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The role of management control systems in the relationship between leaders' attention and research and development performance in SMEs

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Abstract

The importance of research and development (R&D) is well documented in the innovation and accounting literature. R&D has vital implications on organizational productivity and contributes to the long-term performance and firm value. However, the literature has somewhat overlooked the effect of management control system in relation to leaders' attention in managing R&D related activities and the ensuing R&D performance. This paper aims to discuss the possible influence of leaders' attention and management control system as an information system for planning and controlling R&D process within small and medium enterprises context. It contributes to the control system literature by providing insights on scarce organizational resource, namely leaders' attention.

Keywords: Leaders' attention, management control system, R&D performance, small-and-medium enterprises (SMEs)

"A wealth of information creates a poverty of attention," (Herbert Simon, 1971)

1. INTRODUCTION

Past research has demonstrated the important role of research and development (R&D) performance in enhancing productivity (Hall, Lotti, &Mairesse, 2009), and maximizing the long run performance and firm value (Pauwels, Silva-Risso, Srinivasan, & Hanssens, 2004). Within the context of small-and-medium enterprises (SMEs), R&D was argued as difficult, if not impossible, to be conducted due to its complicated procedures and huge handled costs. Furthermore, current dramatic business environment pose challenges and intensive competition for SMEs to succeed and sustain. R&D has been found as a crucial factor for SMEs to gain competitive advantage in local and global markets. Numerous researchers have emphasized that R&D can assist corporations in reducing product cost, creating product differentiation, developing competitive advantage and reinforcing excellent performance that can be sustainable into the future (Hertenstein & Platt, 2000). Without taking product innovation into account seriously, SMEs will not survive in the long run (Khin, Ahmad, & Ramayah, 2010). However, SMEs have been reported as lacking of R&D (Saleh & Ndubisi, 2006). This has been widely referred to because of the limited funding and resources capabilities. But, what is often ignores is the influence of leaders' attention in directing R&D activity. This has been found as an important factor in improving R&D performance (Li et al., 2013). This paper examines the impact of non-financial organizational

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resources - leaders' attention - on R&D performance and the role of management control system (MCS) in the relationship.

Therefore, in order to manage R&D activities successfully it is important to recognize the special nature of R&D. Berson and Linton (2005) contended that employees in R&D environment are more educated and creative than in other administrative environments. Widener (2007) revealed that top management attention is needed to process the information required to properly manage strategic concerns. Furthermore, managers have to deal with uncertain goals and performance targets (Elkins & Keller, 2003). Therefore, leaders' attention is required to manage and succeed R&D performance. As underlined by Simons (1995), management attention is scarce while its importance in innovation context is even more. The uncertainty surrounding R&D activities makes it important to plan for and control those activities. MCS has been proven to be useful tools in environments characterized by high levels of uncertainty (Davila, 2000). Many studies show that MCS has an effect on R&D performance (Davila, 2000; Davila et al., 2009a,b; Ferreira & Otley, 2009, Hertenstein & Platt, 2000, Malagueno & Bisbe, 2010, McCarthy & Gordon, 2011).

Despite the importance of leaders' attention which necessitates the success in R&D context (Elkins & Keller, 2003), it appears limited research examines leaders' attention in both management accounting and innovation literatures Some exceptions are the studies of Li et al. (2013) and Yadav et al. (2007). Since a leader is more related to strategic issues and strategic decision making, and from the strategic orientation of this research, leaders will be taken to investigate their attention effect in this study. Furthermore, despite the dynamic work of MCSs to manage the inherent tension between limited attention and unlimited opportunities, prior research ignored the synthesis effect of leaders' attention and MCS as the source of information on R&D performance. Therefore, this paper attempts to unravel the possible role of leaders' attention in enhancing R&D performance and the mediating role of MCS in this relationship.

The remainder of the paper proceeds as follows. The next section discusses the three concepts, namely, R&D development, leaders' attention in relation to R&D, and management control systems. Drawing on previous studies, the authors elaborates the relationships between control systems and R&D performance. And the paper develops the possible influence of leaders' attention on R&D activity and thus performance. Since control systems are imperative and come in many forms to help top managers to monitor their organization, the way and to what extent they use can have certain implications on its performance.

2. LITERATURE REVIEW

2.1 Research and development (R&D)

Innovation and creativity are important concepts which characterize R&D performance. Innovation can come in a form of new process, product, packaging or piece of knowledge. For the purpose of this study, R&D is defined as any activities related and/or contributed to development of new product, method, technology, and idea. It has been well recognized that R&D can influence firm's outcomes and profitability. Chen et al. (2010) have found out the importance of R&D to overall firm performance and competitive advantage. Achieving competitive advantage, in turn, enables the firm to cope with new market demands.

Business sector in Malaysia has been the major contribution in R&D spending which makes up over 64% of the total R&D expenditure in 2012. The importance of R&D is derived from the fact that R&D and innovation activities are a pre-requisite for Malaysia's competitiveness in the global market. Private firms hope to secure economic rents from product or process innovation resulting from their R&D races with other similar firms (Kassim, 2009). Thus, innovations become key elements in determining competitiveness in the marketplace. Asmawi and Mohan (2011) underline the importance of R&D activities as sources of knowledge and technological innovation. However, SMEs may face limited resources as one of the common barriers. The uncertainty surrounding R&D activities and the resources allocation required make R&D activities costly and risky.

R&D is a function of the search and identification of new information and knowledge (Katila &Ahuja, 2002; Maggitti, Smith, & Katila, 2013). Furthermore, as Davila et al. (2009b) indicated product development is a representative of incremental innovation, they asserted that product development nowadays relies widely on highly structured processes. This reflects the complicated nature of R&D activities that today's organizations have to cope with while they are dealing with strategic uncertainty. Therefore, the complicated characteristics of R&D needs more control to achieve organizations goals. In line with this argument, Adler and Chen (2011) argue that formal controls are needed when tasks are complex and interdependent. Moreover, the main role of

MCSs in product development is to supply the information required to reduce uncertainty (Davila, 2000). Thus, MCS is considered as one of the best tools to control the various activities of R&D in organizations.

2.2 Leaders' attention and link to R&D

Search activities in relation to R&D may vary across SMEs. Firms develop different tendencies to seek information. Some firms use high information search and some low. Leaders play a vital role in search process (Li et al. 2013). A leader who more effectively attends to searching and acquiring of new information and knowledge is more capable to make strategic decisions, to be innovative, and to grow his or her firm (Katila, Chen, & Piezunka, 2012; Li et al., 2013). Howell (2005) argues that it is the responsibility of leaders to shape innovations as opportunities rather than risk to the stakeholders and followers. Brown and Eisenhardt (1995) discuss the important role of agents including senior management in impacting product development performance. They mention other agents such as team members, project leaders, customers, and suppliers who play important role in the environment. This study, in contrast, focuses only on senior or top management for the following reasons. In SME environment it is generally the top management who makes most of the important decisions including those related to innovation and R&D. Since the present study focuses on how MCS is used to monitor and control R&D performance, presumably the top management

It is well recognized that the firm's top management is responsible for its key strategic decisions (Child, 1972; Helfat et al., 2006). In particular, leaders are directly involved in strategic decisions regarding innovation (Burgelman, 1991; Noda & Bower, 1996). Prior studies demonstrated the effect of leaders' attention towards R&D and innovation outcomes. For example, Yadav et al. (2007) developed an attention theory and empirically tested a model highlighting the important role of leaders in the detection, development, and deployment of new products. Their findings suggested that firms with CEOs, who attend to the future and external information more than others, are faster at developing initial products. Furthermore, they mentioned that little is actually known about the link between how leaders think and the specific innovation outcomes that occur in the marketplace (Yadav et al., 2007).

In reviewing some of R&D literature, Brown and Eisenhardt (1995) argue that although the product development process may be delegated to a cross-functional project team, the top management support is critical for timely and successful introduction of a new product. Other studies have also found empirical evidence for the importance of top management support and monitoring in the effectiveness (Hitt et al., 1999) and innovativeness (Sethi et al., 2001) of cross-functional new product teams. In a meta-analysis study of the determinants of new product performance, Henard and Szymanski (2001) found that leaders' support has a positive relationship with new product performance. Thus, leader's support could be in the form of presenting a vision for the future, communicating a distinctive product concept, giving the approval to the project team to go ahead with a new idea, and providing the necessary resources.

In this paper, leaders' attention is viewed as the extent of width and breadth of information search by firms. This includes information sourced from within and outside industry. The vast information is assumed help to improve ability to create firm's new capabilities and in turn enhance its performance. It is assumed in this paper that leaders involve in many information-based work arrangements including team and communication. Leaders have the responsibility to create working teams and lead them to optimal outcomes (Goleman, 2013). Innovations, according to him, do not come only from a handful of people in organization. They come from groups of people working together. It is the leader that creates the environment and ensures new ideas are not stifled by bad decision makings. It is argued that some leaders are bad judges for new ideas and certain work process may inhibit innovation. The variations across firms may impact their R&D performance.

However, we follow the logic that new product introduction requires a strategic decision, and it is the leader of the firm that most care of the organization's future and prosperity. Indeed, innovative signals usually stem from leaders. Communicating those signals to the overall organization requires an effective tool, and good understanding and utilizing from leaders. Simons (2000) argued that MCSs enable leaders to effectively communicate strategy to employees and control strategy implementation. As mentioned earlier, activities related to R&D are considered as important strategic matter due to its effect on the overall performance. Consequently, leaders need to exploit MCSs for better investment of their attention towards R&D performance.

2.3 Management control systems

In innovation environment communication is important for people to share ideas and form team to develop those ideas. Leaders must ensure people from different sections of organization can pool resources and pull ideas from multiple sources internally and externally. With their limited attention, leaders' use of MCS effectively becomes critical to firm's success (Simons, 2000). Also, firms design and use MCS differently. Ditillo (2004) describes MCS as key element in knowledge intensive firms. Mechanisms such as meeting and discussion can facilitate information flow. Communication that fails cannot build trust and collaboration. The leader him/herself must be able to vividly communicate the vision of the future. MCS concept has been evolved over the years from one focusing on the provision of more formal, financially quantifiable information to assist managerial decision making to one that embraces a much broader scope of information. This includes external information related to markets, customers, competitors, non-financial information related to production processes, predictive information and a broad array of decision support mechanisms, and informal personal and social controls (Chenhall, 2003; Malmi& Brown, 2008). Chenhall's (2003) definition of MCS encompasses systematic use of MA and also includes other controls such as personal and clan controls to achieve some goal.

The present study uses Simons' (1995) levers of control who defines MCS as "the formal, information-based routines and procedures managers use to maintain or alter patterns in organizational activities". There are two differences that the current study differs from previous studies in R&D setting. First, this study does not look at specific types of control systems used by firms. Rather, it focuses on the extent to which firms use each lever in general to monitor and control their R&D activities. For example, firms may use certain diagnostic systems such as project milestones (Davilla, 2009a) to monitor performance and to get feedback. Figure below depicts all seven systems used by Davilla (2009a) in his study. We match each system against probable control levers used in this study to help understanding on how the levers may capture the same concept used in previous study.

Specific Control systems	Lever of control
Project milestones	Diagnostic control system
Report comparing actual progress to plan	Diagnostic control system
Budget for development project	Diagnostic control system
Project selection process	Boundary system
Product portfolio roadmap	
Product concept testing process	Interactive control system
Project team composition guidelines	Boundary system

Second, the present study also does not examine specific performance measures related to R&D. In performance measurement literature there are many measures discussed for practitioners to use. For example, new product sales ratio, yield of new product, and cost saving from new technology are widely used to measure output.

Control levers and R&D

Control levers framework comprises belief, boundary, diagnostic control, and interactive control systems. They are distinct but interrelated. Simons (1995, 2000) argues control of business strategy can be achieved by integrating these four levers together. Managerial use of these four control levers creates dynamic tensions within the overall control package, thereby allowing firms to encourage innovation while pursuing pre-set goals simultaneously. The framework has its strength by including different types of controls and providing a broad perspective (Ferreira & Otley, 2009).

Belief systems create initiatives to the organization to encourage innovation (Simons, 2000). Core values, an important source of belief, are normally communicated through mission statement. This study looks at the extent to which managers use the belief system to communicate firm's core values to employees. It examines the active role played by managers to inform and inspire employees as opposed to passive set of values written on firm's mission statements. In order to be effective in terms of innovation, the belief system must enable to motivate employees to be explorative in finding new ideas and ways. Effectively, this control system should be used by managers as source of power to allow freedom to employees to contribute.

Harness Employees' Creativity with the Four Levers of Control			
Potential	**Organizational Blocks**	**Managerial Solution**	**Control Lever**
To contribute	Uncertainty about purpose.	Communicate core values and mission.	Beliefs systems.
To do right	Pressure or temptation.	Specify and enforce rules of the game.	Boundary systems.
To achieve	Lack of focus or of resources.	Build and support clear targets.	Diagnostic control systems.
To create	Lack of opportunity or fear of risk.	Open organizational dialogue to encourage learning.	Interactive control systems.

Boundary draw the areas where innovation is considered being safe and must not be exceeded. Managers use boundary systems to state risks to be avoided. It gives employees freedom to be innovative within the stated boundary. Amabile (1998) argues that "it is far more important that whoever sets the goals also makes them clear to the organization and that these goals remain stable for a meaningful period of time" (p. 80). In line with the argument that MCS makes goals explicit and clear, stated boundary can be viewed as giving clear and stable 'playing area' for employees to be innovative. As Simons (1995a) put it, managers can exert influence through boundary systems by specifying and enforcing rules of the game.

Diagnostic control systems enable managers to set targets and ensure that strategic goals are going to be achieved. R&D projects are serious hazard for the business if they not be planned and controlled well. Through diagnostic control systems, managers can conserve their scarce attention (Simons, 2000) and spare it for other strategic matters. Henri (2006) found that diagnostic control system negatively related to innovativeness. Frequent monitoring may cause interference that discourage employees from taking risk in project or idea that is highly uncertain. This negative influence does not reflect innovation impediment as other studies argued, rather it indicates the beneficial role of diagnostic systems to constraint R&D projects to what is planned for and keep them on track (Henri, 2006). In the same line, Widener (2007) found that belief and diagnostic control systems facilitate the efficient use of leaders' attention. If diagnostic system to be used effectively managers must be aware of several issues and adapt to the situation as the need arises.

And finally, managers exploit interactive systems to search for new information regarding strategic uncertainties and communicate the information to the organization. Interactive control systems facilitate leaders to communicate and control those strategic changes in the pre-set goals. As a business is operating in a dynamic environment, the leader must be aware of strategic uncertainties which could make the current strategy obsolete and in turn getting undesired results. Simons (2000) argued that interactive control system enables leaders to focus organizational attention on strategic threats and opportunities. This argument supported by Widener's (2007) findings. He found that firm faces competitive uncertainty; interactive control system is vital. Bisbe and Otley (2004) found no effect of interactive control on innovation. However, they concluded that it enhance the impact of innovation on performance. So, interactive control enables leaders to communicate innovative ideas got from their attention on search of information and direct the overall organizational attention to focus on such innovations, which in turn enhance the R&D performance.
As leaders, senior managers

MCS have been characterized as impediment or, at most cases, are not beneficial in R&D settings, and researchers found that the role of MCS in these R&D settings should be minimal (i.e., Abernethy & Brownell, 1997; Abernethy & Lillis, 1995; Amabile, 1998; Rockness & Shields, 1988). However, recent studies in management accounting literature argue that recent dynamic changes in today's environment and the flexibility that required by environment to face and keep on competitiveness impose MCSs to be prevalent in the different R&D activities. These findings show that MCS play an essential role in improving R&D performance (Davila et al., 2009a,b; Simons, 1995; Hertenstein & Platt, 2000). Simons (1995) mentions that MCS facilitate control by exception where managerial attention is required only if innovation results deviate from expectations.

Attention-based concept has not been at the centre stage of management accounting research. Hence, the influence of MCSs in the relationship between leader's attention and R&D performance, since MCSs play a vital role to improve R&D performance (i.e., Davila, 2008; Davila et al., 2009a,b; Henri, 2006; Widener, 2007). In general, a business manager is expected to know how to detect unhealthy aspects of the business in order to recover them, understand the MCSs tools that are available to achieve desired goals, and they must have the skills to utilize those tools in different situations (Simons, 2000). Managers' usage of MCSs is argued to influence the process of innovation (Simons, 2000). Managers with certain skills are more able to choose which control systems should be implemented as circumstances warrant. Their attention to MCSs, for example, qualifies them to transmit among control systems to better control innovative activities.

3. THEORETICAL BACKGROUND AND CONCEPTUAL MODEL

Does more information, as conceptualized in leader's attention construct, always contribute to better R&D performance? In this study, information includes those related to issues and answers from organizational environment (Ocasio, 1997). The logic is firms that have more information sourced from various sources are more likely to benefit from those who are not. For example, information on technology opportunity and demand growth can contribute to better R&D investment decisions (Courtney, 2001). While there is always the risk of information overload, it is assumed that the structural process through which MCS is used can mitigate this problem. Decisions are made based on rich and relevant information through control levers which work

independently and in combination. The paper argue that R&D performance may be mediated by how senior managers use control levers. Information is fed to control systems to enable managers to make sense of the environment and in turn to make decisions.

Based on the discussion above, the proposed model is presented in Fig. 1. This model integrates leaders' attention from innovation literature and MCS from management accounting literature to investigate their effect on R&D performance. The relationships in this model are based on attention theory which proposes that bright information will attract searchers' focus firstly, and then allocating more attentional capacity to notice, interpret, and make sense of information and knowledge to impact the outputs; and resource based view which suggests that an organization can create its competitive advantage by utilizing its resources and capabilities; it gains superior performance by effective using of its resources than competitors. Simons (1995) mentioned that attention is critical to creating value and without attention; innovations and solutions cannot be created.

Also, the model incorporates Simons' levers of control as a construct for MCSs. Simons (1995) argued that the use of MCSs creates a dynamic tension that enables organizations to stimulate innovation and simultaneously pursuing pre-set goals. He further argued that MCSs work together to manage the implicit tension between limited attention and unlimited opportunities, which R&D is considered one of these opportunities. The combinations of different control systems may generate synergy – positive tensions or the opposite.
Fig. 1 below shows the conceptual model of this study.

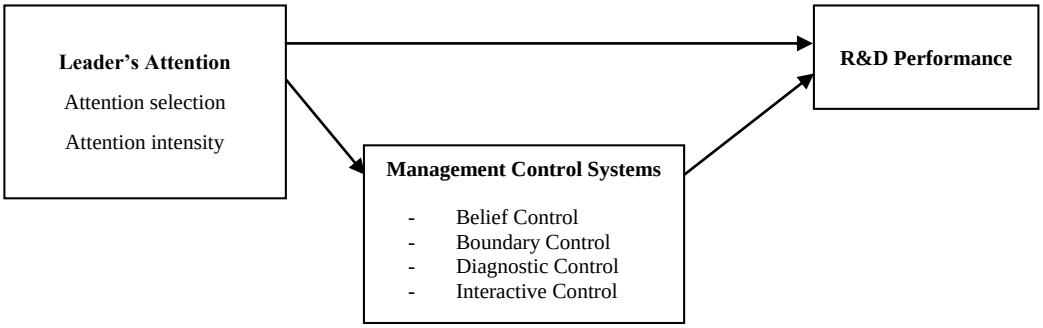

Fig. 1.Conceptual model

4. CONCLUSION

This paper reviews the literature on management control systems, in particular, the attention given by top management, and the possible implications on R&D performance in the context of SMEs. While past studies on control systems and R&D are well discussed, the findings are somewhat mixed due to different concepts entailed by researchers. Attention is limited resource of management and often neglected in the control systems literature. How it is used may have a profound effect on organizational performance. It is noted there are still notable gaps in leader's attention which is viewed in this paper as control system use by top management. An exhaustive empirical study would be important. Such a study would provide an understanding about the role that leaders play in shaping, signalling and motivating innovation within R&D settings. This paper contributes some insights on attention as well as control systems use and discusses its possible relationship with R&D performance.

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