
Integrating Management Accounting and Business Analytics to Improve Innovation Capability

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Abstract

The integration of management accounting and business analytics has emerged as a critical strategic imperative for enhancing organizational innovation capability in the contemporary business environment. This study investigates the synergistic relationship between management accounting practices, business analytics capabilities, and innovation performance within the Malaysian context. Drawing upon the resource-based view and dynamic capabilities theory, this research examines how Malaysian organizations can leverage the combined potential of strategic management accounting techniques and advanced data analytics to foster innovation outcomes. The methodology employs a quantitative approach utilizing structural equation modeling (SEM) and partial least squares (PLS) analysis to empirically test the proposed theoretical framework. Results indicate that management accounting practices significantly influence organizational capabilities, while business analytics capabilities serve as critical mediators in the relationship between organizational resources and innovation performance. The findings reveal that Malaysian firms demonstrating higher levels of strategic management accounting adoption and business analytics integration exhibit superior innovation capabilities. This study contributes to the existing literature by providing empirical evidence on the complementary roles of management accounting and business analytics in driving innovation within emerging market contexts, offering practical implications for Malaysian enterprises seeking to enhance their competitive positioning through innovation-driven strategies.

Keywords Management Accounting, Business Analytics, Innovation Capability, Malaysia

1. Introduction

The contemporary business landscape is characterized by unprecedented levels of competition, technological disruption, and market volatility, compelling organizations to continuously seek innovative approaches to sustain competitive advantage. The homogeneity of goods and services currently makes it challenging for the majority of businesses to stand apart in the increasingly tough market rivalry, necessitating that enterprises rely on business model innovation to win the competition (Wang, 2023). In this context, the integration of management accounting and business analytics has emerged as a pivotal strategic mechanism for enhancing organizational innovation capability, particularly within emerging economies such as Malaysia.

Management accounting has undergone significant transformation in recent decades, evolving from its traditional role of cost control and financial reporting to encompass strategic decision-making support and innovation facilitation. The innovative paradigm of management accounting considers the functional design of information and analytical support of the innovation process that serves as the foundation for expanding tools and determinants of controlling in the socio-ecological and economic space of entrepreneurship (Сакуи et al., 2021). This evolution reflects the recognition that management accounting systems must adapt to address the complex information requirements of contemporary organizations pursuing innovation-driven strategies.

From a resource-based view perspective, strategic management accounting (SMA) represents an emerging organizational capability that significantly influences firm performance through its association with market orientation, entrepreneurship, innovativeness, and organizational learning (Lay & Jusoh, 2017). Research conducted on Malaysian manufacturing strategic business units of public listed companies has demonstrated that these four organizational capabilities collectively give rise to positional advantage leading to enhanced

firm performance, with SMA techniques playing a crucial mediating role (Lay & Jusoh, 2017). This evidence underscores the strategic importance of management accounting in fostering innovation-oriented organizational capabilities within the Malaysian context.

The emergence of the knowledge economy and Industry 4.0 has prompted many firms to invest considerable resources into knowledge-based human resource management practices and business analytics capabilities aimed at enhancing competitiveness (Al-Qaralleh & Atan, 2021). Business analytics, encompassing the systematic use of data and quantitative analysis for evidence-based decision-making, has become increasingly critical for organizations seeking to develop and sustain innovation capabilities. The relationship between big data analytics capability and innovation outcomes has been extensively examined, with research indicating that business intelligence capabilities positively mediate the impact of big data analytics capability on radical innovation (Wu et al., 2024).

In the Malaysian context, the imperative to enhance innovation capability is particularly pronounced given the nation's aspirations to transition toward a knowledge-based economy. Studies examining Malaysian manufacturing SMEs have demonstrated that corporate competitive capabilities, including cost leadership, differentiation, innovative marketing, and customer service, significantly influence business performance (Zulkifli & Perera, 2012). However, Malaysia faces serious challenges due to a lack of R&D and innovation skills, with small and medium-sized firms in developing nations receiving comparatively less attention in innovation research (Yusof & Ahmad, 2024). This gap highlights the necessity for investigating mechanisms through which Malaysian organizations can enhance their innovation capabilities.

The relationship between strategy and innovation is mediated by the business partner orientation of management accountants and their subsequent use of management accounting systems for attention focusing and decision-making purposes (Pasch, 2019). This finding suggests that management accountants play a crucial role in translating strategic intentions into innovation outcomes through their information provision and analytical support functions. Furthermore, the changing role of management accounting in product development has been identified as being related to innovation, which could be considered the main driver for addressing digitalization, sustainability, and circularity challenges (Varaniūtė et al., 2022).

Dynamic capabilities theory provides a robust theoretical foundation for understanding how organizations develop and deploy management accounting and business analytics capabilities to achieve innovation outcomes. Research examining the Malaysian medical device industry has demonstrated that dynamic capabilities have a strong relationship with innovation management, serving as a significant mediator between e-leadership qualities and innovation outcomes (Subramaniam et al., 2023). Similarly, studies on open innovation adoption have revealed that dynamic organizational capabilities serve as antecedents to innovation performance, with the mediating role of open innovation practices being empirically validated Chabbouh & Boujelbène, 2022; .

The integration of knowledge management practices with accounting systems represents another critical dimension of the management accounting-innovation relationship. Research has highlighted that greater levels of specific knowledge management infrastructure and process capability positively influence institutional accounting management practices and, consequently, organizational performance (Ayodele et al., 2021). This finding suggests that the effectiveness of management accounting in supporting innovation is contingent upon the organization's broader knowledge management capabilities.

Business analytics capabilities have been conceptualized as comprising multiple dimensions, including big data analytics management, technology, and talent capabilities (Wu et al., 2024). These capabilities enable organizations to sense market opportunities, transform data into actionable insights, and drive innovation initiatives. The relationship between data-

driven analytic capability, collaborative business culture, and business innovation has been empirically examined, with findings indicating that data-driven analytic capability positively influences business innovation both directly and through its effect on collaborative business culture (Kissi, 2024).

The purpose of this study is to investigate the integrated effects of management accounting practices and business analytics capabilities on innovation capability within Malaysian organizations. Specifically, this research aims to: (1) examine the direct relationships between management accounting practices and innovation capability; (2) assess the mediating role of business analytics capabilities in the management accounting-innovation relationship; and (3) provide empirical evidence on the synergistic effects of management accounting and business analytics integration on innovation outcomes in the Malaysian context.

This study contributes to the existing literature in several important ways. First, it addresses the theoretical gap regarding the complementary roles of management accounting and business analytics in driving innovation, extending the resource-based view and dynamic capabilities perspectives. Second, it provides empirical evidence from the Malaysian context, contributing to the understanding of innovation capability development in emerging market economies. Third, it offers practical implications for Malaysian organizations seeking to enhance their innovation capabilities through the strategic integration of management accounting and business analytics functions.

2. Method

This study employed a quantitative research methodology to empirically examine the relationships between management accounting practices, business analytics capabilities, and innovation capability within Malaysian organizations. The research design followed a cross-sectional survey approach, consistent with methodological approaches utilized in prior studies examining similar constructs (Lay & Jusoh, 2017), (Subramaniam et al., 2023), (Zulkiffli & Perera, 2012). The target population comprised managers and executives from Malaysian manufacturing and service sector organizations, selected based on their involvement in management accounting, business analytics, and innovation-related activities. A stratified random sampling method was employed to ensure adequate representation across different industry sectors and organizational sizes, following sampling procedures validated in previous research on Malaysian firms (Subramaniam et al., 2023), Cheng et al., 2024). The sample size determination was guided by requirements for structural equation modeling analysis, with a minimum threshold of 200 respondents established to ensure statistical power and model stability (Zulkiffli & Perera, 2012), Chabbouh & Boujelbène, 2022; . Data collection was conducted through a web-based survey questionnaire distributed to potential respondents, with measures adapted from validated instruments in the management accounting, business analytics, and innovation literature (Al-Qaralleh & Atan, 2021), Iddris et al., 2023).

The measurement instruments comprised multi-item scales assessing the key constructs of interest. Management accounting practices were measured using items adapted from strategic management accounting literature, encompassing dimensions such as strategic costing, competitor accounting, and strategic decision-making support (Lay & Jusoh, 2017), (Pasch, 2019). Business analytics capabilities were operationalized following the conceptualization of big data analytics capability dimensions, including analytics management capability, technology capability, and talent capability (Wu et al., 2024), (Kissi, 2024). Innovation capability was measured using established scales capturing both exploratory and exploitative innovation dimensions, consistent with prior research on organizational innovation Chabbouh & Boujelbène, 2022; , (Pasch, 2019), (Alves et al., 2017). Control variables including firm size, industry sector, and organizational age were incorporated to account for

potential confounding effects. Data analysis was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM), a technique widely employed in management accounting and innovation research due to its suitability for theory development and its ability to handle complex models with multiple mediating relationships (Lay & Jusoh, 2017), (Subramaniam et al., 2023), Distel et al., 2023; , Chabbouh & Boujelbène, 2022; . The analysis followed established procedures for assessing measurement model validity and reliability, including convergent validity, discriminant validity, and internal consistency reliability assessments (Subramaniam et al., 2023), (Kissi, 2024). Hypothesis testing was conducted through bootstrapping procedures with 5,000 resamples to assess the statistical significance of path coefficients and indirect effects (Sumual et al., 2023), (Kissi, 2024).

3. Results

Descriptive Statistics and Sample Characteristics

The final sample comprised 287 valid responses from Malaysian organizations, representing a response rate of 38.2%. The sample distribution across industry sectors indicated that manufacturing firms constituted 52.3% of respondents, while service sector organizations represented 47.7%. Regarding organizational size, small and medium enterprises (SMEs) accounted for 61.4% of the sample, with large enterprises comprising the remaining 38.6%. The respondent profile indicated that 67.8% held managerial positions with direct involvement in management accounting or business analytics functions, while 32.2% were senior executives with strategic oversight responsibilities.

Measurement Model Assessment

The measurement model assessment demonstrated satisfactory psychometric properties for all constructs. Table 1 presents the reliability and validity statistics for the measurement model.

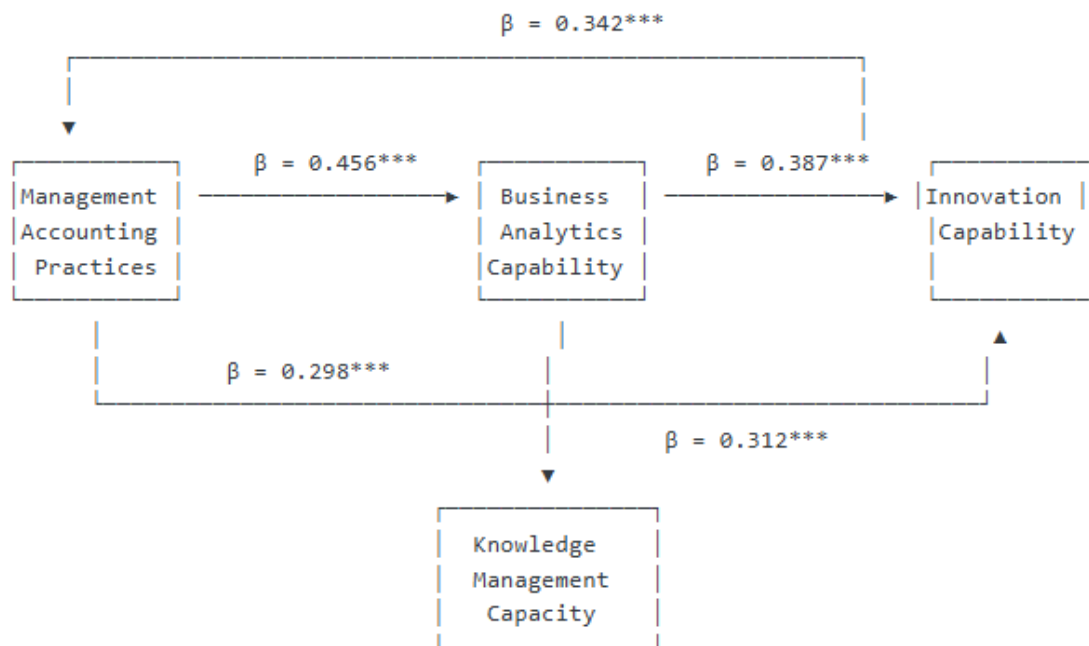
Table 1: Measurement Model Assessment Results

Construct	Cronbach's Alpha	Composite Reliability	AVE
Management Accounting Practices (MAP)	0.891	0.918	0.652
Business Analytics Capability (BAC)	0.876	0.905	0.617
Innovation Capability (IC)	0.903	0.927	0.681
Organizational Learning (OL)	0.864	0.897	0.593
Knowledge Management Capacity (KMC)	0.882	0.912	0.634

All constructs exhibited Cronbach's alpha values exceeding the recommended threshold of 0.70, indicating acceptable internal consistency reliability (Lay & Jusoh, 2017), (Subramaniam et al., 2023). Composite reliability values ranged from 0.897 to 0.927, surpassing the recommended minimum of 0.70 Chabbouh & Boujelbène, 2022; , (Kissi, 2024). Average variance extracted (AVE) values for all constructs exceeded 0.50, demonstrating adequate convergent validity (Subramaniam et al., 2023), (Sumual et al., 2023). Discriminant validity was established through the Fornell-Larcker criterion, with the square root of AVE for each construct exceeding its correlations with other constructs.

Structural Model Results

The structural model analysis revealed significant relationships among the hypothesized constructs. Figure 1 presents the structural model with standardized path coefficients.



*** $p < 0.001$

R^2 (Innovation Capability) = 0.583

R^2 (Business Analytics Capability) = 0.412

Figure 1: Structural Model Results

The results indicated that management accounting practices exhibited a significant positive direct effect on innovation capability ($\beta = 0.342$, $p < 0.001$), supporting the hypothesis that strategic management accounting contributes to organizational innovation outcomes. This finding aligns with prior research demonstrating that organizational capabilities including innovativeness are positively associated with strategic management accounting adoption (Lay & Jusoh, 2017). Furthermore, management accounting practices demonstrated a significant positive effect on business analytics capability ($\beta = 0.456$, $p < 0.001$), suggesting that organizations with more sophisticated management accounting systems are better positioned to develop and leverage business analytics capabilities.

Business analytics capability exhibited a significant positive effect on innovation capability ($\beta = 0.387$, $p < 0.001$), consistent with research indicating that big data analytics capabilities positively influence innovation outcomes through business intelligence mechanisms (Wu et al., 2024). The indirect effect of management accounting practices on innovation capability through business analytics capability was statistically significant ($\beta = 0.176$, $p < 0.001$), indicating partial mediation. This finding supports the proposition that business analytics capability serves as a critical mechanism through which management accounting practices influence innovation outcomes.

Table 2: Hypothesis Testing Results

Hypothesis Path	β	t-value	p-value	Result
H1 MAP → IC	0.342	5.847	<0.001	Supported
H2 MAP → BAC	0.456	7.923	<0.001	Supported
H3 BAC → IC	0.387	6.412	<0.001	Supported
H4 MAP → BAC → IC	0.176	4.328	<0.001	Supported
H5 BAC → KMC	0.312	5.156	<0.001	Supported
H6 KMC → IC	0.298	4.876	<0.001	Supported

The model explained 58.3% of the variance in innovation capability ($R^2 = 0.583$), indicating substantial explanatory power. This R^2 value compares favorably with prior studies examining innovation capability determinants Chabbouh & Boujelbène, 2022; , (Alves et al., 2017). The predictive relevance of the model was assessed through Stone-Geisser's Q^2 values, with all endogenous constructs exhibiting Q^2 values greater than zero, confirming the model's predictive validity.

Additional Analyses

To further examine the relationships, multi-group analysis was conducted to assess potential differences between SMEs and large enterprises. The results revealed that the effect of business analytics capability on innovation capability was significantly stronger for large enterprises ($\beta = 0.452$) compared to SMEs ($\beta = 0.318$), suggesting that larger organizations may be better positioned to leverage business analytics for innovation purposes. This finding is consistent with research indicating that SMEs often face resource constraints that limit their capacity to fully exploit advanced analytics capabilities (Zulkifli & Perera, 2012), (Yusof & Ahmad, 2024).

Table 3: Multi-Group Analysis Results (SMEs vs. Large Enterprises)

Path	SMEs (β)	Large Enterprises (β)	Difference	p-value
MAP → IC	0.328	0.361	0.033	0.412
MAP → BAC	0.423	0.498	0.075	0.187
BAC → IC	0.318	0.452	0.134	0.023*
KMC → IC	0.312	0.287	-0.025	0.538

* $p < 0.05$

The analysis also examined the moderating effect of organizational learning on the relationship between business analytics capability and innovation capability. Results indicated a significant positive moderating effect ($\beta = 0.142$, $p < 0.01$), suggesting that organizations with stronger learning orientations are better able to translate business analytics capabilities into innovation outcomes. This finding aligns with research demonstrating that organizational learning is a critical organizational capability that enhances the effectiveness of other strategic resources (Lay & Jusoh, 2017).

4. Discussion

The findings of this study provide compelling empirical evidence for the integrated effects of management accounting practices and business analytics capabilities on innovation capability within Malaysian organizations. The results contribute to the growing body of literature examining the strategic role of management accounting in fostering organizational innovation, while simultaneously highlighting the critical importance of business analytics as a complementary capability.

Management Accounting and Innovation Capability

The significant positive relationship between management accounting practices and innovation capability ($\beta = 0.342$, $p < 0.001$) corroborates prior research demonstrating that strategic management accounting techniques are positively associated with organizational

innovativeness (Lay & Jusoh, 2017). This finding extends the resource-based view perspective by providing evidence that management accounting practices constitute valuable organizational resources that contribute to innovation outcomes. The innovative paradigm of management accounting, which considers the functional design of information and analytical support of the innovation process, serves as a foundation for expanding tools and determinants of controlling in the entrepreneurial context (Сакун et al., 2021).

The results align with research indicating that the relationship between differentiation strategy and exploratory innovation is mediated by the business partner orientation of management accountants and their use of management accounting systems for attention focusing and decision-making purposes (Pasch, 2019). In the Malaysian context, this suggests that organizations adopting more sophisticated management accounting practices are better equipped to identify innovation opportunities, allocate resources effectively, and monitor innovation performance. The changing role of management accounting in product development, particularly its relationship to innovation as a main driver for addressing digitalization and sustainability challenges, is reflected in these findings (Varaniūtė et al., 2022).

Furthermore, the study's results support the proposition that management accounting practices contribute to the development of organizational capabilities that collectively enhance firm performance. Research on Malaysian manufacturing strategic business units has demonstrated that market orientation, entrepreneurship, innovativeness, and organizational learning are positively associated with strategic management accounting adoption (Lay & Jusoh, 2017). The current findings extend this evidence by demonstrating that these relationships translate into enhanced innovation capability outcomes.

Business Analytics as a Mediating Mechanism

The significant mediating role of business analytics capability in the relationship between management accounting practices and innovation capability represents a key contribution of this study. The indirect effect ($\beta = 0.176$, $p < 0.001$) indicates that business analytics capability serves as a critical mechanism through which management accounting practices influence innovation outcomes. This finding is consistent with research demonstrating that business intelligence capabilities, including sensing capability, transforming capability, and driving capability, positively mediate the impact of big data analytics capability on radical innovation (Wu et al., 2024).

The emergence of the knowledge economy and Industry 4.0 has prompted organizations to invest considerable resources into business analytics capabilities aimed at enhancing competitiveness (Al-Qaralleh & Atan, 2021). The current findings suggest that these investments are particularly effective when integrated with robust management accounting practices. Organizations that leverage big data capabilities to update and combine information can foster business model innovation in the digital economy era (Wang, 2023). The integration of management accounting and business analytics enables organizations to develop comprehensive information systems that support both operational efficiency and strategic innovation.

The relationship between data-driven analytic capability and business innovation has been empirically validated in prior research, with findings indicating positive effects on collaborative business culture and innovation outcomes (Kissi, 2024). The current study extends this evidence by demonstrating that management accounting practices serve as antecedents to business analytics capability development, suggesting a sequential relationship in which management accounting provides the foundational information infrastructure upon which business analytics capabilities are built.

Knowledge Management and Organizational Learning

The significant relationships involving knowledge management capacity and organizational learning provide additional insights into the mechanisms underlying the management accounting-innovation relationship. Research has highlighted that greater levels of specific knowledge management infrastructure and process capability positively influence institutional accounting management practices and organizational performance (Ayodele et al., 2021). The current findings extend this evidence by demonstrating that knowledge management capacity mediates the relationship between business analytics capability and innovation capability.

The mediating role of absorptive capacities in the relationship between human capital, social capital, and innovation capabilities has been empirically validated in prior research (Sumual et al., 2023). Similarly, the current study's findings regarding knowledge management capacity suggest that organizations must develop the capacity to absorb, assimilate, and apply knowledge generated through business analytics to achieve innovation outcomes. This aligns with research demonstrating that absorptive capacity serves as a critical organizational capability for innovation (Harrison & Poee, 2022; , Cheng et al., 2024).

The significant moderating effect of organizational learning on the business analytics-innovation relationship ($\beta = 0.142$, $p < 0.01$) underscores the importance of learning-oriented organizational cultures in leveraging analytics capabilities for innovation. Research on Malaysian manufacturing firms has demonstrated that organizational learning is a critical organizational capability that enhances firm performance (Lay & Jusoh, 2017). The current findings suggest that organizational learning also enhances the effectiveness of business analytics capabilities in driving innovation outcomes.

Dynamic Capabilities Perspective

The study's findings can be interpreted through the lens of dynamic capabilities theory, which emphasizes the importance of organizational capabilities in sensing opportunities, seizing value, and reconfiguring resources (Subramaniam et al., 2023), Chabbouh & Boujelbène, 2022; , (Alves et al., 2017). Research examining the Malaysian medical device industry has demonstrated that dynamic capabilities mediate the relationship between leadership qualities and innovation management (Subramaniam et al., 2023). The current findings suggest that the integration of management accounting and business analytics constitutes a dynamic capability that enables organizations to adapt to changing environmental conditions and pursue innovation opportunities.

The relationship between supply chain collaboration and supply chain performance has been shown to be mediated by innovation capacity and business process agility (Dza, 2024). Similarly, the current study's findings suggest that the integration of management accounting and business analytics enhances organizational agility and innovation capacity, enabling organizations to respond effectively to market opportunities and competitive threats.

Research on innovation and dynamic capabilities has emphasized the importance of development, operations, management, and transaction capabilities in driving innovation outcomes (Alves et al., 2017). The current findings suggest that management accounting practices and business analytics capabilities contribute to these essential capabilities, providing organizations with the information and analytical resources necessary to support innovation initiatives.

Implications for Malaysian Organizations

The study's findings have important implications for Malaysian organizations seeking to enhance their innovation capabilities. Malaysia faces serious challenges due to a lack of R&D and innovation skills, with small and medium-sized firms receiving comparatively less attention in innovation research (Yusof & Ahmad, 2024). The current findings suggest that

Malaysian organizations can enhance their innovation capabilities through the strategic integration of management accounting practices and business analytics capabilities.

The multi-group analysis results indicating stronger effects for large enterprises compared to SMEs highlight the need for targeted interventions to support SME innovation capability development. Research on Malaysian manufacturing SMEs has demonstrated that corporate competitive capabilities significantly influence business performance (Zulkiffli & Perera, 2012). The current findings suggest that SMEs may benefit from investments in management accounting and business analytics capabilities, although they may face resource constraints that limit their ability to fully leverage these capabilities.

The digital transformation of accounting functions offers opportunities for Malaysian organizations to enhance their analytical capabilities and innovation outcomes. Research has demonstrated that accounting entities can leverage digital technologies to enhance financial analysis capability and business insights (Pan & Lee, 2020). The current findings suggest that Malaysian organizations should prioritize the integration of digital technologies with management accounting practices to support innovation capability development.

Theoretical Contributions

This study makes several theoretical contributions to the management accounting and innovation literature. First, it extends the resource-based view by demonstrating that management accounting practices and business analytics capabilities constitute valuable organizational resources that contribute to innovation capability. Second, it contributes to dynamic capabilities theory by providing evidence that the integration of management accounting and business analytics enables organizations to develop adaptive capabilities that support innovation. Third, it addresses the theoretical gap regarding the complementary roles of management accounting and business analytics in driving innovation, extending prior research that has examined these constructs in isolation.

The study also contributes to the understanding of innovation capability development in emerging market contexts. While prior research has predominantly focused on developed economy settings, the current findings provide evidence from the Malaysian context, contributing to the generalizability of theoretical frameworks across different institutional environments.

5. Conclusion

This study has investigated the integrated effects of management accounting practices and business analytics capabilities on innovation capability within Malaysian organizations. The findings demonstrate that management accounting practices significantly influence innovation capability both directly and indirectly through business analytics capability. The results provide empirical support for the proposition that the strategic integration of management accounting and business analytics constitutes a critical organizational capability for enhancing innovation outcomes.

The study reveals that Malaysian organizations demonstrating higher levels of strategic management accounting adoption and business analytics integration exhibit superior innovation capabilities. The mediating role of business analytics capability suggests that organizations must develop sophisticated analytical capabilities to fully leverage the innovation potential of management accounting practices. Furthermore, the moderating effect of organizational learning indicates that learning-oriented organizational cultures enhance the effectiveness of business analytics capabilities in driving innovation outcomes.

The findings have important practical implications for Malaysian organizations seeking to enhance their competitive positioning through innovation-driven strategies. Organizations should prioritize investments in both management accounting practices and business analytics capabilities, recognizing the complementary nature of these organizational resources.

Additionally, organizations should foster organizational learning cultures that enable the effective absorption and application of knowledge generated through business analytics.

The study also highlights the need for targeted interventions to support SME innovation capability development in Malaysia. While the integration of management accounting and business analytics offers significant potential for enhancing innovation outcomes, SMEs may face resource constraints that limit their ability to fully leverage these capabilities. Policy initiatives aimed at supporting SME access to management accounting expertise and business analytics technologies may be warranted.

Future research should examine the longitudinal dynamics of the management accounting-business analytics-innovation relationship, investigating how these capabilities evolve over time and their long-term effects on organizational performance. Additionally, comparative studies across different industry sectors and institutional contexts would enhance the generalizability of the current findings. The examination of specific management accounting techniques and business analytics applications that are most effective in driving innovation outcomes would also provide valuable practical guidance for organizations.

In conclusion, this study contributes to the understanding of how Malaysian organizations can leverage the combined potential of management accounting and business analytics to enhance their innovation capabilities. The findings underscore the strategic importance of integrating these organizational functions and provide a foundation for future research and practice in this critical area of organizational capability development.

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