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CONTROL SYSTEMS AND INNOVATION IN MEDIUM-SIZED FIRMS

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Abstract: *The aim of this paper is to investigate the influence control systems on innovation performance of medium-sized firms. The study adopts Simons' levers of control (LOC) framework to examine the control systems used by top managers. Using a quantitative approach, data were collected from 156 Malaysian medium-sized manufacturing firms in Malaysia. The findings show that control levers have positive relationship with innovation performance. As one of control levers, interactive control systems contribute the most in enhancing innovation followed by belief systems. Boundary systems show significant negative influence on innovation. However, diagnostic control systems do not show significant relationship to innovation.*

Keywords: *Control Systems, Innovation, Medium-Sized Manufacturing Firms, R&D Performance*

Introduction

The importance of innovation in manufacturing firms is well documented. For example, Pauwels et al. (2004) and Hall et al. (2009) concur on the role of research and development (R&D) and innovation in enhancing productivity and long-term performance of firms. R&D and innovation-related activities are considered as a strategic priority that can help firms reduce product cost, initiate product differentiation and create competitive advantage which enable them to sustain in the future (Hertenstein & Platt, 2000).

The recent finding of one study on Malaysian SMEs however is quite disturbing. Amin et al. (2017) report that Malaysian manufacturing SMEs underperform their larger counterparts in terms of productivity and innovation. It does not show improvement from earlier finding that shows SMEs are less in practicing innovation for competitiveness (Anuar & Mohd Yusuf, 2011). As a results, the last decade has shown that the Malaysian manufacturers decline in number for the period between 2003 and 2010 by almost 3 percent from 40,793 to 39,669 (Department of Statistics, 2011). Indeed, Khin et al. (2010) have already warned Malaysian

SMEs that they may not survive in the long term if they do not consider product innovation into account. However, these aspects have been widely reported as lacking in small and medium enterprises (SMEs) (Saleh & Ndubisi, 2006) due to limited funding and resource capabilities.

In management accounting literature, control has been discussed as a key element in dynamic firms which are likely to involve in innovation (Henri, 2006; Davila et al., 2009b; Chenhall & Moers, 2015). Since control systems are imperative and represented by many forms to help top managers monitor their organization, the manner and extent of their use can have certain implications for performance. This leads to this study's major inquiry to investigate how control systems influence innovation performance. Therefore, it is useful to examine the impact of control systems used by senior managers of medium-sized manufacturing firms on innovation performance.

Given its importance in other literature, innovation has also been studied in the management accounting literature, in particular, its relationship to control. Shields (1997) and Davila et al. (2009b) argued that although investigation of the relationship between control systems and innovation has improved in the past years, further examination is required to identify how these two concepts are correlated. Mouritsen et al. (2009) also concur that the influence of control on innovation, as a setting for its information and rules, still needs more exploration. Past research has focused on singular or dual control effects (e.g., Abernethy & Brownell, 1999; Bisbe & Otley, 2004; Henri, 2006, Naranjo-Gil & Hartmann, 2007; Bisbe & Malagueno, 2009). However, Widener (2007) argues that considering one or two control systems limits the understanding of how and when the activation or combination of the full range of control levers happens and with what consequences. Moreover, debate in the management accounting literature has moved from the fostering or hindering role of control systems for innovation to whether one control tool is enough or innovation-oriented firms should use a combination of control systems to better manage their strategic priorities (Simons, 1995a; Widener, 2007; Davila et al., 2009b).

Building on this body of knowledge, the current study attempts to use Simons' levers of control (i) to understand how each lever influence the innovation and (ii) to examine how all four levers impact the innovation simultaneously. It also discusses some possible explanations to the findings. The study differs from past research in innovation setting in two ways. Firstly, it does not focus on specific types of control system used by firms for every lever. Rather, it focuses on the extent to which firms use those levers individually and simultaneously to observe and control their innovation and R&D related activities. Secondly, the present study does not examine specific performance measures related to innovation. In the performance measurement literature, many measures used by practitioners were discussed. For example, to measure the output, new product sales ratio, yield of new product and cost saving from new technology were widely used.

The remaining paper is organised as follows. The subsequent section discusses the two concepts, namely, innovation performance and control systems. The four levers of control were considered in the following sub-sections. The research methodology is discussed in the third section, and the research results are reported and discussed, with their implications, in the fourth and fifth sections. Finally, the main remarks are provided in the concluding section.

Literature Review

Malaysian Medium-sized Manufacturers and Innovation

Medium-sized firms are important growth engine for sustainable economics. Therefore, to understand their operations and innovation efforts is important. While many studies have investigated innovation and R&D related activities in large firms there are only handful of them which have looked into small and medium firms. Medium-sized firms may have relatively less complex R&D setting and fund as compared to their larger counterparts but these should not be likened as being less important.

Medium-sized firms are owned by other larger corporations (private or listed) and typically organized as either cost or profit centres. As a profit centre, medium-sized firm may be structured as a manufacturing unit within which there is R&D department. Alternatively, a medium-sized firm may itself be a R&D outfit treated as a cost centre. In either form, innovation is important for a typical medium-sized firm which requires attention with regard to its performance. The paper argues that how management controls its R&D unit to achieve organizational objectives may have some influence on the innovation performance. The extent and complexity associated with innovation efforts may vary across firms due to structure as mentioned.

Past studies have differentiated between innovation and R&D performance which is problematic in medium-sized environment as it is relatively less complex in nature (see e.g. Akroyd et al., 2009; Brun et al., 2009; Jorgensen & Messner, 2010). In this study innovation includes product (Bisbe & Otley, 2004) and process (Czarnitzki et al., 2007; Davila et al., 2009b). Davila et al. (2009a) argue that innovation plays a major role in product development process which covers activities related to development of a new idea, method, product, or technology.

In Malaysia, innovation and R&D related initiatives are well recognized at both micro and macro levels by the Malaysian government. It introduces many state support schemes for R&D efforts and expenditures (Kassim, 2009). Private sectors of which medium-sized firms constitute significant numbers have shown their commitment to focus innovation as major strategic priority (Gopalan, 2012). Asmawi and Mohan (2011) underline the importance of R&D activities as sources of knowledge and technological innovation. However, limited resources are a common barrier for SMEs. The uncertainty surrounding R&D activities and the resource allocation required make R&D costly and risky.

R&D is a function of the search for and identification of new information and knowledge (Katila & Ahuja, 2002; Maggitti et al., 2013). Davila et al. (2009b) indicate that product development nowadays depends on highly structured processes. This reflects the complicated nature of R&D activities for organizations dealing with strategic uncertainty. Therefore, the complicated characteristics of innovation and R&D related activities need more control to achieve organizational goals. Adler and Chen (2011) argued that formal controls are needed when tasks are complex and interdependent. One of the main roles of control systems in product development is to supply the information required to reduce uncertainty (Davila, 2000). Kasim et al., (2012), based on 61 manufacturing firms' data, argue that the availability of an appropriate control systems would improve performance as respondents believe they possess the required information to accomplish a specific R&D task.

Control systems

In general, there are two views regarding relationship between control systems and innovation. In the past, traditional control systems have been viewed as an impediment to innovation settings. Researchers therefore concluded that the role of control systems on innovation should be minimal. For instance, the probable influence of control systems on product innovation success has been neglected in innovation management studies (Dougherty & Hardy, 1996; Verona, 1999). This implied that top management use of control systems may not be related to successful products innovations. Moreover, research on management accounting, control and innovation assert that the use of control in innovation is not useful (Abernethy & Lillis, 1995; Amabile, 1998; Bisbe & Otley, 2004).

Control systems was developed over the years to provide financial, mechanistic and wider range decision making information. Thus, the second strand view control systems as fostering innovation. Control systems are used by firms to provide pertinent information for decision making and control purpose (Simons, 1995b; Davila, 2000; Henri, 2006; Widener, 2007). According to Ditillo (2004), control systems provide a key element in knowledge-intensive firms. Davila et al. (2009b) establish that a new paradigm emerged which emphasizes the need of innovation to control. They indicate that some organizations use financial plans for encouraging people to project themselves in to the future, identify new trends, observe new opportunities and threats and adopt new strategic positions. De Haas and Kleingeld (1999) opine that activation of flexible information and innovative thinking can be based on control systems. Chenhall and Morris (1995), Davila et al., (2009a) and Mundy (2010) view control systems as a constraint of undesired innovation behaviors.

The concept of control systems is adopted from Simons' (1995b, 2000) levers of control (LOC) framework. LOC framework is chosen for this study because it encapsulates the contradicting uses of control and innovation (Mundy, 2010). There is often an element of tension between freedom associated with innovation and constraint with regard to control. Additionally, it involves an important shift from conventional accounting control to encouraging innovation trends through the new concept of interactive control systems. In this regard, "interactive use is a good approach to fostering and managing process and organizational innovation" (Lopez-Valeiras et al., 2016, p. 504).

Abernethy and Lillis (1995) examined the impact of pursuing flexibility, as a new strategy, on firms' control systems of 42 Australian manufacturing firms. They found that firms committed to flexibility depend more on "integrative liaison devices" which allowed for personal, regular, spontaneous and intensive contact. Their study found that performance of those firms is positively and significantly correlated with the use of integrative liaison devices. They argue that these devices act to defeat the functional barriers imposed by mechanistic structures. These characteristics are consistent with the interactive control concept. In addition, Amabile (1998), in her 22 years of organizational working experience, concludes that innovation is weakened by formal procedures and constraints which basically destroy creativity. Empirically, her study of controls aimed at highlighting the necessity of freedom, intrinsic motivation and lowest levels of formalized constraints and procedures in innovation settings. Amabile (1998) further argued that communication is crucial in sharing ideas in an innovative environment. Malmi and

Brown (2008) consider value controls as one aspect of their culture control system which may be used by firms to regulate behavior in the desired manner.

Furthermore, in the fields of accounting and strategic management, researchers argued that control involves different but interrelated systems (Otley, 1980; Marginson, 2002; Turner & Makhija, 2006). Otley (1999) views "control package" as a combination of multiple formal and informal control elements. While informal controls have important role in encouraging innovation, formal controls are supposed to impede undesired innovation practices and to guarantee the translation of ideas into realistic product innovation and enhance performance (Chenhall & Morris, 1995; Kaplan & Norton, 1996; Henri, 2006; Widener, 2007; Chenhall et al., 2011). For example, Chenhall et al. (2011) find organic innovative culture and formal controls to have direct paths to innovation. Furthermore, on the growing calls to investigate the effect of control package in the innovation setting, recent studies by Lillis and van Veen-Dirks (2008), McCarthy and Gordon (2011), Dekker et al. (2013), and Bedford (2015) confirmed that firms with ambidextrous features (pursuing two different strategies simultaneously) use more complex control systems that highlight a broad diversity of controls, indicating managerial needs to complement rather than to trade off existing capabilities.

Belief systems (BfSs)

Simons (1995) views belief systems as "the explicit set of organizational definitions that senior managers communicate formally and reinforce systematically to provide basic values, purpose and direction for the organization" (Simons, 1995b, p. 34). The concept is also used as "cultural control" by other studies (e.g. Flamholtz et al., 1985; Malmi & Brown, 2008). Senior managers must show their commitment in developing innovation culture in their firm. Their actions shape the right environment for behaviors and efforts which are in line with the R&D strategic objectives. These motivate individuals to introduce new ideas and explore new ways for doing things. Simons (1995a) argued that belief systems provide the "positive energy" important for exploration, and the strategic aligning necessary for employees to gather new knowledge and search for new opportunities independently but in focused manner. This view is confirmed by the work of McCarthy and Gordon (2011) as they conclude that belief controls are used by managers in a manner to focus and energize employees on the innovation and feed-forward control aspect of innovation. This is also proved by the findings of a later study, that the use effect of belief systems is positive and significant on innovation (Bedford, 2015). Therefore, the first hypothesis is formulated as follows:

H1: There is a relationship between BfSs and innovation performance.

Boundary systems (BSs)

Boundary systems mean "the acceptable domain of strategic activity for organizational participants" (Simons, 1995b, p. 39). These are the systems that determine and enforce the borders which employees must not exceed beyond. In fact, firms need this demarcation to protect themselves from over-exploring and being too stretched. Thus, boundary systems are central to reliability-based exploitation behaviors (Simons, 1995b). Their purpose is to avoid undesirable behaviors which in turn will save the organization from undesirable results. McCarthy and Gordon (2011) find that firms use boundary systems to avoid surprises during their strategy implementation and project execution. In this study it is argued, in line with Simons, that using boundary systems would affect innovation negatively. This negative impact,

in fact, limits innovation activities from the domain not covered by current strategy to hinder surprises in strategy implementation. Accordingly, the second hypothesis is stated as follows:
H2: There is a relationship between BSs and innovation performance.

Diagnostic control systems (DCSs)

Diagnostic control systems are "the formal information systems that managers use to monitor organizational outcomes and correct deviations from preset standards of performance" (Simons, 1995b, p. 59). These systems rely on tangible-based measurement to motivate employees to be efficient and productive. Thus, if a strong DCS is integrated with inappropriate or weak belief and boundary controls can result in "what you measure, is what you get" postulate. This, in turn, may lead to undesirable and unintended results. Diagnostic controls, as a performance measurement system, can help firms to ensure innovative efforts by overcoming deviations in desired activities (Davila et al., 2006), and to develop reward systems in a way that motivate managers to generate innovation (Simons, 2000). Widener (2007) revealed that the use of the diagnostic system facilitates the efficient use of management attention and enhances organizational learning which, arguably, is consistent with innovation, and in turn results in better organizational performance. Additionally, the findings of Chenhall et al. (2011) support the role of formal controls (a construct that is like diagnostic controls) in enhancing innovation which, arguably, is the nature of R&D processes. Following this argument, the third hypothesis is as follows:

H3: There is a relationship between DCSs and innovation performance.

Interactive control systems (ICSs)

Simons (2000) argues that ICSs enable managers to focus organizational attention on strategic threats and opportunities. Managers exploit interactive controls to acquire new information regarding strategic uncertainties and communicate this information to the firm. As a business operates in a dynamic environment, the manager must be aware of strategic uncertainties which could make the current strategy obsolete and in turn produce undesired results. ICSs facilitate leaders in communicating and controlling these strategic changes to the pre-set goals. They allow debates which generate and engender new and relevant information associated with changes in the environment that may not be captured earlier during planning stage.

As Simons (1995b) suggests recent empirical works provide evidence that the presence of controls in firms may benefits innovation processes. Also, Davila et al. (2009b) state that interactive controls break with the traditional control paradigm and provide an argument for the relevance of control to innovation. They believe that interactive controls are related to enhanced innovativeness. Notwithstanding what Bisbe and Otley (2004) found that interactive controls play a more important role in low-innovation firms than in high-innovation firms, similar finding is not supported in later research. For instance, Widener (2007) concludes that interactive control is crucial in firms that face competitive uncertainty. In the same vein, Bedford (2015) believes that interactive controls can enhance performance in firms engaged in exploratory innovation (highly innovative activities), but not for exploitation (less innovative activities). Lopez-Valeiras et al. (2016) go beyond launching innovative products to process and organizational innovations. They conclude that ICSs foster process and organizational innovations and thus improve the firm's performance.

Abernethy and Lillis' (1995) survey of Australian manufacturing firms found that those committed to flexibility depended more on integrative liaison devices which allowed for personal, regular and spontaneous and intensive contact to defeat the functional barriers imposed by mechanistic structures, characteristics consistent with the interactive control concept. Furthermore, they concluded that those firms' performance was correlated positively and significantly with the use of integrative liaison devices. Abernethy and Brownell (1999) affirmed that performance effect in periods of strategic change is partly attributed to the interactive use of budgets. Moreover, Widener (2007) demonstrated that ICS carries a high cost since it consumes management attention; however, the net effect of the overall control system on attention is positive, and performance is higher when there is interactive control.

In this study, it is argued that interactive controls enable strategy formulators to communicate their strategy and its goals to all levels of their firm. Further, interactive controls ensure that the strategy is delivered correctly through representing the intended or desired processes and achievements. Based on this discussion, the fourth hypothesis is stated as follows:

H4: There is a relationship between ICSs and innovation performance.

Theoretical framework

The proposed model to enhance innovation performance include the four levers of control which construct control systems as the predictors. Innovation performance represents the criterion variable. The associations are in line with LOC framework, which suggest that the different effect of control systems creates a control combination to manage the dynamic tension in the innovation setting, while concurrently pursuing pre-determined goals. The combinations of different control systems may generate synergy – positive tensions or the opposite.

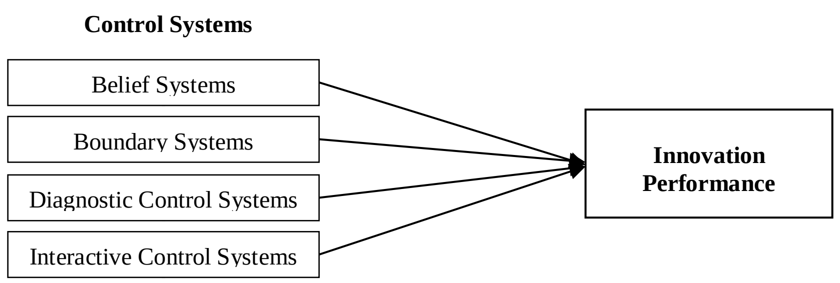

Figure 1: Theoretical model

Research design

Sample

A covering letter along with the structured questionnaire was given to 654 manufacturers. Names and addresses of manufacturers are obtained from the Federation of Malaysian Manufacturers (FMM) directory (2015). Shafi'i and Ismail (2015) in their study on Malaysian manufacturing have found evidence that the types of sector do influence the propensity of firms to innovate. They are chemicals, electrical and electronic, machinery and transport, food and beverages, basic metal, and rubber and plastic. This validates the chosen sample to be likely involved in innovation. As shown in Table 1, the first six sectors which are considered as high propensity innovation make up more than 81% of the sample.

Table 1: Descriptive statistics of manufacturing industries

INDUSTRY	Frequencies	Percentage %
Food, beverages and tobacco	27	17.3
Plastic and rubber	24	15.4
Chemicals including petroleum	23	14.7
Machinery and Transport	22	14.1
Fabricated and basic metal	16	10.3
Electrical and electronics	15	9.6
Paper, printing and publishing	13	8.3
Textile, wearing apparel and leather	5	3.2
Wood and furniture products	5	3.2
Others	6	3.9
Total	**156**	**100**

All the selected manufacturers are medium-sized enterprises in Malaysia, because this type of firm is supposed to depend on innovation opportunities to grow and move to the next level. The study targeted top-level managers as being most likely to respond to questions concerning the strategic matters related to this topic. To increase the response rate, most of the manufacturers in northern Malaysia were visited and research assistants distributed the questionnaires. Of the 654 questionnaires distributed, 167 were received; 11 were incomplete, so only 156 questionnaires were useful for the analysis, representing a 23.8% response rate. As shown on Table 1 above, the sample firms constitute 10 sector segments. The major respondents are from food, beverages and tobacco with 17.3%, plastic and rubber with 15.4%, chemicals with 14.7%, machinery and transport with 14.1, and fabricated and basic metal with 10.3%.

Measures

The instruments for this study were developed using established measures from previous work. The four control systems constructs (i.e., belief systems, boundary systems, diagnostic control systems and interactive control systems) were operationalized using Simons' (1995b) and (2000) definitions and items determined by Henri (2006) and Widener (2007). For innovation performance, the study adapted the instrument developed by Prajogo and Sohal (2006) and used by Yusr et al. (2014). All items were measured using the five-point Likert scale.

A reliability test was conducted on the questionnaire, using Cronbach's alpha on the constructs. All scores for all variables indicated that the items had a high level of reliability, above 0.70 (refer to Table 2). Following the scale measurement literature (Pallant, 2005; Field, 2009; Hair et al., 2010), it is safe to say that the reliability of the research instruments is within a satisfactory level in terms of internal consistency. For validity, all items used in this study are chosen from past empirical studies. So, the content of the individual constructs can be argued as valid; however, the items were discussed with the cost managers of some firms and with academics during the pilot stage to ensure that they were relevant from their perspectives. The results of exploratory factor analysis (EFA) show a clear conceptualizing of unobservable constructs. Further, EFA can diagnose the highly correlated items of individual factors, as well as separate ones that differ from each other (Sekaran & Bougie, 2010). Table 2 presents the figures of EFA and reliability tests for all constructs.

Table 2: Factor analysis and reliability of reflective constructs

Construct	Items	Factor loadings	Eigenvalue	Cronbach's alpha
Belief Systems	BfSs1	0.57	12.57	0.95
	BfSs2	0.81		
	BfSs3	0.92		
	BfSs4	0.89		
	BfSs5	0.93		
	BfSs6	0.69		
Boundary systems	BSs1	0.93	7.17	0.97
	BSs2	0.92		
	BSs3	0.97		
	BSs4	0.94		
	BSs5	0.86		
	BSs6	0.91		
Diagnostic Control Systems	DCSs1	0.54	1.67	0.95
	DCSs2	0.97		
	DCSs3	0.95		
	DCSs4	0.94		
	DCSs5	0.84		
	DCSs6	0.83		
Interactive Control Systems	ICSs1	0.69	1.45	0.98
	ICSs2	0.97		
	ICSs3	0.95		
	ICSs4	0.93		
	ICSs5	0.95		
	ICSs6	0.95		
	ICSs7	0.97		
	ICSs8	0.98		
Innov Performance	InnovP1	0.94	6.04	0.95
	InnovP2	0.86		
	InnovP3	0.93		
	InnovP4	0.87		
	InnovP5	0.81		
	InnovP6	0.82		
	InnovP7	0.78		
	InnovP8	0.92		

Results

Correlation matrix displayed in Table 3 shows all control levers have significant relationships with innovation performance. These findings are consistent with the past research (e.g. Bedford, 2015; Widener, 2007). Although the correlations do not suggest cause-and-effect relationships, the findings provide some insights on the different impact of control levers on innovation. For example, ICSs have relatively more impact on innovation performance than the other three levers. They are followed by belief systems, diagnostic control systems and boundary systems, respectively. It is also interesting to find that boundary systems do show significant negative relationship with innovation in medium-sized firms.

Table 3: Pearson correlation matrix of the variables

Construct	BfSs	BSs	DCSs	ICSs	InnovP
BfSs	—	-0.039^{ns}	0.613**	0.708**	0.697**
BSs		—	0.311**	-0.336**	-0.329**
DCSs			—	0.449**	0.417**
ICSs				—	0.767**
InnovP					—

Note: ** Correlation is significant at the 0.01 level; n.s. = Non-significant.

Multiple-regression is run to test the effect of all control lever acting together on innovation performance. The P value, standard coefficient of beta (β), and R^2 are used to interpret the regression results. These indicators are considered as evidence to accept or reject the hypothesis. Table 4 represents the multiple-regression that includes the four levers of control, answering the main research question, i.e. do control systems foster or hinder innovation? Overall, the results reveal that control systems have a significant influence on innovation performance (R^2 = 0.66, P < 0.01). The coefficients for ICSs and BfSs are positive and significant at 0.43 and 0.34 respectively. This provides support for H1 and H4. The regression for BSs indicates H2 is also accepted with negative significance influence. However, the results for DCSs reveal an insignificant coefficient which leads to rejection of H3. The results from multiple-regression analysis have given some interesting insights on Simons' control levers. Combined together, they show that the power of Simons' control levers appears when all the levers are used simultaneously for various situations. As argued by Simons (1995b) the levers should be used by managers to manage the dynamic tensions in firms.

Table 4: Summary of multiple-regression analysis for control systems influencing innovation performance

	B	SE B	β	Sig.
BfSs	0.36	0.08	0.34**	0.00
BSs	-0.16	0.05	-0.20**	0.00
DCSs	0.07	0.06	0.08^{ns}	0.25
ICSs	0.46	0.08	0.43**	0.00

Note: R^2 = 0.66; F = 73.36; significant level: **P < .01; ns = Non-significant;
B = Unstandardized coefficient; SE B = Standard error of coefficient; β = Beta coefficient.

Discussion and implications

The aim of the study is to examine the impact of control systems on innovation and R&D related performance in medium-sized firms. It also seeks to explain how different control levers affect innovation individually and simultaneously. The significant relationship between each control lever and innovation performance indicates the importance of all control levers for senior managers to used in managing innovation. Their choice of control mechanisms must take into account all four control levers. Interestingly, the results indicate that the relationship between DCSs and innovation performance is relatively the weaker. This could be due to the fact that diagnostic systems typically cover short period i.e. one year or less. However for innovation activities to show meaningful results would require longer term. It can be argued certain measures may not have intended results. Also, given the constraint of resources, control systems of medium-sized firms may be less sophisticated than that of large companies, and hence may not have appropriate performance measures to help them measure and therefore monitor the innovation related activities. Frequent and regular meetings and communicating plans for new ideas would improve the innovation performance in medium-sized firms. Communication and discussion and the consequences of information flowing top-down and bottom-up encourage innovative ideas in R&D, in turn improving the productivity of R&D projects.

From theoretical perspective, the findings provide an insightful evidence that all control levers if used simultaneously by senior managers can have significant impact. The data shows 66% of the variation in innovation performance was explained by the four levers acting together. This finding supports the current view of control systems which treat control systems as tools to foster innovation rather than hindering it (Simons, 2000; Davila et al., 2009b; Bedford, 2015; Chenhall et al., 2015). It also supports the arguments that the beneficial role of accounting in the R&D setting (Chapman, 1997; Ahrens & Chapman, 2004). The findings contribute to the growing literature investigating the role of control systems in innovation settings in several ways. The negative relationship refers to BSs limiting the discretion of employees in medium-sized firms in communicated ideas of innovation.

The practical implications are senior managers need to be observant with their choice of control mechanisms and attempt to use them together. For example, often in medium-sized firms, managers may not realize the importance of certain policy formulated to limit creativity within the strategic priority of the head office or the parent company. This is actually a form of boundary system which the study has evidenced important and could be used with other interactive control mechanism such periodic project meeting. Hence, a senior manager may discuss about new perspective of a R&D project and at the same time remind the team about the strategic focus that team members need to stick to.

Conclusion

This paper shows evidence on how individual control levers when are used by senior managers simultaneously can influence innovation positively. Much of the past literature considers the relationship between one or two control systems rather than a combined control package. This study responds to the various calls by past research to examine the combined influence of control systems on innovation (e.g., Otley;1999; Davila, 2000; Chenhall, 2003; Widener, 2007; Malmi & Brown, 2008). It addresses this gap by examining the combined influence of control levers in innovation setting. By doing so, this study highlights the power of LOC framework to enhancing innovation performance. The results indicate the simultaneous use of the different control levers by senior managers is beneficial to enhance innovation performance of medium-sized firms. The use of interactive control systems exerts the strongest influence on innovation providing more support to the uniqueness of control levers framework in innovation setting.

The current study has a few limitations. First, it was based on data obtained from a questionnaire which has inherent weakness of common method bias. However, its development and implementation were considered carefully, and diagnostic tests suggest that any bias is unlikely to be of significant concern. Secondly, the measurements of innovation performance depend on subjective evaluation by leaders. Future studies may use more objective and real indicators. Thirdly, this study did not consider the factors that may affect the senior managers' choice of control levers use. It is highly recommended to determine such factors to get with better understanding to the functioning of control systems in innovation setting.

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