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Economic Research-Ekonomska Istraživanja

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/rero20

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To cite this article: Huyen Mong Le, Thu Thi Nguyen & Trang Cam Hoang (2023) Performance implications of exploratory and exploitative innovation: the role of management control systems, Economic Research-Ekonomska Istraživanja, 36:3, 2211152, DOI: 10.1080/1331677X.2023.2211152

To link to this article: https://doi.org/10.1080/1331677X.2023.2211152

Published online: 25 May 2023.

ECONOMIC RESEARCH-EKONOMSKA ISTRAŽIVANJA
2023, VOL. 36, NO. 3, 2211152
https://doi.org/10.1080/1331677X.2023.2211152

Performance implications of exploratory and exploitative innovation: the role of management control systems

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ABSTRACT

Drawing on prominent theories of innovation, this study investigates the inter-relationships between the use of management control systems (MCS), exploratory innovation, exploitative innovation, and firm performance in Vietnam, an emerging market. The research hypotheses were empirically tested using a partial least squares-structural equation model. Data were collected by survey questionnaires from a sample of 238 top-level and middle-level managers in Vietnamese firms. The results confirm that the diagnostic use of MCS has a significant positive effect on exploitative innovation and the interactive use of MCS has a significant positive effect on both exploratory innovation and exploitative innovation. The results also reveal that exploitative innovation and exploratory innovation partially mediate the relationship between the interactive use of MCS and firm performance. Understanding these relationships can assist Vietnamese firms to invest appropriately in MCS that is able to promote innovation actions, thereby achieving outstanding performance.

ARTICLE HISTORY
Received 16 April 2022
Accepted 30 April 2023

KEYWORDS
Exploitative innovation; exploratory innovation; firm performance; management control systems; Vietnam

JEL CLASSIFICATIONS
C31; M41; O32

1. Introduction

In order to adapt to intense competition in a dynamic business environment, firms must seek to explore new ideas or processes and design new products and services for emerging markets. At the same time, they require stability so as to be able to utilize current competencies and exploit existing products and services (Danneels, 2002). To achieve such outcomes previous researchers have argued that firms need to be 'ambidextrous' (Cho et al., 2020; He & Wong, 2004; Venugopal et al., 2020), and develop simultaneous exploration and exploitation (Tushman & O'Reilly, 1996) to gain a sustainable competitive advantage, thereby improving firm performance.

Previous studies have highlighted the benefits of balancing exploration and exploitation (Cao et al., 2009; Dhir & Dhir, 2018; Hassan et al., 2022; He & Wong, 2004; Lubatkin et al., 2006). The question remains as to how the firms might promote both

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exploration and exploitation. The prior researchers have documented the required environmental, structural and behavioral antecedents (Jansen et al., 2006; Pertusa-Ortega & Molina-Azorín, 2018; Simsek et al., 2009), such as organizational context characteristics (Wei et al., 2014), formal and informal coordination mechanisms (Jansen et al., 2006), structural differentiation (Jansen et al., 2009; Pertusa-Ortega & Molina-Azorín, 2018), top management team diversity and decision-making processes (C.-R. Li et al., 2016). In addition, behavioral integration of the top management team (Ramachandran et al., 2019; Umans et al., 2020; Venugopal et al., 2020; Wu & Chen, 2020), top management team shared leadership (Umans et al., 2020), perceived organizational support and empowering leadership (Siachou & Gkorezis, 2018), and technology and market-sensing capabilities (L. V. Ngo et al., 2019), environmental dynamism (Haarhaus & Liening, 2020), have all received attention.

While many studies have recognized the role of management, little is known about the role of using MCS in promoting both exploration and exploitation (Gschwantner & Hiebl, 2016). Pursuing both contradictory activities simultaneously is often complicated and difficult (Benner & Tushman, 2003). Dekker et al. (2013) has shown that firms with mixed strategies have a more complex performance management system (PMS), with various measures required to capture management needs so as to balance a trade-off between competing objectives. Bedford (2015) has tested the role of promoting the performance of levers of control in the context of ambidextrous organizations. Severgnini et al. (2018) have revealed the three dimensions of the PMS (attention to focus, strategic decision-making, legitimization of the firm's choices) that increase organizational ambidexterity (which is to say, exploratory and exploitative innovations) and which consequently influence organizational performance. More recently, Mura et al. (2021) have shown that the dynamic tension created by joint diagnostic and interactive use of PMS has the strongest association with organizational ambidexterity.

The MCS has long been recognized as having an important role in providing information for managers to perform their functions of planning, control, and decision-making (Bedford, 2015; Henri, 2006). Moreover, MCS is also leverage for innovation (Müller-Stewens et al., 2020) and is considered an important resource for competitive advantage (Barney, 1991). Therefore, it can be argued that MCS can contribute to the emergence of a firm's innovation behavior, thereby improving firm performance. However, a review of prior studies reveals that existing research has focused only on the PMS as well as being restricted to developed countries (e.g., Bedford, 2015; Bedford et al., 2022; Dekker et al., 2013; Mura et al., 2021; Severgnini et al., 2018). There is a lack of consensus systematically on the relationship between the use of MCS, exploration, exploitation, and firm performance in the context of an emerging and dynamic market (like Vietnam). Legally, management accounting was officially recognized in Vietnamese Accounting Law, which was updated on June 17, 2003. In fact, the role of management accounting is not essential as management accounting used in companies is very simplistic (H. Q. Nguyen & Le, 2020). Recently, the study of Pham et al. (2020) revealed that traditional management accounting practices (such as budgeting, standard costing, CVP analysis, responsibility accounting, and cost variance analysis) are dominated in Vietnamese firms. However, positive

points can be recognized when 16 contemporary techniques (such as strategic costing, target costing, product profitability analysis, life-cycle costing, value chain analysis and so on) are selected by studied firms. Managers in Vietnamese firms are still weighing the costs and benefits of investing in MCS (T. T. Nguyen et al., 2017). In addition, as an emerging economy (V. D. Ngo et al., 2016; Q. A. Nguyen et al., 2015), Vietnam is recognized as a rapidly growing economy in the Asia-Pacific region (L. V. Ngo et al., 2019). Over the years, Vietnam has consistently been ranked as one of Asia's best investment locations (L. V. Ngo et al., 2019). Like many emerging economies in Asia, Vietnam has undergone major economic shifts and has achieved a high rate of economic growth (V. D. Ngo et al., 2016). Firms operating in such an emerging economy must respond quickly to continuing changes in the business market (Luu, 2017). In addition, they must develop fast complementary capabilities that enable continuous innovation, so that they can be adaptive and responsive to new market conditions (L. V. Ngo et al., 2019). For such reasons, Vietnam is an ideal setting for empirically testing our model of the use of MCS, innovation and performance.

This study contributes to the literature by providing evidence for the important role of MCS as a tool to promote the innovation behaviors and outcomes necessary for firms in an emerging and dynamic economy (such as Vietnam). In addition to revealing how managers might successfully use MCS to pursue exploratory and exploitative innovations, the study seeks to illuminate how exploitative innovation and exploratory innovation mediate the relationship between the use of management accounting information and firm performance. By doing so, this study contributes to the literature on innovation and ambidexterity more specifically as well as the management accounting literature more generally.

2. Theory and hypotheses

2.1. Exploratory innovation and exploitative innovation

Drawing upon the conceptualization of March (1991), exploration implies firm behaviors characterized by such as 'search, variation, risk-taking, experimentation, play, flexibility, discovery, and innovation' (March, 1991, p. 71). In addition, exploration requires new knowledge or departure from existing knowledge (Benner & Tushman, 2003, 2015; O'Reilly & Tushman, 2013) for firms to make radical innovations activities, thereby meeting the needs of emerging customers or markets (Cao et al., 2009; Danneels, 2002; Jansen et al., 2006). Such approaches are expected to lead to new products/services designs, as well as opening up new markets (Bedford et al., 2019; Cho et al., 2020; Mura et al., 2021).

Exploitation implies 'refinement, choice, production, efficiency, selection, implementation, and execution' (March, 1991, p. 71). Exploitative innovations are incremental innovations and are designed to meet the needs of existing customers or markets (Benner & Tushman, 2015; Cao et al., 2009; Jansen et al., 2006). To achieve such outcomes, firms need to modify and/or improve the quality of existing products and services and increase effectively the firm's production (Bedford et al., 2019; Cho et al., 2020; Mura et al., 2021). Hence, exploitation builds on existing knowledge so

as to reinforce existing skills, processes, and structures (Benner & Tushman, 2003, 2015; O'Reilly & Tushman, 2013).

2.2. The diagnostic and interactive use of MCS

MCS is defined as formalised procedures and systems that use the information to maintain organisational activities. This includes the planning, budgeting, measuring, and communication systems that managers use for decision-making and evaluation (Bedford, 2015; Henri, 2006). 'MCS is a broader term that encompasses management accounting system and also includes other controls such as personal or clan controls' (Chenhall, 2006, p. 164). This study adopts the framework of control levers of Simons (1995) including the approaches to using controls that have been widely used in recent MCS studies (Lopez-Valeiras et al., 2016; Matsuo et al., 2021; Müller-Stewens et al., 2020; Osma et al., 2022; Su et al., 2015).

The diagnostic use of MCS represents the traditional role of MCS which provides information to monitor, compare and evaluate actual performance from preset performance targets (Bedford, 2015; Henri, 2006). Information is produced by the MCS which alerts senior managers when actions or results do not match with preordained plans (Abernethy & Brownell, 1999; Bedford, 2015; Müller-Stewens et al., 2020). To achieve this, the management accounting department plays an important role in preparing and interpreting the information created by MCS. Data are reported through the formal reporting process, with senior managers only rarely involved in the process (Abernethy & Brownell, 1999; Bedford, 2015; Simons, 1995).

An interactive use of MCS is designed to stimulate the search for opportunities and encourage the emergence of new initiatives (Bedford, 2015; Henri, 2006; Simons, 1995). Because it includes dialogue and communication among senior managers as well as between top-level managers and subordinates (Bedford et al., 2019; Widener, 2007) and Henri (2006, p. 533) have argued that when the MCS is used interactively 'data are discussed and interpreted among organizational members of different hierarchical levels'. The significance of an interactive use of MCS is that it contributes to the breaking down of functional barriers and the hierarchical systems of capital constraining the flow of information within organizations (Abernethy & Brownell, 1999). Thus, this use of MCS can be expected to encourage and facilitate strategic change and product innovation (Bisbe & Otley, 2004; Lopez-Valeiras et al., 2016; Müller-Stewens et al., 2020; Su et al., 2015).

2.3. Hypotheses

The prior studies that build from the resource-based view of operations suggest that a diagnostic use of MCS constrains organizational capabilities. For example, Henri (2006) concludes that a diagnostic use of PMS negatively affects a range of organizational capabilities, including market orientation, entrepreneurship, and organizational learning, and innovativeness. Because the diagnostic use focuses on mistakes and negative variances, some researchers (e.g., Henri, 2006; Simons, 1995) argue that this approach often stifles innovation, creativity and new opportunities for the

organization. Nevertheless, Adler and Chen (2011) argue that the diagnostic use of MCS may provide sufficient space and flexibility for subordinates to adjust their activities. In addition, such an approach may encourage single-loop learning through exploiting existing knowledge rather than expanding new knowledge (Bedford, 2015; Haas & Kleingeld, 1999; Widener, 2007), which in turn provides for exploitative innovation activities (Bedford, 2015; He & Wong, 2004; Mura et al., 2021). Therefore, our first hypothesis becomes:

H1: The diagnostic use of MCS has a positive effect on exploitative innovation.

Abernethy and Brownell (1999) argue that a feature of an interactive use of a budget is the continuous discussion between the top management and subordinates, as well as among managers in various functional departments. The organization's opportunities, challenges, strengths, and weaknesses are interchanged among managers through their interactions. The interactive use additionally provides a platform for debating how to respond to environmental changes and conditions (Matsuo et al., 2021; Simons, 1995; Widener, 2007). Such interactions, facilitates and the consequent exchange of information thereby increase the decision-making quality of managers (Bedford et al., 2019; C.-R. Li et al., 2016). Through such dialogue and discussions, the firm is assisted to make appropriate adjustments to improve existing activities, resulting in improved quality of products/services and an improved response to customer needs (Bedford, 2015; Müller-Stewens et al., 2020). In other words, the interactive sharing of information contributes to the promotion of both exploration and exploitation.

Bisbe and Otley (2004, p. 729) have hypothesized and concluded that the use of interactive MCS supports innovation 'through the provision of guidance for search, triggering and stimulus of initiatives'. Henri (2006) studied how the use of PMS affects organizational capabilities and finds that there are positive relationships between interactive use and organizational capabilities (innovativeness, market orientation, entrepreneurship, and organizational learning). Moreover, the exchange of information among managers increases the ability to access knowledge within the organization. Such exchange of information assists managers to combine existing knowledge and develop new knowledge based on exploration (Bedford, 2015; Bedford et al., 2019, 2022; Müller-Stewens et al., 2020). Therefore, we propose second hypothesis as follows:

H2a: The interactive use of MCS has a positive effect on exploitative innovation.

H2b: The interactive use of MCS has a positive effect on exploratory innovation.

A firm focusing on exploitation will tend to pursue existing market development (He & Wong, 2004). Companies will gain greater performance benefits from exploitation provided they can make continuous and incremental adaptations rather than a precise reproduction of pre-specified routines (Benner & Tushman, 2003, 2015). Slater and Narver (1995) argue that firms gain profitability, sales growth, and customer retention when they learn continuously, understand and respond to customer needs, feelings, and provide suitable target products. Continuous learning can assist companies to accumulate an expanded experience and knowledge, such as how to avoid repeated mistakes, how to reduce production costs and transaction costs, and how to enhance mutual understanding, coordination, and problem-solving capabilities

(Henri & Wouters, 2020; Jiang & Li, 2009). Therefore, through these repeated processes, organizations can achieve a higher product quality, minimize risks and failures, enhance profitability and continue to improve their products. Some previous empirical evidence suggests that exploitation has a direct effect on firm performance (e.g., Peng & Lin, 2021; Severgnini et al., 2018). Therefore, our third hypothesis is proposed as follows:

H3: Exploitative innovation has a positive effect on firm performance.

Exploration implies a testing of new schemes in relation to new sources of technology and knowledge, the creation of new products and services and the opening up of new markets (Benner & Tushman, 2003, 2015; He & Wong, 2004). D'Aveni (1994) argue strongly that no firm can build a sustainable competitive advantage because today's strength rapidly becomes tomorrow's weakness. In reality, instead of trying to exploit existing competencies, firms need also to explore new capabilities so as to gain a competitive advantage in the new context. A dynamic environment is characterized by fluid customer needs, uncertain technological developments, and highly volatile markets (DeSarbo et al., 2005; Henri & Wouters, 2020). In such environments, the initial strategies, as well as existing key resources, may be unsuitable or even hinder the firm's development (Leonard-Barton, 1992; Li & Liu, 2014). Therefore, when necessary, firms should remove old resources, gather new resources or redesign business models to ensure the right direction (Bedford et al., 2019; Lavie, 2006; Li & Liu, 2014), which in turn leads to higher firm performance. Therefore, we propose our fourth hypothesis as follows:

H4: Exploratory innovation has a positive effect on firm performance.

From a resource-based perspective, 'a behavioral context in which exploitation and exploration can simultaneously flourish might be regarded as a valuable, rare, and costly to imitate resource, and therefore a potential source of competitive advantage' (Simsek et al., 2009, p. 881). Besides, most dynamic capabilities researchers believe that dynamic capabilities play an important role in achieving firm sustainable competitive advantages and outstanding performance (Bresciani et al., 2023; Ferreira et al., 2021; Rehman et al., 2019). In addition, dynamic capabilities have also been confirmed as an intermediate variable to change resources into competitive advantages and/or firm performance (Hidalgo-Peñate et al., 2019; Rehman et al., 2019). This combination of exploration and exploitation can be the basis of a dynamic capability, as firms are required to engage in 'sufficient exploitation to ensure its current viability and, at the same time, devote enough energy to exploration to ensure its future viability' (March, 1991, p. 105). Allowing that MCS is also a unique resource of the firms (Barney, 1991), we argue that the use of MCS can contribute to improving firm performance *via* the combination of exploration and exploitation. Therefore, the next two hypotheses are proposed as follows:

H5a: The exploitative innovation and exploratory innovation mediate the relationship between the diagnostic use of MCS and firm performance.

H5b: The exploitative innovation and exploratory innovation mediate the relationship between the interactive use of MCS and firm performance.

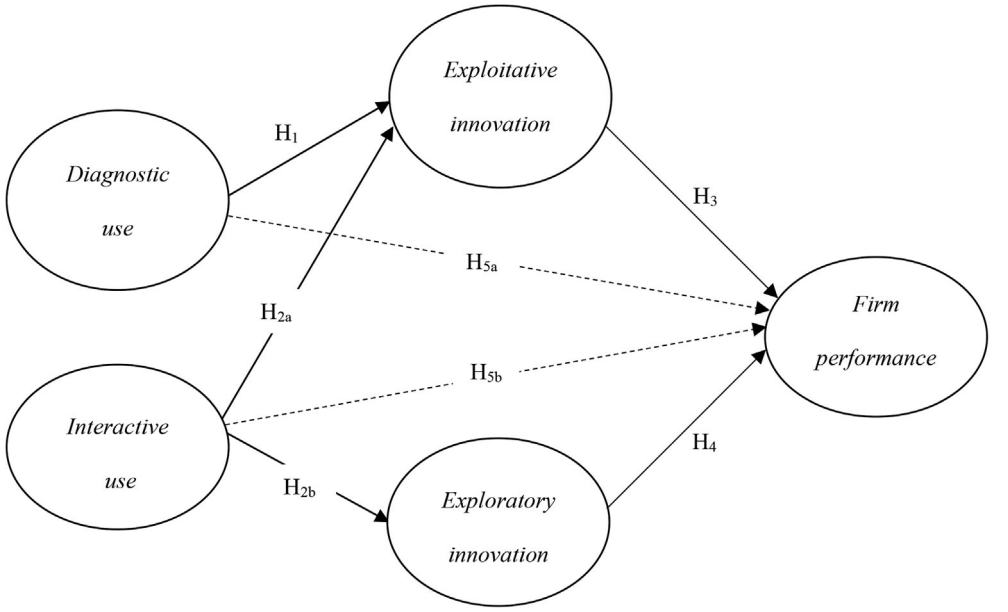

Figure 1. Hypothesized model.

The hypothesized model in Figure 1 illustrates the inter-relationships between the use of MCS, exploratory innovation, exploitative innovation, and firm performance.

3. Research method

3.1. Data collection

The sample comprised 4.277 firms that were selected from the Vietnam Trade Directory, General Statistics Office of Vietnam and CEO Club. The top-level managers or/and mid-level managers such as CEO, CFO, manufacturing managers, marketing managers, sales managers, research and development managers, were the target informants. They are able to provide reliable information and have a thorough understanding of their firm's innovation and performance (Luu, 2017; Vorhies & Morgan, 2003). We selected the sample by a convenience method combined with use snowball sampling. This means we will ask all potential participants based on our accessibility of their contact details and a match with our research criteria. Salganik and Heckathorn (2004) suggest that snowball sampling leads to methodically unbiased samples, allowing good sampling and even better than random sampling methods. Our survey was conducted from June to September 2020. The questionnaire was sent to the email address of targeted informants. A reminder email was relayed to the non-respondents after ten days. After three follow-ups, we received 237 responses,

yielding a response rate of 5.54%. This participation rate is similar to the email-survey study of Schamberger et al. (2013). Following Luu (2017), we removed 61 small companies to ensure that organizational variables (i.e., the use of MCS, innovations and firm performance) could be applied and to ensure that a formal MCS is primed (T. T. Nguyen et al., 2017). Furthermore, medium and large firms are expected to have sufficient resources to pursue exploration and exploitation (Jansen et al., 2006; Vietnam Report, 2019). In order to have enough data for the study, we continued to seek the help of tax departments, customs departments and associations. As a result, we received 62 qualified responses to hard files. Thus, the usable responses were 238.

3.2. Variable measurement

First, the diagnostic use was applied to measure through a reflective measurement model. Four items were adopted following Henri (2006) and as subsequently used in other studies (e.g., Su et al., 2015; Widener, 2007). Besides, the interactive use was based on the scale defined by Bisbe et al. (2007) and was subsequently used in other studies (e.g., Bedford, 2015; Sakka et al., 2013). For each statement, respondents were asked to indicate their use of MCS on a five-point Likert ranging from (1) not at all to (5) very great extent.

Second, He and Wong (2004) developed eight items to measure exploration and exploitation. Subsequently, this scale was adopted in many studies which were conducted in different settings (e.g., Cao et al., 2009; C.-R. Li et al., 2016; Lubatkin et al., 2006; Peng & Lin, 2021; Severgnini et al., 2018). In these studies, this scale was confirmed to have high reliability. The eight items were measured on a five-point Likert scale ranging from 1 to 5, where 1 represents 'strongly disagree' and 5 represents 'strongly agree'.

Last, most studies on MCS used managers' subjective perceptions of performance (Otley, 2016). The subjective perceptions scales are a good substitute in the absence of objective data (Dess & Robinson, 1984). Therefore, we adopted the scale developed by Govindarajan (1984), which has been subsequently adopted by other studies (Baines & Langfield-Smith, 2003; Hoque, 2011) to measure firm performance. The respondents were asked to indicate the performance of their firms relative to that of their competitors over the last three years in each of the ten items on a scale ranging from 1 (very unsatisfactory) to 5 (outstanding).

4. Research results

4.1. Descriptive statistics

The demographics information of the participating firms and respondents are shown in Table 1. Of the responding firms, 54.62% were from industry and construction industries, 36.56% from trade and services industries, and 8.82% from agriculture, forestry, and fisheries industries. In total, 95.38% of sampled firms have more than 100 full-time equivalent employees. In addition, 6.72% were state-owned firms, 65.13% were not state-owned firms, and 28.15% were foreign-invested firms. Of the informants, 82.35% were from mid-level managers, and 17.65% were top-level managers. The managers worked in many different departments such as marketing

Table 1. Demographics of informants.

Demographics	Frequency	Percent	Demographics	Frequency	Percent
Sector			*Word position*		
Agriculture, forestry, fisheries	21	8.82	Mid-level managers	196	82.35
Industry and construction	130	54.62	Top-level managers	42	17.65
Trade and services	87	36.56	*Department/ Responsibility*		
Number of employees			Marketing	26	10.92
50–100 peoples	11	4.62	R & D	17	7.14
101–200 peoples	125	52.52	Manufacturing	29	12.18
201–500 peoples	55	23.11	Sales	39	16.39
501–1.000 peoples	26	10.93	Finance/accounting	94	39.50
> 1.000 peoples	21	8.82	Others	33	13.87
Firm age			*Work experience*		
3–5 years	25	10.50	3–5 years	64	26.89
6–10 years	53	22.27	6–10 years	95	39.92
11–20 years	117	49.16	11–20 years	74	31.09
21–50 years	37	15.55	> 20 years	5	2.10
> 50 years	6	2.52			
Company's Ownership					
State-owned	16	6.72			
Non-State-owned	155	65.13			
Foreign direct investment	67	28.15			

Source: raw data analysis.

(10.92%), research and development (7.14%), manufacturing (12.18%), sales (16.39%), finance/accounting (39.50%), and others (13.87%). The informants had a mean industry experience of 9.17 years. The independent t-test between the earliest (25%) and latest (25%) responses reveals that there is no significant divergence, which reduces concerns that the data suffer from non-response bias (Armstrong & Overton, 1977).

4.2. Evaluation of measurement models

For measurement models, Table 2 shows that the composite reliabilities (CR) of all reflective constructs were higher than 0.7 (ranging from 0.897 to 0.921), and Cronbach's alpha was greater than 0.7 (ranging from 0.847 to 0.885) (Hair et al., 2017). Besides, the outer loadings of all observed variables ranged from 0.710 to 0.884, which is higher than the cut-off value of 0.50 (Hulland, 1999). The t-values of all items were well above 1.96 to be statistically significant (ranging from 12.908 to 51.183). The average variance extracted (AVE) values of all latent variables can be accepted because they are higher than 0.50 (ranging from 0.643 to 0.744) (Hair et al., 2017). These imply that the scales used in this study are highly reliable.

Table 3 shows the discriminant validity of the scales. Item INTE5 is removed because cross-loading is less than 0.2 (Müller-Stewens et al., 2020) and the ratio of the larger variance to the smaller variance is less than 2 (Hair et al., 2019). After removing this item, the results show that the square roots of average variance extracted (AVE) of all reflective constructs ranging from 0.802 to 0.863 which were well above the corresponding correlations between these constructs (from 0.118 to 0.603). Moreover, the correlation coefficients of constructs (numbers below the diagonal) are smaller than the composite reliability (CR) (shown in Table 2 with values from 0.897 to 0.921) demonstrating that the scales for constructs in the model ensure discriminant validity (Fornell & Larcker, 1981). Moreover, the correlation coefficients among the variables are lower than the cut-off value of 0.7, thereby indicating

Table 2. Scale items and latent variable evaluation.

Construct and items	Loading	T-value
Diagnostic use (AVE = 0.719; CR = 0.911, CA = 0.870)		
Set targets for critical performance variables.	0.851	25.028
Monitor progress toward critical performance targets.	0.825	20.416
Provide information to correct deviations from preset performance targets.	0.847	28.460
Review key areas of performance.	0.868	26.295
Interactive use (AVE = 0.646; CR = 0.901; CA = 0.863)		
Provide a recurring and frequent agenda for top management activities.	0.836	32.992
Provide a recurring and frequent agenda for subordinate activities.	0.813	26.588
Enable continual challenge and debate of underlying data, assumptions and action plans with subordinates and peers.	0.831	32.825
Focus attention on strategic uncertainties (i.e., factors that may invalidate the current strategy or provide opportunities for new strategic initiatives).	0.791	22.484
Encourage and facilitate dialogue and information sharing with subordinates*.	0.745	22.051
Exploratory innovation (AVE = 0.744; CR = 0.921; CA = 0.885)		
Introduce new generation of products	0.878	43.191
Extend product range	0.861	38.232
Open up new markets	0.863	42.446
Enter new technology fields	0.848	35.247
Exploitative innovation (AVE = 0.687; CR = 0.897; CA = 0.847)		
Improve existing product quality	0.884	51.183
Improve production flexibility	0.835	34.372
Reduce production cost	0.783	23.730
Improve yield or reduce material consumption	0.809	26.609
Financial performance (AVE = 0.644; CR = 0.900; CA = 0.862)		
Operating profit	0.843	34.215
Return on investment	0.801	26.952
Sales growth rate	0.776	22.042
Market share	0.769	18.278
Cash flow from operation	0.822	32.156
Non-financial performance (AVE = 0.643; CR = 0.900; CA = 0.860)		
New product development	0.710	12.908
Market development	0.833	27.940
Research & development	0.790	20.862
Cost reduction programs	0.782	21.851
Personnel development	0.883	43.731

Note: AVE: Average Variance Extracted; CR: Composite Reliability; CA: Cronbach's Alpha; *Item eliminated due to low cross-loading.
Source: raw data analysis.

satisfactory discriminant validity (Tabachnick & Fidell, 2012). Lastly, we employed the Heterotrait-Montrait (HTMT) test to evaluate the discriminant validity of constructs (Henseler et al., 2015). Table 3 shows that the HTMT values, which were computed based on the bootstrapping routine, ranging between 0.142 and 0.665 (significantly below 0.90), provide clear evidence for discriminant validity.

4.3. Hypothesis testing

The results in Table 4 reveals that the diagnostic use of MCS significantly positively affects exploitative innovation ($\beta = 0.145$, $p < 0.05$, $t = 2.517$), in support of hypothesis H1. In addition, Table 4 reveals that interactive use significantly positively affects exploitative innovation ($\beta = 0.563$, $p < 0.01$, $t = 8.374$) as well as exploratory innovation ($\beta = 0.557$, $p < 0.01$, $t = 9.745$), thereby supporting hypotheses H2a and H2b. Hypotheses H3 and H4 are also supported as confirmed by Table 4 which reveals that exploitative innovation ($\beta = 0.162$, $p < 0.05$, $t = 2.147$) and exploratory innovation ($\beta = 0.306$, $p < 0.01$, $t = 4.314$) have a significant positive effect on firm performance.

Table 3. Construct means, standard deviations, and correlations.

Construct	*1*	*2*	*3*	*4*	*5*	*6*
1. Diagnostic use	**0.848**					
2. Interactive use	0.273	**0.837**				
	0.312					
3. Exploratory innovation	0.366	0.556	**0.863**			
	0.416	*0.639*				
4. Exploitative innovation	0.299	0.603	0.441	**0.829**		
	0.344	*0.697*	*0.507*			
5. Financial performance	0.199	0.448	0.446	0.412	**0.803**	
	0.229	*0.522*	*0.509*	*0.481*		
6. Non-financial performance	0.118	0.451	0.451	0.369	0.573	**0.802**
	0.142	*0.524*	*0.516*	*0.427*	*0.665*	
Mean	4.326	3.975	4.652	3.886	4.217	4.188
Standard deviation	0.731	0.895	0.934	1.032	1.183	1.210

Note: The numbers on the diagonal (bold) are the square root of Average Variance Extracted (AVE); In each cell, the first value indicates the correlation between variables (off-diagonal), and the second value is the HTMT ratio; All correlation coefficients are significant ($p < 0.01$).
Source: raw data analysis.

Table 4. Partial least squares result for theoretical model.

	β	*p*-value	t-value
Direct effects			
Diagnostic use → Exploitative innovation	0.145**	0.013	2.517
Interactive use → Exploitative innovation	0.563***	0.000	8.374
Interactive use → Exploratory innovation	0.557***	0.000	9.745
Exploitative innovation → Firm performance	0.162**	0.029	2.147
Exploratory innovation → Firm performance	0.306**	0.000	4.314
Diagnostic use → Firm performance	−0.053^{ns}	0.501	0.667
Interactive use → Firm performance	0.306***	0.000	4.314
Indirect effects			
Diagnostic use → Firm performance	0.023^{ns}	0.158	1.410
Interactive use → Firm performance	0.262***	0.000	4.278

Note: ***Correlation is significant at the 1% level (2 - tailed t-test); **Correlation is significant at the 5% level (2 - tailed t-test); ^{ns}Correlation is not significant at the 1% level (2 - tailed t-test).
Source: raw data analysis.

Regarding indirect hypotheses, we find that exploitative innovation and exploratory innovation fail to mediate the relationship between diagnostic use and firm performance ($\beta = 0.023$, $p > 0.05$, $t = 1.410$). Thus, hypothesis H5a is not supported. Conversely, Table 4 reveals that the effect of interactive use on firm performance *via* exploitative innovation and exploratory innovation is significant ($\beta = 0.262$, $p < 0.01$, $t = 4.278$), thereby supporting hypothesis H5b. Regarding the mediating types, Table 4 reveals that use of interactions directly affects firm performance (Model 2, $\beta = 0.238$, $p < 0.01$, $t = 3.424$). Moreover, the indirect effect and the direct effect are both significant and point in the same direction, implying that exploratory innovation and exploitative innovation are complementary mediations for the relationship between interactive use and firm performance (Hair et al., 2017).

4.4. Model fit and common method bias

The diagnostic test of multicollinearity is based on the variance inflation factors (VIF) for the regression coefficients and reveals that the largest VIF in the model is 2.146, substantially less than the critical threshold of 5 (Hair et al., 2017). Therefore, multicollinearity is not a concern for the conclusions derived from the parameter

estimates. Next, the adjusted R^2 for dependent variables (exploratory innovation = 0.307, explorative innovation = 0.377, and firm performance = 0.332) were greater than the recommended level of 0.10 (Hair et al., 2019). Finally, the result of running Blindfolding shows that all Q^2 values are positive (exploratory innovation = 0.225, explorative innovation = 0.249, and firm performance = 0.164), implying that models have medium predictive relevance (Hair et al., 2017).

To check for the common method bias, we apply two methods of Harman's single-factor analysis and the marker variable technique that are commonly applied in cross-sectional research studies (e.g., Lopez-Valeiras et al., 2016; Müller-Stewens et al., 2020; L. V. Ngo et al., 2019). Firstly, Harman's single-factor test is conducted to assess common method bias. The first factor accounted for only 32.914% of the total variance, implying that single-source bias is not a significant concern (Podsakoff et al., 2003). Secondly, we applied the marker variable technique (Lindell & Whitney, 2001) using the marker variable: 'Are you satisfied with your phone service?' to control for common method bias. Analysis results show that there is no significant correlation between the marker variable and the dependent variables. The mean change in the correlations of the key constructs (r_u—r_a) accounting for the effect of r_m was 0.003, providing evidence of no common method bias in this study.

5. Discussions

This study examines the roles of using MCS to promote the simultaneous achievement of exploitation and exploration and, ultimately, in enhancing firm performance. In this research, we focused on two different types of uses of MCS—diagnostic and interactive. Interestingly, our study supports hypothesis H1 that diagnostic use contributes to the achievement of exploitative innovation. Although prior studies have suggested that diagnostic use reduces organizational capabilities (Henri, 2006) and firm performance (Yuliansyah et al., 2019), our study shows that diagnostic contributes to promoting exploitative initiatives and efforts by the firm. This is in line with studies that considered it as a means to stimulate problem-solving and increase managers' focus on the achievement of operational and strategic goals (Bedford, 2015; Grafton et al., 2010). With the results accepting hypothesis H2a-b, we have highlighted the potential of an interactive use to significantly affect both exploration and exploitation. The noted effects are the outcome of the encouragement to managerial members to openly discuss and debate conflicting exploratory and exploitative demands and goals within their firm. Thereby, strategic contradictions and conflicts as arising from integrating and implementing spatially dispersed exploratory and exploitative activities are more satisfactorily resolved (Jansen et al., 2009).

To test the developed hypotheses H3 and H4, this paper applies exploration versus exploitation constructs to capture the different logics of technological innovation activities (Cao et al., 2009; He & Wong, 2004; Liu & Chen, 2015). As predicted, our empirical results support the hypotheses that both exploration and exploitation enhance firm performance. First of all, firms that pursue exploration have significantly increased firm performance. This suggests that a key to gaining performance in competitive and emerging economies (such as Vietnam) can be the development of new radical products and

services for emerging markets and customers (Jansen et al., 2009; Jansen et al., 2006). Thus, although the pursuit of exploration involves risk, it nevertheless offers a way to establishment of new markets for long-term competitive advantage. In addition, our findings also show that business firms that pursue exploitation can improve their performance. Thereby, besides exploring new products and markets, firms can expand current products and services and defend existing markets for increasing customer loyalty, in effect, being able to successfully operate in more dynamic and competitive conditions.

Regarding the mediating role of exploration and exploitation (H5a and H5b), our findings reveal that both innovations mediate the effects of the interactive use of MCS on firm performance. Specifically, the two innovation types are complementary mediation for the relationship between interactive use and performance. Our findings confirm that their combination provides a foundational resource for competitive advantages, thereby achieving superior performance. A reasonable explanation is that simultaneously pursuing both explorative (radical) and exploitative (incremental) innovation allows the firm to identify both its ability and capabilities (Tushman & O'Reilly III, 1996). Moreover, such a valuable identification is both rare and costly to imitate (Simsek et al., 2009), so it becomes a competitive advantage source (Barney, 1991).

6. Conclusions

This study's purpose is to test the relationship between the use of MCS, exploratory innovation, exploitative innovation, and firm performance. The results support all hypotheses that are proposed, except for hypothesis H5a. Thereby, the results confirm that the diagnostic use of MCS has a significant positive effect on exploitative innovation and the interactive use of MCS has a significant positive effect on both exploratory innovation and exploitative innovation. Especially, this study also shows that exploitative innovation and exploratory innovation partially mediate the relationship between the interactive use of MCS and firm performance.

6.1. Implications for theory

Firstly, the research on exploratory innovation and exploitative innovation has expanded rapidly. Nevertheless, our understanding of the antecedents of both activities remains rather incomplete (Chakma et al., 2021; O'Reilly & Tushman, 2013). First, Our study has highlighted fresh insights regarding the potential for the role of MCS as leverage for increasing the level of exploration and exploitation with a consequent improvement of firm performance. The results of our study reveal that diagnostic use has a positive effect on exploitation while interactive use positively affects both exploitation and exploration. These findings suggest that exploration is best achieved through interactive use only. Because the interactive use is said to foster capabilities that enhance exploration by focusing managers' attention on strategic priorities and by stimulating dialogue across the organization (Bedford, 2015; Henri & Wouters, 2020). Conversely, the diagnostic use as a means to create constraints and to ensure compliance with orders, and therefore as a barrier to introducing new processes, technologies and offerings (Bititci et al., 2018; Henri, 2006).

Secondly, because both exploitative and exploration positively affect performance, firms may seek to combine the magnitude of the two, consistent with exploration and exploitation being orthogonal activities (Gupta et al., 2006). The ability of firms to pursue both exploitation and exploration simultaneously provides an ongoing debate in the literature, to which this study has contributed. Thus, for example, Porter (1998) argues that firms have to trade-off between exploration and exploitation because the pursuit of these two innovative activities incompatible required skills, processes and performance appraisals. However, a more recent and growing literature argues that exploration and exploitation processes are not necessarily in fundamental opposition and may actually be mutually enhancing (Gupta et al., 2006) and this perspective is supported by empirical evidence relating to technological innovation (e.g., Cao et al., 2009; He & Wong, 2004) and organizational learning (Gupta et al., 2006; Suzuki, 2019).

6.2. Implications for practice

The study has contributed to managerial implications for top-level and middle-level management. Prior research has left it unclear whether the concern should be with trade-offs between such as exploration and exploitation or with the attempt to achieve high levels of both simultaneously. In the context of the emerging market that is Vietnam, our findings indicate that the simultaneous pursuit of exploration and exploitation is both possible and desirable. In order to compete effectively in the short term and survive in the long term, we recommend that managers need to manage the tension between exploration and exploitation continuously through the development of organizational capabilities to create competitive advantage (Henri, 2006; Tian et al., 2021), more especially, an ambidextrous capacity that is increasingly important for the sustained competitive advantage of firms (Junni et al., 2013). In particular, the study recommends that Vietnamese firms need to avail of MCS in both diagnostic and interactive manners, with a special emphasis on interactive manner. The implication is that, in the face of complex innovative decisions - such as whether or not to innovate radically, and how much resources should be devoted to exploitation and to exploration - managers need to debate thoroughly and discuss extensively in the lights of their MCS (Bedford et al., 2019).

6.3. Limitations and future research directions

First, our data were collected during the COVID-19 pandemic. Therefore, the next studies may collect data during the normal period to provide more robust evidence of these relationships. Second, to control the common method bias from the study design stage, subsequent studies should divide the questionnaire into two parts and send it to two managers, who represent a company, to answer two questionnaires (Cao et al., 2009; Jansen et al., 2006). Alternatively, future research may consider a longitudinal research design to provide evidence of causal linkages among constructs over time (Jansen et al., 2009; Jansen et al., 2006; Luu, 2017). Finally, although we recognize that MCS should be used in interactive and diagnostic manners

simultaneously, we have not considered the effect of their interaction on innovation types and performance (Henri, 2006). Future studies might usefully seek to fill this research gap in the literature on MCS research.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This research is funded by University of Economics Ho Chi Minh City, Vietnam (UEH).

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