PLS-SEM. This gap is of great importance given that MAS is the major organisational mechanism through which raw data is converted into decision-relevant information. Finally, the geographical concentration of BDAC research in North American and European sites (Akter et al., 2016; Oesterreich et al., 2022) has left an empirical gap with respect to those relationships in emerging countries. Although some existing Arab-world studies have recently addressed this gap (Lutfi et al., 2022; Al-Hawary et al., 2024; Al-Dmour et al., 2023; Alotaibi, 2023), no study has assessed the BDAC–MAS–MDQ mediation pathway in Southeast Asia. This study would be well suited to Malaysia with its well-developed capital market and digital transformation agenda MyDIGITAL Blueprint that has been operational in Malaysia already. This study directly fills up these three gaps in action.

3. Theoretical Framework and Hypotheses Development :

3.1 Theoretical Foundations :

This study draws on three complementary theoretical frameworks**:** the Resource-Based View (RBV), Information Processing Theory (IPT), and Contingency Theory of MAS.

- **Resource-Based View (RBV):** The RBV, as articulated by Barney (1991) and extended to information systems by Wade and Hulland (2004), posits that organisational capabilities that are valuable, rare, inimitable, and non-substitutable constitute sources of sustained competitive advantage.

BDAC fulfils these criteria: it requires substantial investments in infrastructure, human capital, and organisational learning that create path dependencies and barriers to imitation (Akter et al., 2016; Oesterreich et al., 2022). From an RBV perspective, BDAC constitutes a dynamic capability (Teece et al., 1997) that enables organisations to sense and seize information-based opportunities, thereby enhancing decision quality.

- **Information Processing Theory (IPT):** Galbraith's (1974) IPT argues that organisational performance is contingent on the alignment between information processing requirements and information processing capacity. BDAC enhances organisational information processing capacity by expanding the volume, variety, and velocity of processable data. MAS, in turn, structures this enhanced capacity into decision-relevant formats, reducing information processing uncertainty and improving decision quality. This framework provides a direct rationale for the BDAC → MAS → MDQ pathway hypothesised in this study.

- **Contingency Theory of MAS:** Chenhall's (2003) contingency theory argues that the appropriateness of MAS characteristics is contingent on contextual factors including environmental uncertainty, technology, and organisational structure. In high-information-intensity environments—precisely those created by BDAC adoption—broader, more integrated, and more timely MAS are predicted to be more effective in supporting decision quality. This theoretical lens supports the expectation that BDAC investment will drive MAS sophistication, which in turn enhances MDQ.

3.2 Hypotheses Development :

H1: BDAC and MAS Sophistication

Big Data Analytics Capability, by generating high-velocity, high-variety, and high-volume information streams, creates both the opportunity and necessity for MAS to evolve toward greater sophistication. BDAC infrastructure enables more frequent, automated, and real-time reporting, enhancing MAS timeliness. The aggregation and integration dimensions of MAS are directly enhanced by BDAC's capacity to integrate cross-functional data streams and apply machine learning algorithms. Empirical support is provided by Yigitbasioglu and Velcu (2012), who found that BI system adoption positively predicted MAS scope and integration, and by Lem (2024), who established that data analytics strategies enhance internal information quality. Alotaibi (2023), in Saudi Arabia's industrial sector, further confirmed that data mining methods significantly improve information quality and management decision support, reinforcing the BDAC–MAS link.

H1: BDAC positively and significantly influences MAS sophistication.

H2: BDAC and Managerial Decision Quality

The direct effect of BDAC on MDQ is theorised through the RBV: organisations with superior data analytics capabilities can generate faster, more accurate, and more comprehensive information relevant to strategic, tactical, and operational decisions. Li et al. (2022) found that big data analytics usage positively predicts decision-making quality. Franke and Hiebl (2023) established that data quality and data-driven culture significantly predict decision quality in US firms. Al-Hawary et al. (2024) confirmed the positive BDAC–MDQ relationship in Jordanian telecommunications firms. While MAS mediates a significant portion of this effect, direct effects are also anticipated as BDAC produces analytical outputs—predictive models, visualisations, real-time dashboards—accessible independently of formal MAS channels.

H2: BDAC positively and significantly influences Managerial Decision Quality.

H3: MAS Sophistication and Managerial Decision Quality

MAS sophistication—characterised by broad scope, timeliness, aggregation, and integration—enhances decision quality by providing managers with comprehensive, accurate, timely, and contextualised information. Chenhall and Morris (1986) demonstrated that MAS characteristics were significantly associated with managerial performance. Abernethy and Bouwens (2005) confirmed that broad-scope MAS enhanced decision quality in decentralised organisations. Lem (2024) established that analytics-strategy firms demonstrate superior management forecasting accuracy. Al-Dmour et al. (2023) confirmed that BDA-enhanced accounting information systems improve decision quality in Jordanian banking.

H3: MAS sophistication positively and significantly influences Managerial Decision Quality.

H4: Mediating Role of MAS

The mediating role of MAS in the BDAC–MDQ relationship follows directly from IPT: BDAC enhances organisational information processing capacity; MAS structures this capacity into decision-relevant formats; and enhanced MAS quality improves MDQ. We hypothesise partial rather than full mediation, as BDAC also generates direct decision-relevant outputs that bypass formal MAS channels.

H4: MAS sophistication partially mediates the relationship between BDAC and Managerial Decision Quality.

4. Research Methodology :

4.1 Research Design :

A quantitative, cross-sectional survey design was employed, consistent with prior studies in management accounting and information systems research (Akter et al., 2016; Lutfi et al., 2022; Mardini et al., 2022). The positivist epistemological stance, deductive reasoning approach, and quantitative methodology are appropriate given the study's objectives of testing a priori hypotheses derived from established theories.

4.2 Population and Sampling :

The target population comprised companies listed on Bursa Malaysia across the Main Market and ACE Market segments. As of December 2022, Bursa Malaysia listed 912 companies across multiple industry sectors (Bursa Malaysia, 2023). A stratified random sampling approach was applied, stratifying by industry sector to ensure proportional representation. Eligible respondents were senior managers, finance directors, and CFOs with responsibility for management accounting and strategic decision-making, identified via company annual reports and regulatory filings.

A target sample of 160 companies (two respondents per company) was established based on statistical power analysis using G*Power 3.1 (Faul et al., 2009), indicating a minimum of 272 respondents required to achieve 80% power to detect medium effect sizes ($f^2 = 0.15$) at $\alpha = 0.05$. Survey instruments were distributed via email between January and June 2023. After two follow-up rounds, 324 responses were received, of which 312 were retained after removing incomplete or invalid responses, representing 156 companies.

4.3 Measurement Instrument :

All constructs were measured using validated multi-item reflective scales rated on a seven-point Likert scale (1 = Strongly Disagree; 7 = Strongly Agree). BDAC was measured using 18 items adapted from Akter et al. (2016), covering three dimensions: (1) BDAC Infrastructure (5 items); (2) BDAC Human Talent (7 items); and (3) BDAC Management (6 items). MAS sophistication was measured using 16 items adapted from Chenhall and Morris (1986), covering Scope, Timeliness, Aggregation, and Integration (4 items each). MDQ was measured using 8 items adapted from Li et al. (2022) and Franke and Hiebl (2023), covering forecasting accuracy, resource allocation quality, and strategic alignment. Control variables included firm size (log of total assets), firm age, leverage (debt-to-equity ratio), and industry sector dummy variables.

The instrument was translated into Bahasa Malaysia following the back-translation procedure (Brislin, 1970). A pilot study involving 30 practitioners confirmed item clarity and scale reliability (Cronbach's $\alpha > 0.80$ for all constructs).

4.4 Common Method Bias Assessment :

Given the cross-sectional self-reported nature of the data, common method bias (CMB) was evaluated using multiple procedures. Harman's single-factor test yielded a maximum common variance of 28.3%, below the 50% threshold. A marker variable technique (Lindell & Whitney, 2001) was applied; partial correlations controlling for the marker variable were not substantially different from zero-order correlations, further supporting the absence of significant CMB.

4.5 Analytical Strategy :

Partial Least Squares Structural Equation Modelling (PLS-SEM) was employed using SmartPLS 4.0 (Ringle et al., 2022). PLS-SEM is appropriate given: (1) the exploratory nature of the mediation hypothesis; (2) the complexity of the measurement model; and (3) non-normal data distributions confirmed by Mardia's test (Kurtosis = 3.8, $p < 0.001$). Measurement model evaluation followed Hair et al.'s (2022) criteria: composite reliability (CR > 0.70), average variance extracted (AVE > 0.50), and HTMT ratios (< 0.85) for discriminant validity. Mediation analysis followed Preacher and Hayes's (2008) indirect effects approach with bias-corrected confidence intervals (10,000 resamples).

5. Results :

5.1 Sample Profile :

Table 1. Sample Characteristics (n = 312)

Characteristic	Category	Frequency (%)
Industry Sector	Manufacturing	38.5%
	Financial Services	28.2%
	Technology	18.3%
	Consumer Goods	15.0%
Firm Size	Large (> RM500M assets)	44.2%

Characteristic	Category	Frequency (%)
	Medium (RM50–500M)	38.5%
	Small (< RM50M)	17.3%
Respondent Role	CFO / Finance Director	47.8%
	Senior Manager	35.6%
	Management Accountant	16.6%
BDAC Adoption Stage	Advanced	29.2%
	Intermediate	42.3%
	Early/Basic	28.5%

5.2 Measurement Model Evaluation :

All constructs demonstrated satisfactory reliability and validity. Composite Reliability (CR) ranged from 0.843 to 0.927, exceeding the 0.70 threshold (Hair et al., 2022). Average Variance Extracted (AVE) ranged from 0.512 to 0.681, all surpassing the 0.50 criterion (Fornell & Larcker, 1981). All factor loadings were statistically significant at $p < 0.001$ and exceeded 0.60. Discriminant validity was established as all HTMT ratios were below 0.85.

Table 2. Measurement Model Summary

Construct	Items	CR	AVE	Loading Range
BDAC – Infrastructure	5	0.891	0.621	0.743–0.831
BDAC – Human Talent	7	0.921	0.648	0.762–0.859
BDAC – Management	6	0.904	0.634	0.741–0.844
MAS – Scope	4	0.873	0.633	0.748–0.822
MAS – Timeliness	4	0.858	0.601	0.733–0.808
MAS – Aggregation	4	0.868	0.612	0.740–0.819
MAS – Integration	4	0.879	0.645	0.759–0.840
Managerial Decision Quality	8	0.927	0.681	0.782–0.874

5.3 Structural Model and Hypothesis Testing :

The structural model demonstrated adequate explanatory power: $R^2 = 0.487$ for MDQ and $R^2 = 0.412$ for MAS. Stone-Geisser Q^2 values were positive for all endogenous constructs (MDQ: $Q^2 = 0.312$; MAS: $Q^2 = 0.268$), confirming predictive relevance.

Table 3. Structural Model Results – Direct Effects

Hypothesis	Path	β	SE	t-value	Decision
H1	BDAC → MAS	0.512***	0.048	10.67	Supported
H2	BDAC → MDQ	0.431***	0.052	8.29	Supported
H3	MAS → MDQ	0.365***	0.047	7.77	Supported

Note: *** $p < 0.001$; β = standardised path coefficient; SE = standard error; bootstrapping with 10,000 resamples.

5.4 Mediation Analysis (H4) :

Mediation analysis using bias-corrected bootstrapped confidence intervals (10,000 resamples) confirmed that MAS sophistication significantly mediates the BDAC–MDQ relationship. The indirect effect (BDAC → MAS → MDQ) was β = 0.187, 95% CI [0.112, 0.268], which does not include zero, indicating statistical significance. The direct effect of BDAC on MDQ remained significant (β = 0.431, $p < 0.001$) after including the mediator, confirming partial mediation. The variance accounted for (VAF) by the mediation pathway was 30.3%, indicating that approximately one-third of BDAC's effect on MDQ is channelled through MAS sophistication. Hypothesis H4 is therefore supported.

Table 4. Mediation Analysis Results

Effect	β	SE	t-value	95% CI	VAF
Direct: BDAC → MDQ	0.431***	0.052	8.29	[0.329, 0.533]	—
Indirect: BDAC → MAS → MDQ	0.187***	0.041	4.56	[0.112, 0.268]	30.3%
Total: BDAC → MDQ	0.618***	0.049	12.61	[0.522, 0.714]	—

Note: VAF = Variance Accounted For by mediation; *** $p < 0.001$; CI = Confidence Interval.

5.5 Moderating Effects of Firm Size and Industry :

Post-hoc multi-group analysis (MGA) in SmartPLS confirmed that the BDAC → MAS path coefficient was significantly stronger for large firms (β = 0.621) compared to SMEs (β = 0.389; difference = 0.232, $p < 0.01$). Financial sector firms exhibited significantly stronger BDAC → MAS relationships (β = 0.591) compared to manufacturing (β = 0.456; difference = 0.135, $p < 0.05$), consistent with the higher information intensity characteristic of financial services organisations. These findings align with Lutfi et al. (2022), who found that firm readiness and sector characteristics moderate BDA adoption outcomes in emerging markets.

6. Discussion :

6.1 BDAC and MAS Sophistication (H1). The confirmation of H1 (β = 0.512, $p < 0.001$) is consistent with Information Processing Theory (Galbraith, 1974) and empirical evidence from Yigitbasioglu and Velcu (2012) and Lem (2024). Organisations that invest in BDAC infrastructure and human talent develop enhanced data integration and analytical capabilities that naturally expand the scope, timeliness, aggregation, and integration dimensions of MAS. These findings establish BDAC adoption as a significant driver of MAS modernisation, consistent with Alotaibi's (2023) evidence from Saudi Arabia's industrial sector that data mining techniques improve information quality and management decision support systems. The cross-national convergence of these findings across

MENA and Southeast Asian contexts reinforces the robustness of the BDAC–MAS relationship beyond any single institutional environment.

6.2 BDAC and MDQ (H2). The significant direct effect of BDAC on MDQ ($\beta = 0.431$, $p < 0.001$) confirms and extends prior evidence: Li et al. (2022) established that big data analytics usage positively predicts decision quality in organisations, while Franke and Hiebl (2023) demonstrated the positive effect of BDAC on decision quality across US firms. The present study generalises these results to the Malaysian emerging market context, demonstrating that the BDAC–MDQ relationship is robust across diverse institutional environments. The convergence with Al-Hawary et al.'s (2024) findings in Jordanian telecommunications further confirms the cross-regional validity of this relationship.

6.3 MAS and MDQ (H3). The significant MAS → MDQ path coefficient ($\beta = 0.365$, $p < 0.001$) confirms the long-standing theoretical proposition that MAS sophistication enhances decision quality (Chenhall & Morris, 1986; Abernethy & Bouwens, 2005). Sophisticated MAS reduce decision uncertainty and improve forecasting accuracy and strategic responsiveness by delivering more comprehensive, timely, aggregated, and functionally integrated information. These findings resonate with Lem (2024), who demonstrated using archival data that analytics-aligned information systems produce more accurate management forecasts — a direct, objective measure of MDQ. Further corroborating evidence comes from Al-Dmour et al. (2023), who found that BDA-enhanced accounting information systems improve organisational decision quality in Jordanian banking, providing parallel support from another emerging market.

6.4 The Mediating Role of MAS (H4). The partial mediation of MAS in the BDAC–MDQ association (indirect effect: $\beta = 0.187$, VAF = 30.3%) constitutes the central novel contribution of this study. This finding provides an empirically validated mechanism through which BDAC translates into superior decision outcomes: by enhancing MAS scope, timeliness, aggregation, and integration, BDAC-enabled organisations generate decision-relevant information streams that directly improve MDQ. The partial rather than full mediation finding is theoretically coherent: BDAC also produces decision-relevant outputs —real-time dashboards, predictive models, AI-generated alerts— that bypass formal MAS channels, sustaining a significant direct BDAC–MDQ path. These results are consistent with Franke and Hiebl's (2023) finding that management accountants' data analytics competencies moderate the big data–decision quality link, suggesting that both individual-level and system-level mechanisms operate in parallel. 6.5 Moderating Effects of Firm Size and Industry. The multi-group analysis results reinforce the contingency theoretical perspective adopted in this study. The significantly stronger BDAC–MAS path for large firms ($\beta = 0.621$ vs. 0.389 for SMEs) reflects the resource endowments —capital, IT infrastructure, and specialist human talent— that enable large organisations to leverage BDAC investments more fully in upgrading their MAS. Similarly, the stronger effect observed for financial sector firms ($\beta = 0.591$ vs. 0.456 for manufacturing) is consistent with the higher information intensity and regulatory reporting demands characteristic of financial services, which create stronger incentives for MAS modernisation in response to BDAC adoption. These moderating patterns echo Lutfi et al.'s (2022) finding that firm readiness and sector characteristics shape BDA adoption outcomes in emerging markets, and extend this insight to the MAS sophistication outcome specifically.

7. Conclusion, Practical Implications, and Limitations :

7.1 Theoretical Contributions :

This study makes three theoretical contributions. First, it provides solid empirical evidence that BDAC has a direct impact on the MDQ within an emerging market setting, and extends the

BDAC–performance literature (Akter et al., 2016; Oesterreich et al., 2022) to an unexplored outcome variable and geographic context. Second, using PLS-SEM, the study establishes MAS sophistication as a significant partial mediator of the BDAC–MDQ relationship, offering an empirically proven mechanism. Third, it integrates RBV, Information Processing Theory, and Contingency Theory and illustrates the theoretical complementarity between these frameworks in comprehending BDAC's role in organisational information processing – promoting a more all-encompassing understanding of how digital capabilities result in the quality of decisions.

7.2 Practical Implications :

For practitioners they should consider investment in BDAC infrastructure and talent as well as investment in upgrading their MAS to optimise decision-relevant value of analytics outputs aimed at improving managerial decision quality. For example, organizations should focus on MAS enhancements that improve scope (external and non-financial data), timeliness (real-time and exception-based reporting), aggregation (cross-functional dashboards) and integration (ERP–BI system integration). The fact that large firms and financial sector organisations derive the greatest advantage from BDAC–MAS complementarity indicates the need for focus and support in developing the organisational capabilities required to harness this complementarity (Lutfi et al.'s (2022) call for customized BDA adoption frameworks for SMEs from developing countries).

Implications for policymakers: For policymakers in Malaysia and similar emerging markets, these findings highlight the need to support digital accounting transformation alongside big data investment. MAS modernisation could be explicitly considered as a facet of the digital transformation agenda by the Malaysian government's MyDIGITAL Blueprint. Accounting profession bodies need to consider instituting training programmes that facilitate management accountants' understanding and skills in both data science and systems knowledge to make use of BDAC—a directive echo from Franke and Hiebl (2023) that needs to be formally developed for management accountants' data analytics skills.

7.3 Limitations and Future Work :

There are a number of limitations to this study. A cross-sectional design does not allow making causal inferences; longitudinal or experimental designs may provide stronger evidence about causal mechanisms. However, the sample is limited to Malaysian listed companies and cannot be used for unlisted companies and elsewhere in emerging markets. We recommend that future research replicate and extend the model into other ASEAN economies, GCC countries and Africa. Further, future studies should investigate dynamic dimensions of the BDAC–MAS–MDQ relationship along the BDAC maturity continuum and aggregate objective archival data (e.g., return on assets, Tobin's Q) with survey-based MDQ measures for enhanced construct validity.

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