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Unveiling the Mediating Effect of Intellectual Capital on the Relationship between Management Control System, Management Accounting, and Business Performance

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Abstract
In today's knowledge-driven economy, organizations compete through their intellectual capital (IC). However, effectively leveraging IC requires robust management control systems (MCS) and sound management accounting (MA) practices. Despite theoretical arguments, empirical evidence on the interplay between these elements and their combined impact on performance remains limited. This study addresses this gap by investigating how MCS and MA influence IC development and how IC subsequently affects business performance within Saudi Arabian companies. Data were collected through a questionnaire survey sent to diverse manufacturing and service companies and analyzed using structural equation modeling with AMOS software. Findings reveal that comprehensive MCS drives increased use of MA tools, both contributing to IC development, although MCS's influence operates indirectly through MA. Importantly, this study provides strong empirical support for the positive and significant impact of IC on business performance. Interestingly, IC fully mediates the relationships between MCS/MA and performance, suggesting that the direct effects of these practices lack independent influence. These findings underscore the critical role of aligning MCS and MA with IC components. By establishing processes, systems, and environments that foster knowledge creation, information networks, organizational learning, and capabilities, companies can unlock the full potential of IC for improved performance. This study offers valuable insights for managers seeking to optimize their control and accounting practices to build a strong foundation for sustainable competitive advantage through enhanced intellectual capital.

Keywords- Knowledge management, Management control system, Management accounting, Intellectual capital, Performance.

1. Introduction

In today's global and information-oriented economy, knowledge management, including effective intellectual capital management, is a critical challenge for organizations (Walczak, 2005). The notion of organizational knowledge has been extended by the emergence of the intellectual capital concept, which focuses on the individual's knowledge and the structure of organizations that allow the knowledge to grow and expand (Novas et al., 2017). Intellectual capital refers to the intangible resources that create value for the organization (Ashton, 2005). Successful knowledge management requires a managerial support structure and systems (Goh, 2003; Gold et al., 2001; Swan et al., 2000). Knowledge management does not relate to a single activity but requires the coordination and engagement of different organizational spheres (Bhimani and Roberts, 2004; Tayles et al., 2002), including financial and non-financial mechanisms and measurements (Tayles et al., 2007), which act as the building blocks of MCS, providing both quantitative and qualitative insights into organizational performance. These elements are then shaped and monitored by MA practices to ensure that they align with strategic objectives and drive desired knowledge management behaviors. Research in the areas of management control, management accounting, performance measurement, and performance management is intertwined. As a result, these terms have been used interchangeably (Chenhall, 2003) in the literature related to organizational, institutional, contingency, and other managerial theories. Therefore, researchers have reported difficulties in stipulating a clear and distinct definition for these terms or concepts (Chenhall, 2003; Franco-Santos et al., 2007; Malmi and Brown,

2008). In this study, MA refers to a group of techniques and practices, such as costing tools, profitability analysis tools, budgeting tools, performance measurement, and performance management tools, that are used to provide specific information for one or more organizational functions. MCS refers to several types of controls established in the form of activities and processes designed to ensure the effectiveness of operations, the efficiency of resource allocation, and the administration of communication, coordination, and motivation. Hence, MCS provides an essential framework for creating an environment where knowledge can be effectively captured, shared, and used.

If intellectual capital is about knowledge, MCS and MA should contribute fundamentally to the management and development of this knowledge. Researchers have attempted to clarify the role of management accounting in recognizing, measuring, and managing IC e.g. (Cleary, 2015; Guthrie et al., 2012; Toorchi et al., 2015). However, although there is ongoing discourse regarding the significance of intellectual capital in enhancing organizational competitiveness, the extent to which MCS and MA can actively contribute to this remains uncertain (Cleary, 2015). While MA provides relevant and timely information for decision making, MCS ensures the proper execution of those decisions and evaluates their outcomes. The information provided by MA and controlled by MCS is processed by individuals and departments within the organizations, which reinforces organizational learning and consequently develops intellectual capital. Accordingly, organizations need to design and maintain their MCS and MA tools in coherence with other organizational functions for optimal knowledge management and intellectual capital development (Novas et al., 2017).

Galabova and Daskalova (2020) proposed a framework on how intangibles, and more specifically intellectual capital elements, can be embedded as a part of a contemporary MCS. They suggested that MCS could be used to improve intellectual capital by incorporating intangible assets such as human capital, structural capital, and relational capital into the control system. An enabling MCS design can stimulate the development of valuable local knowledge and relationships as intellectual capital (Coyte, 2019). Furthermore, an adequate MCS design can contribute to the externalization of tacit knowledge and transform it into explicit knowledge, which reinforces intellectual capital. Therefore, MCS can help assess and measure the performance of intangible assets, which are key factors in creating competitive advantages for companies (Dana et al., 2021). Management accounting, on the other hand, can help in the accounting and reporting of intellectual property, addressing issues related to its organization, diversity, and content (Hariyati et al., 2023). By managing and monitoring intellectual capital using advanced management tools and implementing evaluation and incentive systems, companies can achieve higher and more stable performance (Truant, 2017). In turn, intellectual capital enhances innovation, knowledge management, and operational processes and contributes to the value and competence of an organization, leading to improved performance (Bansal et al., 2023; Lores et al., 2023; Ameli kalkhoran et al., 2022; Shabbir et al., 2023).

Organizations rely heavily on intangible assets such as IC for a competitive advantage. However, unlocking the full potential of IC requires effective management, which is where robust MCS and sound MA practices come in. Yet, despite theoretical assertions, there is a critical gap in empirical evidence demonstrating how these elements intertwine and jointly influence business performance. Hence, organizations may be unknowingly neglecting a vital lever for sustainable growth. This research aims to address this gap by providing empirical evidence on the specific mechanisms through which MCS and MA practices empower IC development and how a robust IC foundation ultimately translates into superior performance. By illuminating these relationships, this study can help businesses optimize their control and accounting systems to unlock the full potential of their intellectual capital, thus fostering sustainable competitive advantage. Therefore, this study investigates the role of MCS and MA in the development of IC and examines its direct effect on corporate performance. In addition, the present study examines the mediating

role of IC in the relationships between MCS, MA, and performance considering the complementary features of MCS and MA. This study contributes to the literature in different ways. First, it provides a holistic view of the relationships between MCS and MA components and how they affect the development of IC components (human, relational, and structural). Second, it illustrates how the effect of MCS and MA on performance passes through the developed IC. Third, this study demonstrates the direct and indirect effects of the variables included in the model on business performance.

The remainder of this paper is organized as follows: The next section reviews the literature and provides a foundation for developing research hypotheses. The methodology section will then detail the research design, data collection methods, and analysis techniques employed to test the hypotheses. Following this, the results section will present the key findings of this study clearly and concisely. In the discussion section, the results will be interpreted in light of the existing literature. Finally, the conclusion section summarizes the main findings of the study and discusses their broader implications.

2. Literature Review and Hypotheses Development

2.1 Literature Review

Organizational knowledge is the systematic employment of individuals and collective experiences within an organization that reflects the members' capability to perform work and processes with mutual understanding (Tsoukas and Vladimirou, 2001). The majority of an organization's knowledge comes from its employees and serves as their primary source of value creation (Ali & Tang, 2023; Rogers, 2001). Nevertheless, the question of legal ownership for this type of organizational knowledge remains uncertain. Therefore, companies face the challenge of integrating it into their core operations to harness its long-term value and potentially impact future performance. Firms must seamlessly incorporate this valuable knowledge into their core processes to ensure its long-term impact on organizational performance (Alkhatib and Valeri, 2024; Bontis and Fitz-enz, 2002; do RosÃ and Vaz, 2006; García-Ayuso, 2003; Wang and Chang, 2005). The concept of intellectual capital has broadened the understanding of organizational knowledge. This shift in focus emphasizes both individual knowledge and the organizational structure that facilitates knowledge growth and expansion (Novas et al., 2017). CIMA (2001) defines IC as *"the possession of knowledge and experience, professional knowledge and skills, good relationships, and technological capacities, which when applied will give organizations competitive advantage"*. Despite the absence of a general agreement among researchers on the precise definition of IC, there is a broad consensus that IC comprises three main components: human capital, structural capital, and relational capital (Cleary, 2015; Paoloni et al., 2023). Human intellectual capital encompasses the knowledge, expertise, professional skills, and innovative thinking of employees. Structural intellectual capital includes intangible assets such as patents (innovation capital) and organizational procedures and processes for efficient operations (process capital). Relational intellectual capital represents knowledge related to market channels, customer-supplier relationships, and connections with governmental or industry networks (Kazemian et al., 2020; Tayles et al., 2007).

For organizations that rely on knowledge-based activities and innovation to generate profits, effective knowledge management (including IC) requires the measurement of knowledge (Paoloni et al., 2023). Researchers argued that accountants working in organizations with significant intellectual capital should adopt a strategic management accounting approach. This means placing increased emphasis on assessing, evaluating, and quantifying IC to prevent the neglect of the organization's most valuable assets (Tayles et al., 2002). Management accounting provides tools for knowledge management that contribute to the development of intellectual capital by providing the needed information on a timely basis (Bresciani et al., 2023; Edwards et al., 2005). The increased importance of IC has necessitated the creation and implementation of management systems that are capable of supporting knowledge-based competencies

within the organization, something that had not previously been prioritized (Isaac et al., 2009).

This research draws upon the resource-based view (RBV) to investigate the interplay between management control systems (MCS), management accounting (MA) practices, and intellectual capital (IC), ultimately analyzing their combined impact on organizational performance. The RBV posits that a firm's competitive advantage is determined by its unique and valuable resources, which can be both tangible and intangible (Wernerfelt, 1984). In the knowledge-driven economy, IC emerges as a critical intangible resource that encompasses knowledge, skills, organizational routines, and other capabilities that are difficult to imitate and contribute significantly to sustained performance. This research aligns with the RBV by considering IC as a key strategic resource (Grant, 1996) and exploring how MCS and MA practices facilitate its development and leverage. This study posits that robust MCS structures and sound MA tools directly contribute to the increased use of IC components, ultimately generating a competitive advantage and enhanced performance (Merchant and Van der Stede, 2007). Building upon the RBV, the research framework goes beyond individual resource analysis, investigating the synergistic interplay between MCS, MA, and IC in fostering superior performance (Subramaniam and Youndt, 2005). By employing the RBV lens, we gain a deeper understanding of how firms can strategically manage their intangible resources and derive maximum value from their intellectual capital for sustainable success.

2.2 Hypotheses Development

In recent years, management accounting research has paid considerable attention to the management of intellectual capital. Some studies, such as those by Widener (2004) and Tayles et al. (2007), have focused on how IC influences the development of MAS and the design of MCS. Additionally, these studies suggest that MA and MCS are shaped by their operating contexts. Other research has shifted its focus toward examining how management accounting plays a role in fostering the development of intellectual capital. In this line of inquiry, MA functions as a valuable instrument that directs managerial attention and facilitates comprehension of specific elements that are vital for organizational success (Cleary, 2015; Skoog, 2003; Tayles et al., 2002). Management accounting systems offer a range of indicators, both financial and non-financial, that are tailored to the unique strategies and goals of each organization. These indicators help identify opportunities for leveraging new knowledge and strengthening existing knowledge (Edwards et al., 2005). Thus, MA facilitates the necessary conditions for knowledge acquisition, which serves as the foundation for creating intellectual capital (Lyn, 2000). The process of knowledge creation places significant emphasis on IC. The involvement of MA in the process can be observed through its ability to offer information that facilitates the growth of IC and its capability to capture and encode the human capital generated within an organization, thus enabling the development of other intellectual capital dimensions. Considering that human capital arises from the integration of competency, attitude, and intellectual ability among members of an organization, it is essential to evaluate how MA provides support for fostering or enhancing these connections (Novas et al., 2017). Management accountants play a crucial role in the management of intellectual capital. Their focus is on optimizing the usage of existing information and knowledge within the organization to improve organizational performance (Tayles et al., 2002). Based on the above discussion, the following hypothesis is proposed:

***H*1:** Increased use of MA tools supports the development of IC.

MCS is a set of policies, procedures, and practices that managers use to ensure that the organization is achieving its goals and objectives (Abernethy and Brownell, 1997; Bisbe and Otley, 2004). Recently, research on MCS has changed the focus from demonstrating the design and application of several controls to comprehending the way they are used and integrated with other organizational functions (Hudson et al., 2001), their outcomes (Franco-Santos et al., 2012), their effect on organizational effectiveness (Pešalj et

al., 2018), and their consequences on corporate performance (Pavlov and Bourne, 2011). Feedback provided by MA on financial performance (e.g. short-term financial results) and non-financial performance (e.g. customer relations, quality, and innovation) assists managers in making different classes of decisions related to operations and cost (Tappura et al., 2015), performance evaluation (Ittner et al., 2003), and risk prevention (Ibarrondo-Dávila et al., 2015). Hence, management accounting tools are used to collect, analyze, and report financial and non-financial information that managers need to design, implement, and monitor their control systems. With the growing recognition of the significance of intangibles in driving profitable businesses, there is an increasing need for accounting to effectively capture, quantify, and communicate the value and performance of intellectual capital (Beattie and Smith, 2013). This implies that organizations with effective MCSs will be more successful in facilitating these efforts. Accordingly, the following hypotheses are proposed:

***H*2**: Extensive use of MCS involves increased use of MA tools.

***H*3**: Extensive use of MCS contributes significantly to the development of IC.
H*3*a: *MCS has a direct positive effect on the development of IC.*
H*3*b: *MCS has an indirect positive effect on IC development through MA.*

Firms perceive their employees' knowledge to be the main component of their intellectual capital (Chan & Lee, 2011). Although the "tacit knowledge" of human capital is difficult to evaluate and document, it is a major resource for competitive advantage (Norman, 2002). Measuring a firm's intellectual capital and its impact on business performance is complex, as there is no universally accepted method for assessing IC (Clarke et al., 2011). Nonetheless, previous research has consistently shown a strong correlation between business performance and specific components of intellectual capital such as human capital (Mention & Bontis, 2013), structural capital (F-Jardón & Martos, 2009; Novas et al., 2017), relational capital and structural capital (Cabrita and Bontis, 2008; Sharabati et al., 2010), or the three dimensions of IC (Human, Structural, and relational), as reported by (Hussinki et al., 2017). One potential explanation for the variation in findings reported in previous studies could be attributed to the diverse countries and industries where these studies have taken place. Thus, research on intellectual capital heavily relies on its contextual application, which contributes to the differences observed across different studies (Mouritsen, 2006). Stated formally:

***H*4**: IC has a direct positive effect on performance.

Various studies conducted by MA researchers have emphasized the significance and advantages of advanced MA in delivering value to organizations through efficient resource utilization (Cagwin and Bouwman, 2002; Liu and Pan, 2007; Maiga and Jacobs, 2008). Moreover, these studies report positive effects on overall corporate performance (Baines and Langfield-Smith, 2003) as well as specific areas of financial and non-financial performance (Fuzi et al., 2019; Latan et al., 2018). The implementation of advanced MA tools has been argued to enhance managerial efficiency within companies, leading to improved organizational performance (Al-Dhubaibi et al., 2023; Nuhu et al., 2016). Furthermore, the incorporation of information from MAS into decision-making processes can lead to improved management and utilization of resources (Bourne et al., 2005; Stede et al., 2006). This will ultimately improve the effectiveness and efficiency of resource employment and deployment (Ahrens and Chapman, 2004; Hudson et al., 2001). The incorporation of non-financial metrics in performance evaluation, such as the adoption of a balanced scorecard methodology, is linked to improved organizational performance (Davis and Albright, 2004). When faced with increased levels of competition, firms tend to rely more on the information generated by their management accounting systems to develop, execute, and monitor strategies. This

strategic response correlates with enhanced business performance (Mia and Clarke, 1999).
Management accounting in knowledge-based organizations has been improved and expanded to address the growing significance of intellectual capital for subsequent business performance (Gowthorpe, 2009; Novas et al., 2017). Cleary (2015), provided evidence to support the suggested link between advanced MA systems and business performance. In addition, this study's findings align with prior research on the connection between the three components of IC (human, structural, and relational) and business performance. Hence, the following research hypotheses are suggested.

***H*5:** MA has a positive effect on performance.
*H*5*a: MA has a direct positive effect on performance.*
*H*5*b: MA has an indirect positive effect on performance through IC.*

Management control systems play a crucial role in shaping corporate performance in contemporary organizations. These systems provide the necessary structure and processes to ensure the effective implementation of strategies, allocate resources efficiently, monitor performance, and make informed decisions (Bedford, 2015; Bruggeman and Stede, 1993; Davila and Foster, 2009). According to Simons (1994), senior executives have effectively employed a comprehensive control system consisting of four components (beliefs, boundaries, diagnostics, and interactions) to promote awareness, secure support for, and direct organizational efforts toward the successful implementation of new strategic initiatives. Furthermore, Simons (1995) provided evidence that these four control levers contribute to organizational learning and enhance managerial capabilities, ultimately improving overall performance. Later studies elaborated that the implementation of an interactive control system enhances organizational capabilities in areas such as market orientation, entrepreneurship, and organizational learning (Henri, 2006). This, in turn, amplifies the impact of innovation on overall organizational performance (Bisbe and Otley, 2004). Novas et al. (2017) argued that diagnostic and interactive management control systems can enhance organizational performance by positively impacting intellectual capital in terms of human and structural assets.

Management control system positively influences managerial performance (Beuren and Vaz, 2021) and improves overall organizational performance by directing management attention and promoting organizational learning (Widener, 2007). Furthermore, it has been emphasized that the application of a management control system, when used effectively, enhances corporate competitiveness and improves both financial and non-financial performance by supporting organizational learning (Chenhall, 2005; Hult, 1998; Tippins and Sohi, 2003). Prior research has suggested several factors that intervene in the effect of MCS on performance. For instance, the impact of MCS on performance is strengthened through the mediation of cost efficiency (Diefenbach et al., 2018) and effective utilization of assets (Nartey et al., 2020). Organizations can optimize their resources and streamline operations by efficiently managing costs and effectively using assets, ultimately leading to improved overall performance. In environmental management, control systems play a vital role in mediating the relationship between environmental strategy and managerial performance (Rötzel et al., 2019). Based on the arguments in this and previous sections, the following hypotheses are developed:

***H*6:** MCS has a positive effect on performance.
*H*6*a: MCS has a direct positive effect on performance.*
*H*6*b: MCS has an indirect positive effect on performance through MA.*
*H*6*c: MCS has an indirect positive effect on performance through IC.*

3. Methodology

3.1 Research Design

This study adopts a quantitative approach to investigate the influence of management control systems (MCS), management accounting (MA) practices, and intellectual capital (IC) development on business performance within Saudi Arabian companies. Specifically, it employs a survey research design to gather data from a diverse sample of manufacturing and service companies in Saudi Arabia. A structured questionnaire, carefully developed based on existing literature and pre-tested for reliability and validity, was used to collect data on the variables. Structural equation modeling (SEM) with AMOS software was used to analyze the data, allowing for a comprehensive examination of the complex relationships between MCS, MA, IC, and business performance, while accounting for potential interaction effects and mediating variables. This approach enables the study to move beyond simple correlations and unveil the underlying causal mechanisms through which these factors contribute to performance and business success.

3.2 Sample and Data

Historically, researchers of MA and MCS have focused on manufacturing firms because of their relatively large sizes, complicated operations, and need to determine and manage the cost of products (Pavlatos and Paggios, 2009). Considering the lack of empirical studies in the domains of MA and MCS practices in non-manufacturing firms, researchers have called for more research on these domains in service, financial, construction, health, and other types of firms (Macinati and Anessi-Pessina, 2014). In response to this call, the data of this study were collected from diverse manufacturing and service companies using a simple random technique from a comprehensive list of large and medium-sized companies with head offices in Riyadh province, where the main Saudi businesses are located. Of the 387 questionnaires distributed, 152 valid responses were received. This response rate (39.27%) is similar to or higher than the response rate of some other studies conducted in the same region on MA and MCS, e.g., McLellan and Moustafa (2011) with a response rate of 34% and Joshi et al. (2011) with a response rate of 23%. Both studies were conducted in the Gulf Cooperation Council countries (Saudi Arabia, United Arab Emirates, Qatar, Oman, Bahrain, and Kuwait). This response rate is not uncommon as many research papers with similar response rates in the same areas of study have been conducted in several parts of the world and published in reputable journals, e.g., Gomez-Conde et al. (2023) with a response rate of 38.8% and Tayles et al. (2007) with a response rate of 44%. Hiebl and Richter (2018) conducted a study of 140 survey articles published in leading specialist journals of management accounting research, namely the Journal of Management Accounting Research and Management Accounting Research. Their findings revealed a decrease in response rates within management accounting research over recent years.

The questionnaire encompasses four sections. The first section provides a brief background on the respondent's firm. The second section evaluates the extent of MCS practices and the level of MA use by the responding firms. For this aim, the term "extensive use of MCS" refers to the widespread implementation of MCS across different departments, functions, and levels within an organization; and the high level of utilization, which implies that MCS is heavily relied upon for decision-making, performance evaluation, and strategic planning. A seven-point Likert scale is used with 1 = "never used" and 7 = "extensively used". The 13 items included in this section were adopted from (Abdel-Kader and Luther, 2006; Kruis, 2008; Waweru et al., 2004) with appropriate modifications to serve the purpose of this study. The third section assesses the status of the IC by measuring the implementation of practices related to human capital, relational capital, and structural capital using nine items. The items of this construct were adopted from Novas et al. (2017). The last section solicits respondents' assessment of their firms' performance using six financial and non-financial indicators related to profitability, sales, cost, quality, services, and innovation. Self-reported measurement of performance is widely used (Wall et al., 2004), especially when objective measures of performance are not available to the researcher (Dess and Robinson,

1984). These reasons cause a substantial body of prior research to use the self-reported measure of performance, for example, (Henri, 2006; Maiga and Jacobs, 2008; Tayles et al., 2007; Tsamenyi et al., 2011).

Structural equation modeling using AMOS 21 software was used to analyze the data and test the proposed hypotheses. Researchers e.g., Abdel-Maksoud et al. (2016) have recommended the use of multivariate analysis (path analysis) to detect the interdependence between MCS, MA, and other organizational functions. Path analysis was used to examine the interrelated causal effects stated in the research hypotheses (Davis, 1985; Hair et al., 2014; Ho, 2006). SEM allows researchers to test multiple interrelated effects between exogenous, mediators, and endogenous variables in one model (Bisbe and Otley, 2004). Following Anderson and Gerbing (1988) and Hair et al. (2014), multivariate analysis was performed in two phases. First, the measurement models (latent variables) were validated using confirmatory factor analysis (CFA). Second, the hypotheses were tested using a structural model.

3.3 Path Model

The path model in **Figure 1** proposes that MCS has indirect effects on PER as follows: MCS affects MA, which in turn affects PER; MCS affects IC, which in turn affects PER; and MCS affects IC again, but this time passes through MA to affect PER. Furthermore, MA has a direct effect on PER and an indirect effect whereby it affects IC, which in turn affects PER. IC has a direct effect on PER but no indirect effects.

To obtain the path coefficients, three structural equations are used:

(i) $MA = \beta 0 + \beta 1MCS + \varepsilon$.

(ii) $IC = \beta 0 + \beta 1MCS + \beta 2MA + \varepsilon$.

(iii) $PER = \beta 0 + \beta 1MCS + \beta 2MA + \beta 3IC + \varepsilon$.

where, MCS = management control system, MA = management accounting, IC = intellectual capital, and PER = performance.

In these equations, $\boldsymbol{\beta 0}$ represents the intercept for each equation. It indicates the predicted value of the dependent variable (MA, IC, or PER) when all the independent variables (MCS, MA, and IC) are zero. This means that it captures the effect of any unobserved variables not included in the model that might influence the dependent variable. $\boldsymbol{\beta 1}$ represents the direct effect of MCS on each dependent variable. It shows how much change is expected in the dependent variable (MA, IC, or PER) for a one-unit increase in MCS, holding all other variables constant. $\boldsymbol{\beta 2}$ represents the direct effect of MA on IC and PER. It shows how much change is expected in IC or PER for a one-unit increase in MA, holding all other variables constant. $\boldsymbol{\beta 3}$ represents the direct effect of IC on PER. It shows how much change is expected in PER for a one-unit increase in IC, holding all other variables constant. $\boldsymbol{\varepsilon}$ represents the error term. It captures the influence of unobserved variables and random errors on the dependent variable. The coefficients included in the equations are standardized path coefficients, meaning that they represent the change in the dependent variable in units of its standard deviation for a one-unit change in the independent variable in units of its standard deviation.

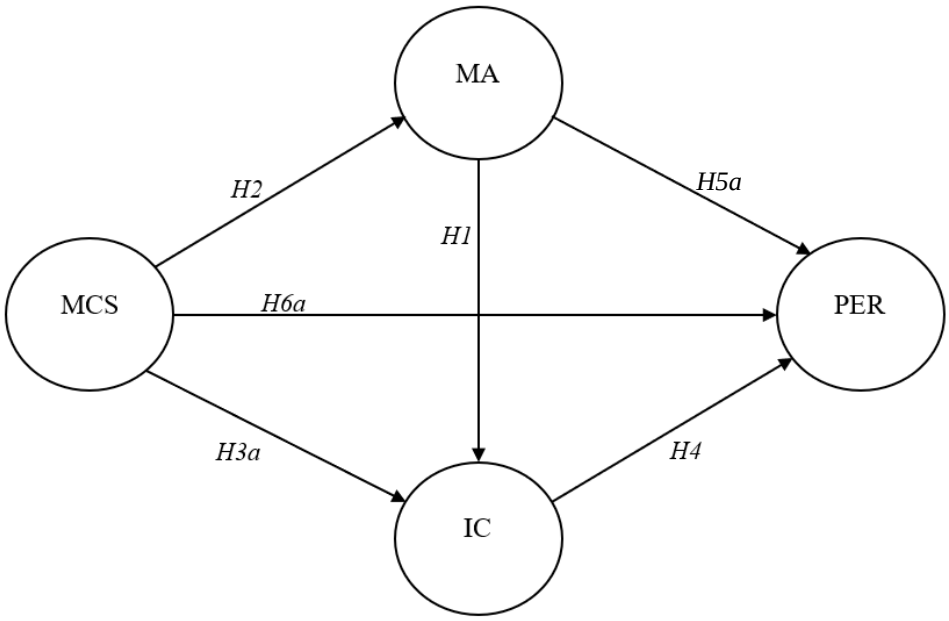

Figure 1. The theoretical proposed model of the study.

4. Results

This study utilizes structural equation modeling (SEM) with AMOS software to analyze data and test hypotheses. Chenhall (2003) and other researchers recommended the use of multivariate analysis to investigate the interrelationships among MCS, MAS, and other organizational functions. A two-step analysis suggested by Hair et al. (2014) was followed. First, the measures were validated using CFA Analysis. Second, the hypotheses were tested by running two levels of structural models.

4.1 Validation of the Measures

This section evaluates the reliability and validity of the measurement models included in the structural model for hypotheses testing analysis. Following Hooper et al. (2008) and Awang (2013), the fit of each construct (measurement model) was obtained to assess the unidimensionality and construct validity of each latent variable. The constructs were then pooled into one measurement model, and CFA was conducted to assess the validity and reliability of the entire measurement model. To assess the ability of the model to represent data on hand, researchers can select the proper goodness-of-fit measures from several fitness indices that fall under three mean categories: absolute, incremental, and parsimonious fit measures. According to Hair et al. (2014), using one fit index from each category is sufficient to ensure the appropriateness of the model for further analysis (hypotheses testing). **Table 1** presents the obtained values of one absolute fit measure, namely, the Goodness of Fit Index (GFI); three incremental fit measures, namely, the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Normed Fit Index (NFI); and one parsimonious fit measure, namely, Chi-Square/Degrees of Freedom (Chisq/df). The actual values for all fitness indices are higher than the minimum recommended criteria (level of acceptance that is used as a reference value and presented at the head of the Table).

Discriminant validity was verified by examining the correlation between the constructs. The results

provided in **Table 2** indicate that discriminant validity for all four constructs was achieved. The correlation between each pair of exogenous latent constructs was lower than 0.85. The high correlation that causes the common method bias is r = > 0.90 (Bagozzi et al., 1991).

Table 1. Model fit for the measurement models.

Construct	**Absolute fit**	**Incremental fit**			**Parsimonious fit**
	GFI (> 0.90)	CFI (> 0.90)	TLI (> 0.90)	NFI (> 0.90)	ChiSq/df (< 5.0)
Management Control System	0.949	0.950	0.917	0.929	3.04
Management Accounting	0.915	0.951	0.926	0.934	3.722
Intellectual Capital	0.905	0.952	0.936	0.931	3.109
Performance	0.919	0.942	0.903	0.929	4.890

Table 2. Discriminant validity index summary.

	Management control system	Management accounting	Intellectual capital
Management Accounting	0.797		
Intellectual Capital	0.546	0.652	
Performance	0.647	0.718	0.826

Table 3. Confirmatory factor analysis (CFA) results.

Construct	Item	Factor loading (> 0.6)	R^2 (> 0.4)	Cronbach alpha (> 0.7)	CR (> 0.6)	AVE (> 0.5)
Management Control System	MCS_1	0.65	0.42	**0.86**	**0.86**	**0.51**
	MCS_2	0.73	0.54			
	MCS_3	0.80	0.64			
	MCS_4	0.75	0.56			
	MCS_5	0.73	0.53			
	MCS_6	0.61	0.41			
Management Accounting	MA_1	0.73	0.54	**0.93**	**0.93**	**0.65**
	MA_2	0.81	0.65			
	MA_3	0.89	0.79			
	MA_4	0.83	0.69			
	MA_5	0.85	0.73			
	MA_6	0.76	0.58			
	MA_7	0.78	0.61			
Intellectual Capital	IC_1	0.87	0.76	**0.95**	**0.95**	**0.87**
	IC_2	0.84	0.70			
	IC_3	0.83	0.68			
	IC_4	0.74	0.55			
	IC_5	0.79	0.63			
	IC_6	0.70	0.49			
	IC_7	0.86	0.74			
	IC_8	0.91	0.82			
	IC_9	0.86	0.74			
Performance	Perf_1	0.75	0.56	**0.92**	**0.92**	**0.64**
	Perf_2	0.80	0.64			
	Perf_3	0.80	0.64			
	Perf_4	0.89	0.79			
	Perf_5	0.80	0.64			
	Perf_6	0.77	0.60			

Table 3 summarizes the results of the CFA analysis. The standardized estimates indicate that the factor loading and the squared multiple correlations (R^2) of each item for all constructs meet the required levels (> 0.60 and > 0.40, respectively). Hence, unidimensionality and construct validity were achieved. The

average variance extracted (AVE) for each construct was calculated using the following formula: (AVE= $\sum K^2/ n$), where, (K) is the factor loading of every item and (n) is the number of items in the model. The AVE values obtained are all > 0.5. Therefore, the convergent validity of each construct was achieved. Finally, the composite reliability (CR) and internal consistency reliability represented by Cronbach's alpha scores achieved acceptable levels for each construct (> 0.6 and > 0.7, respectively).

4.2 Structural Model Results and Hypotheses Testing

This section presents the empirical results of the hypotheses testing. To test the direct and indirect effects stated in the proposed hypotheses, two stages of analysis were performed. First, the direct effects were tested before entering the mediating paths into the structural model. This is to examine the significance of the direct effects, observe the changes that occur to the coefficients after the addition of the mediating paths, and test whether a full or partial mediation exists. **Table 4** presents the results of the direct effects before and after including the mediating paths (the initial and final structural models). Based on the standardized path coefficients of the final (complete) model, *H*1 is supported. The effect of MA on IC was found to be significant at the 0.001 level (*H*1*: β* = 0.594***). The increased use of MA has been proven to substantially contribute to the development of IC. The outcomes of the analysis support *H*2. The results indicate a significant association between the extensive use of MCS and the use of MA tools (*H*2: *β* = 0.797, *p* < 0.001).

Table 4. Standardized and regression coefficients (β) of the structural model.

Hypothesized paths			Standardized estimate	Regression estimate	S.E.	C.R.	P-value
Initial Model (without mediators' effect)							
Management Control System	--->	Management Accounting	0.833	0.855	0.12	7.14	***
Management Control System	--->	Intellectual Capital	0.611	0.77	0.122	6.329	***
Management Control System	--->	Performance	0.769	0.807	0.118	6.86	***
Management Accounting	--->	Performance	0.329	0.347	0.074	4.672	***
Intellectual Capital	--->	Performance	0.64	0.549	0.07	7.853	***
Final Structural Model							
Management Control System	--->	Management Accounting	0.797	0.844	0.124	6.826	***
Management Control System	--->	Intellectual Capital	0.073	0.094	0.173	0.542	0.588
Management Accounting	--->	Intellectual Capital	0.594	0.724	0.171	4.242	***
Management Accounting	--->	Performance	0.19	0.203	0.116	1.74	0.082
Intellectual Capital	--->	Performance	0.615	0.537	0.075	7.172	***
Management Control System	--->	Performance	0.159	0.18	0.115	1.563	0.118

As demonstrated in **Table 4**, the direct effect of MCS on IC in the final structural model is not significant. Hence, *H*3*a* is rejected (*H*3*a: β* = 0.073). However, this path was significant in the initial model (*β* = 0.611, *p* < 0.001) before the addition of the mediating path (MA to IC). Given that the two indirect paths in the final model are significant (MCS to MA and MA to IC) and the direct path (MCS to IC) is changed from significant to insignificant, the requisites of full mediation have been met. Based on these multiple analysis results, *H*3*b* is supported. The extensive practice of MCS boosts the development of IC indirectly through the use of MA tools.

Table 5. Results of the indirect effect analysis (Standardized coefficients).

Hypothesized paths					Direct effect before mediation	Direct effect after mediation	Indirect effect	Test of mediation
MCS	--->	MA	--->	IC	0.611***	0.073 (0.588)	(0.797***) × (0.594***) = 0.473	Full mediation
MA	--->	IC	--->	PER	0.329***	0.19 (0.082)	(0.594***) × (0.615***) = 0.365	Full mediation
MCS	--->	MA	--->	PER	0.769***	0.159 (0.118)	(0.833***) × (0.329***) = 0.274	Full mediation
MCS	--->	IC	--->	PER	0.769***	0.159 (0.118)	(0.611***) × (0.64***) = 0.391	Full mediation

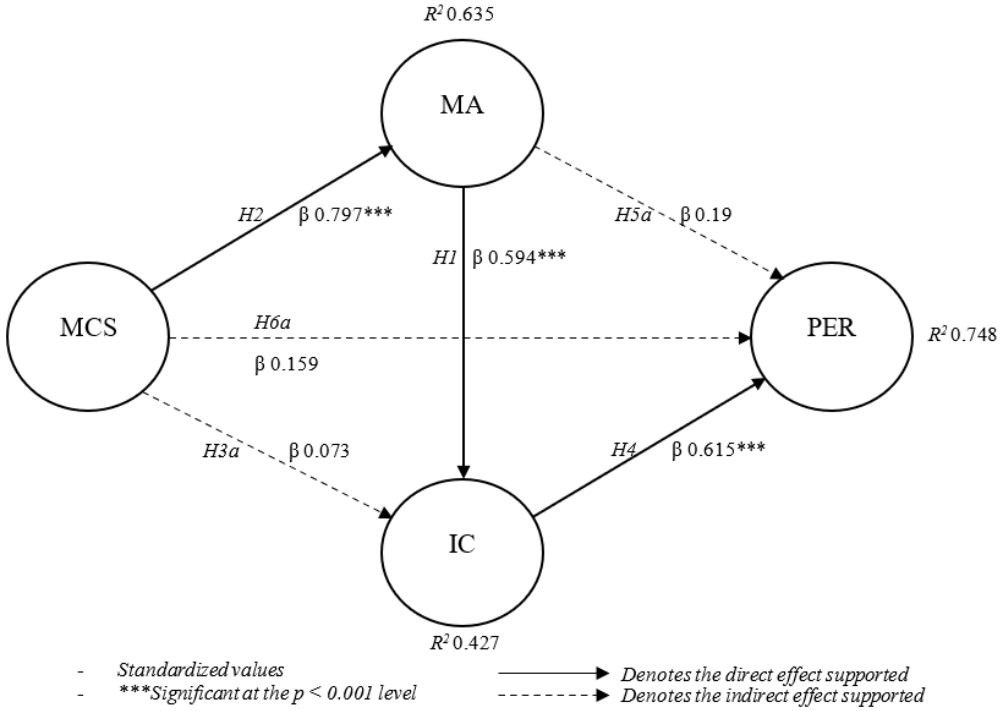

Figure 2. Path diagram with path coefficients from the results of structural equation modelling.

The results showed that IC has a positive and significant effect on PER supporting *H*4 (β = 0.615***), whereas, based on the final structural model, the direct effects of MCS and MA on PER are both insignificant; therefore, *H*5*a* and *H*6*a* are rejected. However, the results presented in **Table 5** show that IC mediates the effect of MA on PER, which supports *H*5*b*. Furthermore, MCS affects PER indirectly through both MA and IC, as the analysis proved that the full mediation requirements were fulfilled. Accordingly, both *H6b* and *H6c* are supported. **Figure 2** presents a summary of the hypothesized model results, which include: (1) direct effects; (2) indirect effects; (3) standardized paths' coefficients of the effects; and (4) the squared multiple correlation coefficients (R^2). R^2 measures the proportion of the total variance on the dependent variables that is accounted for by a set of predictors (independent variables).

5. Discussion

This study aims to evaluate the impact of MA and MCS as information networks and controls on the development of organizational IC and consequently on performance. MA and MCS are designed to provide the information needed for decision making; hence, MCS and MA are knowledge management systems. From this perspective, MCS, MA, and IC are expected to interact in a way that contributes to each other's development. However, this study focuses on the role of MCS and MA in the development of IC, while the

direct effect of IC is examined on corporate performance. In addition, the present study examines the mediating role of IC in the relationships between MCS, MA, and performance considering the complementary features of MCS and MA. IC provides a competitive advantage by providing the company with unique capabilities or insights that others may not have. IC encompasses various intangible resources that contribute to the overall value of a business. By effectively leveraging their IC, companies can gain a competitive advantage and thrive in today's fast-paced business environment. Whether through research and development, strategic partnerships, or other means, investing in intellectual capital is a critical factor for long-term success.

In contrast to Widener (2004) and Tayles et al. (2007) studies that have focused on how IC influences the development of MAS and the design of MCS, this study proposes that MA supports the development of IC. This finding is consistent with Novas et al. (2017), who confirmed the role of MAS in the development of human and structural capital. Management accounting practices such as cost analysis, performance measurement, and budgeting can provide valuable insights into the allocation of resources toward intellectual capital development initiatives. In this context, effective management accounting practices can aid in identifying and valuing intangible assets such as human capital, customer relationships, and organizational knowledge, which are key components of intellectual capital. In addition, management accounting can help companies measure the performance of their intellectual capital investments. By tracking the return on investment of various intellectual capital initiatives, companies can determine which investments generate the greatest return and adjust their investment strategies accordingly.

This study proposed that extensive use of MCS involves increased use of MA tools, which entails another proposition that MCS indirectly contributes to the development of IC through MA. The findings support both propositions, whereas the direct effect proposition of MCS on IC is not supported. MCSs are designed to help organizations achieve their goals and objectives by ensuring that resources are allocated and used efficiently and effectively. Researchers assert that MCS and MA are intertwined in organizational and research settings (Ferreira and Otley, 2009) and demonstrated that while MA is a group of tools or practices, MCS encompasses the systematic use of MA and other types of controls (Chenhall, 2003). Hence, increased procedures and practices of controls require increased use of MA to measure, monitor, and control various aspects of business. Furthermore, MCS relies on MA data to track progress toward goals and objectives, motivate and reward employees, and provide key performance indicators. On the other hand, MA provides insight into the effectiveness of various MCSs and optimizes the use of these systems to achieve organizational goals. These findings align with the resource-based view concept of resource bundling, where valuable resources (MCS and MA) complement each other to create even more valuable resources (IC).

The mediation of MA in the effect of MCS on IC is an original contribution of this study as the evidence of the direct effect of MCS on IC was changed to insignificant when the mediator (MA) was entered into the model. The design of MCS that empowers and holds employees accountable for financial and operational performance, through the use of MA information and feedback, can stimulate situated learning and the development of intellectual capital. This finding is consistent with prior research findings. For instance, Coyte (2019) confirmed the intervention of MA in the effect of one type of MCS which is "enabling MCS" on the development of IC elements of human, relational, and structural capital.

As for the impact on performance, this study's findings revealed a positive and significant direct effect for the developed IC on overall corporate performance, whereas the effect of both MCS and MA on performance was found to be indirect. MA influences performance positively through IC, whereas MCS influences performance indirectly through both MA and IC. These findings align with the resource-based

view principle of sustainable competitive advantage, where superior resources ultimately drive performance. Through the utilization of employees' intellectual assets, organizations can augment their capacity for innovation. This potentially creates novel products or services aligned with customer expectations, ultimately driving revenue growth and market expansion. Furthermore, leveraging the cumulative knowledge and skills of employees enables businesses to make judicious strategic decisions that lead to increased operational proficiency and enhanced competitiveness. On the other hand, the findings of this study provide statistical evidence for the mediating role of IC between MCS, MA, and performance. These findings are consistent with the results of scarce studies that tested similar propositions. For instance, Novas et al. (2017) showed that MA has an indirect positive effect on performance through human capital and structural capital but not through relational capital.

6. Conclusion

In conclusion, these findings provide empirical evidence for the effect of MCS, MA, and IC on corporate performance and how the right positioning of these functions within the organizational sphere enables them to interact and elevate their positive effect on performance. The findings show that despite the significant role of MCS in achieving organizational objectives, for its impact on performance to be realizable and more profound, it needs to be equipped with an appropriate and systematic source of timely information, which is ideally the job of MA. Moreover, the findings proved that MCS and MA support the development of IC and influence corporate performance through the capabilities of IC that they support.

The findings of this study have several implications. First, companies should invest in developing and implementing robust MCSs, select appropriate MA tools, and optimize their use of management accounting information systems to enhance intellectual capital and ultimately improve business performance. Furthermore, companies should evaluate the effectiveness of existing MCS and MA tools and assess their contribution to knowledge creation, information flow, and organizational learning. Second, companies are advised to identify and invest in opportunities to develop and improve their intellectual capital. This may include investing in employee training and development, research and development, and intellectual property protection. Finally, this study provides guidance for companies to align their MCS and MA with the components of IC and establish the processes, systems, procedures, controls, and environment that expand organizational knowledge, improve information networks, reinforce organizational learning, and support organizational capabilities to ultimately improve business performance. The limitations of the questionnaire surveys apply to this study. The self-reported data are subject to the respondents' assessment and bias. Future research may use a qualitative approach to gain more understanding of how different types of MCS and MA relate to each dimension of IC. Moreover, future research could examine how factors such as organizational culture, leadership style, and industry competition influence the relationships among MCS, MA, IC, and performance.

Conflict of Interest

The author declares no potential conflict of interest.

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