An empirical analysis of the levers of control framework

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Abstract

The purpose of this paper is to use the levers of control framework to explore the antecedents of control systems – various facets of strategy that drive the use of controls; to explore the relations among control systems; and to explore the costs and benefits of control systems – costs in terms of consumption of a constrained resource (i.e., management attention) and benefits (i.e., learning). Using data from a survey of 122 Chief Financial Officers, this study tests a structural equation model that relates strategic risk and uncertainty to control systems (i.e., beliefs, boundary, diagnostic, and interactive control systems), which in turn are hypothesized to affect learning and attention, and ultimately firm performance. The evidence suggests that there are multiple inter-dependent and complementary relations among the control systems. I find that strategic risk and uncertainty drive both the importance and use of performance measures in diagnostic or interactive roles. Moreover, it appears that in certain strategic conditions information processing needs are such that firms use performance measures both interactively and diagnostically. Finally, I conclude that although there is a cost of control, there is a positive effect on firm performance.

Introduction

The purpose of the management control system (MCS) is to provide information useful in decision-making, planning, and evaluation (Merchant & Otley, 2006). While the management accounting literature is replete with studies that investigate control systems, many focus on only one control such as the use of performance measures (Ittner & Larcker, 1998). However, it is well-recognized that the MCS is comprised of multiple control systems that work together (Otley, 1980). Simons (2000), in his levers of control (LOC) framework, posits that four control systems – beliefs (e.g., core values), boundary (e.g., behavioral constraints), diagnostic (e.g., monitoring), and interactive (e.g., forward-looking, management involvement) – work together to benefit a firm. The LOC framework asserts that strategic uncertainty and risk drive the choice and use of control systems, which in turn, impact the organization through organizational learning and the efficient use of management attention (Simons, 2000). The theoretical framework is illustrated in...
Fig. 1. The purpose of this paper is to use the LOC framework to investigate the antecedents of control systems (i.e., strategic uncertainty and risk); the associations among the control systems; and the costs and benefits of control systems (management attention, learning, and firm performance).

Using data from a survey of 122 Chief Financial Officers (CFOs), I perform a three-stage analysis. First, I estimate a trimmed structural equation model (SEM) based on Fig. 1, which provides evidence on the holistic LOC framework. Second, I use coefficients from the trimmed SEM to provide evidence on three sets of hypotheses: (1) the relations among the control systems, (2) the relations between both strategic risk and uncertainty and each of the control systems, and (3) the relations between each of the control systems and outcomes (i.e., attention, learning, and performance). Finally, since the existence of a well-fitting SEM does not ensure that it is the only appropriate model (Kline, 1998), I generate six alternative models for comparison against the base model.

This study makes several contributions to the literature. First, it is generally well-accepted that control systems are inter-dependent (Milgrom & Roberts, 1995); however, it is unclear whether they are complements or substitutes. This study finds that when firms emphasize the beliefs system, they also emphasize each of the three other control systems. In addition, the use of performance measures in the interactive system is associated with the use of performance measures in the diagnostic system and emphasis on the boundary system. The evidence suggests that the interdependencies are complementary. Thus, this study provides empirical evidence on the relations among the control systems in the LOC framework and contributes to a small but growing body of work that investigates relations among control systems (e.g., Anderson & Dekker, 2005; Kennedy & Widener, 2006).

Second, this study investigates both costs and benefits of control systems. An assumption in the literature is that firms implement controls only when the benefits received outweigh the costs. However, little evidence exists to support this assumption (e.g., for a review of performance measurement (PM) literature see Ittner & Larcker, 1998). A limitation is that this research often focuses on an aggregate measure of firm performance without delineating specific costs and benefits. A recent study extends the literature and provides evidence that a strategic PM system is associated with a specific benefit (i.e., decreased role stress) (Burney & Widener, 2007); however, the cost of controls is still largely ignored. I find that control systems are associated with both a benefit (organizational learning) and a cost (consumption of management attention); but, overall, have a positive effect on firm performance.

Third, not withstanding a line of research that has investigated the alignment between strategy...
and a firm’s MCS (Ittner & Larcker, 1997; Langfield-Smith, 1997), Langfield-Smith (1997) concludes that knowledge is limited since studies only investigate single facets of a multifaceted construct. Moreover, Chenhall (2003) argues that accounting studies may suffer from outdated strategy constructs. This has spurred studies to incorporate additional strategic facets such as strategic resources (see e.g., Henri, 2006) and competitive advantage (Widener, Shackell, & Demers, 2006). This study investigates two elements of strategy that Simons’ (2000) argues play a central role in the LOC theory – strategic uncertainties and strategic risk, and finds that both are associated with the use of control systems.

Finally, business are competing with complex, rapidly changing, and knowledge-intensive business models driving the need to better understand the role of PM systems and how they can better meet managerial needs. A control system can function in different roles (i.e., either interactively or diagnostically). This study sheds insights on the role of the PM system and finds generally that internal (external) strategic factors are associated with diagnostic (interactive) controls. However, under certain circumstances, performance measures are used in both roles. These results add to a growing body of literature that investigate how the role of control systems differs (e.g., Abernethy & Brownell, 1999; Bisbe & Otley, 2004; Henri, 2006).

This study is organized as follows. Section “Theory development and hypotheses: control systems” provides an overview of the control systems that comprise the levers of control framework and develops hypotheses for the inter-dependencies among the control systems. Section “Theory development and hypotheses: drivers and outcomes of control systems” develops the hypotheses for the drivers (strategic risk and uncertainty) and outcomes (learning, attention, and performance) of the control systems. Section “Methods” discusses the research method and measurement of the variables. The analyses and results are presented in Section “Results”. Finally, conclusions, limitations, and extensions are discussed in Section “Conclusions”.

Theory development and hypotheses: control systems

Overview of control systems

The LOC framework consists of four control systems: beliefs, boundary, diagnostic, and interactive. The beliefs system is “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, 1995, p. 34). That is, a beliefs system communicates core values in order to inspire and motivate employees to search, explore, create, and expend effort engaging in appropriate actions. However, in dynamic environments there must be some restraint placed on employees to stop them from engaging in high-risk behaviors. This restraint is the boundary system, which acts in opposition to the beliefs system. A boundary system “delineates the acceptable domain of strategic activity for organizational participants” (Simons, 1995, p. 39). The boundary system communicates the actions that employees should avoid. Its purpose is to allow employees freedom to innovate and achieve within certain pre-defined areas. The boundary and beliefs systems are similar in that they both are intended to motivate employees to search for new opportunities; however, the boundary system does so in a negative way through the constraint of behavior while the beliefs system does so in a positive way through inspiration (Simons, 1995). Often, firms communicate beliefs through a mission or vision statement and boundaries through a code of conduct. Appendix “Examples of beliefs and boundary control systems” provides examples for two firms in this study.

A firm’s critical success factors are embedded in its diagnostic system and communicated to its employees. The diagnostic system is intended to motivate employees to perform and align their behavior with organizational objectives. It reports information on the critical success factors which allows managers to focus their attention on the underlying organizational drivers that must be monitored in order for the firm to realize its intended strategy. The diagnostic control system
also enables managers to benchmark against targets. Similar to the boundary system, the diagnostic system acts as a constraint on employee behavior (Simons, 2000).

While the diagnostic system allows managers to manage results on an exception basis, an interactive system is forward-looking and characterized by active and frequent dialogue among top managers. The interactive system is intended to help the firm search for new ways to strategically position itself in a dynamic marketplace. Top managers choose which control system (e.g., PM, brand management, budget process) they want to use in an interactive manner. This study investigates the PM system since it is used extensively in practice and because the results of this study can contribute to a long stream of research on performance measures (see e.g., Ittner & Larcker, 1998).

It is well-accepted in the literature that control systems are inter-dependent (e.g., Merchant & Otley, 2006; Otley, 1999). Otley (1999) argues that researchers must approach research studies with a holistic perspective of control systems since different firms may use different configurations of control systems. Simons (2000, p. 301) posits that in the LOC framework all four control systems, working together, are necessary to provide an effective control environment. He argues that an integrated control environment effectively facilitates the quest for competitive sustainability and strategy implementation and states,

Control of business strategy is achieved by integrating the four levers of beliefs systems, boundary systems, diagnostic control systems, and interactive control systems. The power of these levers in implementing strategy does not lie in how each is used alone, but rather in how the forces create a dynamic tension...

This notion of dynamic tension is consistent with Milgrom and Roberts (1995) who analytically demonstrate that control features can be complementary, that is, increasing the emphasis on one control component increases the benefits received from increasing the emphasis on other control components.

Simons (1995) suggests that the four levers create tension in that two of the levers – the beliefs and interactive control system – create positive energy, while the remaining two levers create negative energy. Henri (2006) empirically tests this proposition. He posits that managers use performance measures in both a diagnostic and interactive role and that doing so results in a desirable state of dynamic tension that will enhance organizational capabilities. Henri (2006) finds some evidence that together the two levers of control result in dynamic tension that is positively associated with performance. Similar to Henri (2006), in the section that follows I posit that the diagnostic and interactive uses of the performance measurement system are complementary. However, Henri (2006) does not investigate whether or how the levers influence one another. That is, he does not investigate the relations among the levers of control. In the following section, I hypothesize the strongest relations supported in the underlying literature and leave other relations for exploration in Section “Comparison to alternative models – Step 3”.

1 Tuomela (2005) uses a case study to investigate how the interactive or diagnostic use of the performance measurement system affects the beliefs and boundary system.

2 I argue that the interactive use of performance measures influences the diagnostic use of performance measures, while Henri (2006) models an independent-variables interaction (Luft & Shields, 2003). That is, Henri (2006) argues that how much the diagnostic (or interactive) use of performance measures affects capabilities is conditional on the other use of performance measures.

3 Simons (2000) asserts that the control components in the LOC framework are integrated to form an effective control system. This can lead to various interpretations of inter-dependencies including the most complete model in which all four controls influence each of the other controls. Simons (2000, p. 305) also presents other perspectives including that the beliefs and boundary, boundary and diagnostic, diagnostic and interactive, and interactive and belief systems have bi-directional relations, that is, they influence each other. However, Simons (2000, p. 32) also contains a diagram in which actions flow from the mission, thus indicating that the mission influences all else. Due to the lack of extant evidence regarding the nature of the associations of the relations among the control components, I choose to hypothesize only those links that can be strongly argued. However, I test several other likely associations among control components when testing specifications of alternative models in Section “Comparison to alternative models – Step 3”.
Hypotheses among control systems

Organizational theory suggests that the beliefs system is critical to high-performing organizations (Calfee, 1993; Analoui & Karami, 2002). Pearce (1982, p. 24) states

It [a mission statement] thus provides management with a unity of direction that transcends individual, parochial, and transitory needs. It promotes a sense of shared expectations among all levels and generations of employees. It consolidates values over time and across individuals and interest groups.

In this section I first posit that the more a firm emphasizes the beliefs system to communicate intended strategy and inspire employees to search for opportunities, the more the firm will emphasize the other three components of the LOC framework – the boundary and diagnostic systems to reign in and monitor employee behavior and the interactive system to watch for threats and opportunities thus allowing for emergent strategy.

At a high level of abstraction there are two reasons why the beliefs system is likely related to each of the other control levers. First, it is important that all four levers are “balanced” in order to manage “the inherent tensions between (1) unlimited opportunity and limited attention, (2) intended and emergent strategy, and (3) self-interest and the desire to contribute” (Simons, 1995, p. 28). Second, there is considerable evidence that the beliefs system may not be effective unless it is strongly supported with alternative mechanisms. For example, Pearce and David (1987, p. 109) note that while a firm’s mission statement provides a foundation for the organization, it is simply a “starting point”. Moreover, Bart, Bontis, and Taggar (2001) find that while there is a positive relation between firm performance and the emphasis placed on the mission statement, that internal structure, policies, and procedures are related to employee behaviors which are more strongly related to firm performance. This suggests that the emphasis placed on the boundary, diagnostic, and interactive systems may complement the emphasis placed on the beliefs system.

There are also specific reasons at the control level that provide a foundation for expecting inter-dependencies. The beliefs and boundary systems both inform organizational members about opportunities to explore, create, and innovate. While the beliefs system motivates employees, the boundary system sets the limits of exploration. Thus the boundary system fits inside the beliefs system, that is, the boundary system constrains the exploration motivated by the beliefs system (Simons, 1995). Using case studies, Simons (1994) illustrates the interplay between the beliefs and boundary systems as one in which managers implement formal boundary systems in order to counterbalance the inspirational and motivational message communicated in the beliefs system. The beliefs system is also embodied in the diagnostic control system since the latter captures the critical success factors associated with the core values espoused in the beliefs system. The more motivated employees are to work towards achieving the firm’s ideals and core values, the more emphasis management will place on measuring the appropriate critical success factors in order to ensure that employees’ actions are aligned with the firm’s strategy. Finally, once the firm’s strategy has been clarified and communicated through the mission and vision contained in its beliefs system, top managers will realize where potential threats and opportunities may reside and can implement an interactive system. Thus I expect that the emphasis firms place on the beliefs system is inter-dependent with the emphasis they place on each of the boundary, diagnostic, and interactive systems. I formally hypothesize:

H1a: The emphasis firms place on the beliefs system is positively associated with the emphasis they place on a boundary system.

H1b: The emphasis firms place on the beliefs system is positively associated with the emphasis they place on the use of performance measures in a diagnostic control system.

H1c: The emphasis firms place on the beliefs system is positively associated with the emphasis they place on the use of performance measures in an interactive control system.
The beliefs and interactive systems are the positive energy levers that inspire employees to seek, explore, and create. The relation between these two is captured above in H1c. Conversely, the boundary and diagnostic levers work in tandem with one another as negative forces to reign in behavior, to constrain the space that employees have to explore, and to ensure compliance with organizational objectives. These levers counterbalance the positive forces of the beliefs and interactive control system (Simons, 1995). A boundary system is considered a necessary component of most organization’s structure; it is required legally both by the stock exchanges and through the enactment of the Sarbanes-Oxley Act; considered in environmental actions; and called for by shareholder and stakeholder groups (Paine, Deshpande, Margolis, & Bettcher, 2005). Thus I posit that firms will implement a boundary system; as they rely more on the boundary system they will also rely more on the diagnostic system in order to maintain the necessary balance needed for the control structure. I formally hypothesize that:

H1d: The emphasis the firm places on the boundary system is positively associated with the emphasis the firm places on the diagnostic system.

Interactive controls provide top managers with a mechanism to learn of new strategic opportunities. As strategy emerges through the interactive control structure, objectives and critical success factors must be redefined and conveyed throughout the organization. Thus, interactive controls become effective through a support structure (Chenhall & Morris, 1995). Within the LOC framework, I posit that the interactive use of performance measures influences the diagnostic use of performance measures since the latter provides the necessary structure that enables the interactive control system to be effective. As the organization adjusts to the strategy that emerges through the interactive system, the diagnostic PM system must also adjust in order to reflect the firm’s new strategic position and critical success factors.

Simons (1994) finds that the four managers in his case study that attempted to turn around their firm’s strategy use the diagnostic system to communicate the new critical success factors. That is, the diagnostic system is used to communicate the strategy that emerges through the interactive system. In related empirical work, Chenhall and Morris (1995) find that organic decision processes, similar in nature to interactive controls, are more effective when coupled with a formal management control system (see also Henri, 2006). Simons (2000, p. 305) summarizes the relation of the diagnostic and interactive systems when he says, “the information and learning generated by interactive systems can be embedded in the strategies and goals that are monitored by diagnostic control systems”. Thus, I argue that firms will use both an interactive and diagnostic system, and the more top managers rely on the interactive control system, the more they will rely on the diagnostic control system to provide the structure necessary to enable the interactive system to be effective. This supports the following hypothesis:

H1e: The emphasis firms place on the use of performance measures in an interactive control system is positively associated with the emphasis they place on the use of performance measures in a diagnostic control system.

Theory development and hypotheses: drivers and outcomes of control systems

This section is comprised of two parts. The discussion is guided by Fig. 1. The first sub-section discusses the relation between strategic factors and each of the beliefs and boundary systems; and then turns to a discussion of the relation with each of the diagnostic and interactive systems. The second sub-section discusses the costs and benefits associated with the use of each of the control systems.

Strategic factors

A feature of the LOC framework is that managers must decide how much emphasis they will place on each of the four types of control systems (Merchant & Otley, 2006). The contingency framework holds that environmental variables are important
to consider in the design of the management control system (Chenhall, 2003). In the LOC framework one type of environmental variable is strategic uncertainty, which is defined as “the emerging threats and opportunities that could invalidate the assumptions upon which the current business strategy is based” (Simons, 2000, p. 215).

That is, they are changes in competitive dynamics or internal competencies that top managers monitor. Uncertainty implies that there is a gap between the information known and desired (Galbraith, 1973). Thus the more uncertainty, the more monitoring is necessary to reduce the information gap (Simons, 2000).

A second type of environmental variable in the LOC is strategic risk, which is defined as “an unexpected event or set of conditions that significantly reduces the ability of managers to implement their intended business strategy” (Simons, 2000, p. 255). Risk is a source of potential harm to the organization. Strategic risk stems from both operations (i.e., a malfunction in core internal operating procedures) and external factors (i.e., a mass disruption in customer base or intense rivalry among competitors). Similar to strategic uncertainty, strategic risk requires increased information processing to assess the likelihood of risk and the magnitude of any resultant harm.

Firms use both the beliefs and boundary systems to manage risk since they help ensure the alignment of employee behavior, which minimizes the possibility that the organization can be harmed. Empirical research suggests that these control systems are also beneficial in managing strategic uncertainty. Merchant (1990) finds that profit center managers are more likely to manipulate earnings when conditions are uncertain implying that the likelihood of engaging in unethical acts is higher in environments characterized by uncertainty. Strong boundary and beliefs systems are intended to counteract undesirable behavior and minimize the negative behavioral effects associated with strategic uncertainty. Moreover, Simons’ (1994) case study shows that when organizations face strategic change (and thus heightened uncertainty) the beliefs system is important for communicating the vision and core values while the boundary system delineates the appropriate area for pursuing opportunities. Related research grounded in contingency theory finds that firms use sophisticated control systems when facing environmental uncertainty (e.g., Chenhall, 2003), market competition (Bromwich, 1990; Khandwalla, 1972; Mia & Clarke, 1999), and environmental hostility (Otley, 1978). Chenhall (2003, p. 138) summarizes this stream of literature by saying “hostile and turbulent conditions appear, in the main, to be best served by a reliance on formal controls…” Thus, I propose that:

H2a: The extent to which firms face strategic risks and uncertainties is positively associated with the emphasis they place on a beliefs system.

H2b: The extent to which firms face strategic risks and uncertainties is positively associated with the emphasis they place on a boundary system.

In the analyses that follow, I investigate three types of strategic uncertainty: operating uncertainty (e.g., scale effects, internal product innovation), competitive uncertainty (e.g., new industry entrants), and technological uncertainty (e.g., new technology); and three types of strategic risks that Simons’ (2000) identifies: operating risk (e.g., safety of operations), asset impairment risk (e.g., accounts receivable turnover), and competitive risk (e.g., marketplace factors).4

Firms use diagnostic control systems to manage both strategic uncertainty and risk (Galbraith, 1973; Simons, 2000). In order to reduce the information processing burden for top managers, decision rights can be delegated throughout the organization (Galbraith, 1973). Performance measures embedded in a diagnostic control system then provide direction to these empowered employees, which help ensure that their behaviors are aligned with organizational goals. Furthermore, diagnostic controls facilitate information processing through the provision of exception reporting. In the face of uncertainty and risk, the need to process information can become significant.

Galbraith (1973, p. 15) suggests that once firms have implemented goal setting their next step is to either “reduce the need for information processing” or “increase the capacity to process the information”. One way to increase information processing capacity is to engage in a vertical information system (Galbraith, 1973), similar to an interactive control system. Information is spread vertically throughout the organization to operating managers and lower-level employees, which spurs action, attention, and dialogue. Simons (1995, p. 102) characterizes the interactive control system as follows:

By choosing to use a control system interactively, top managers signal their preferences for search, ratify important decisions, and maintain and activate surveillance throughout the organization. All subordinate managers will engage in the interactive dialogue to the extent demanded by their position. Thus, the system may remain interactive down three or four levels in the organization...

In order to use a performance measure diagnostically it must be possible to set a goal, measure outputs, and compute variances (Galbraith, 1973; Simons, 2000). This implies that the properties of the measures must be stable, with low noise and variation. Managers can assess operations, standardize processes, and implement procedures to ensure safety and quality (Simons, 2000). Measures of internal strategic factors such as safety, quality, internal innovation, and cost of inputs lend themselves to being captured in a more routine type of PM system which allows managers to use these measures diagnostically, look for exceptions, and gather feedback information. In addition, there are measures available to provide managers with information regarding the risk that assets might become impaired (e.g., monitoring of inventory turnover to watch for slow-moving items). On the other hand, measures of competitor tactics, customer switching costs, and new technology often have greater variation and contain more noise. Environmental upheaval, such as uncertainty, will cause measures to be less precise and thus noisier (Banker & Datar, 1989), thus not lending themselves to use as a diagnostic control. While these measures may facilitate discussion among top management and lend themselves to an interactive use, they may not be stable or routine enough to use diagnostically.5

Empirical research shows that interactive systems are effective in firms facing various types of risk and uncertainty, including competitive, market, and technological risk and environmental uncertainty (see e.g., Bisbe & Otley, 2004; Simons, 1991). Bisbe and Otley (2004) conclude that firms that face high degrees of innovation risk and uncertainty have higher firm performance when a control system is used interactively. In firms with managers that clearly understand their strategy, Simons (1991) finds that uncertainties related to product technology, new product introductions, and market competition are associated with the use of interactive controls. In addition, Simons (2000, p. 261) states “interactive control systems are essential to monitor competitive risks in a culture that could potentially create barriers to impede the free flow of information about emerging threats and opportunities”. Abernethy and Brownell (1999) find that the interactive use of budgets enhances performance in hospitals facing strategic change.

Based on the above discussion, I posit that firms will use diagnostic control to manage risk and uncertainty when more precise measurement is likely to be available. I also posit that firms will rely more on interactive controls when facing higher levels of strategic risk and uncertainty. I formally hypothesize the following:

H2c: The extent to which firms face strategic risks and uncertainties, specifically operating risk, operating uncertainty or the risk of asset impairment, is positively associated with the

5 Table 2 shows that the standard deviation for operational uncertainties is 1.04 while the standard deviation for competitive and technological uncertainty is 1.20 and 1.41, respectively. The standard deviation for operations risk is 0.78 while the standard deviation for competitive risk is 1.38. Assuming that the properties of performance measures that capture the strategic factors exhibit the same type of variance, the data suggest that measures of external factors are likely to be noisier than measures of internal strategic factors.
emphasis they place on the use of performance measures in a diagnostic control system.

H2d: The extent to which firms face strategic risks and uncertainties is positively associated with the emphasis they place on the use of performance measures in an interactive control system.

Costs and benefits of management control: organizational learning and attention

Organizational learning

Organizational learning originates in historical experiences which are then encoded in routines (Levitt & March, 1988). Based on historical experiences, the organization adopts and formalizes “routines that guide behavior” (Levitt & March, 1988, p. 320). The beliefs, boundary, and diagnostic systems are formalized routines (Simons, 2000) intended to guide behavior, and as such, facilitate organizational learning. Simons (1994) finds that after undertaking a strategic turn around, managers issue new mission and vision statements to communicate ideas and information to employees. The firms develop the new routines (i.e., belief system) based on their historical experience during the turn around. Marginson (2002) investigates control components in a UK telecommunications firm and finds that the beliefs system opens the doors for new ideas, actions, and initiatives. Moreover, he finds that the organization’s boundary system motivates a search for new ideas within the prescribed acceptable domain.

The diagnostic control system provides managers with information on outcomes that are not meeting expectations, and as such, is an example of single loop learning (Argyris, 1977). Simons (1994) contends that diagnostic controls communicate agendas and translate strategy through the identification of critical success factors. This is consistent with Kaplan and Norton (1996) who assert that PM systems inform employees of the firm’s strategy. Kloot (1997) uses two case studies to investigate the link between management control systems and organizational learning. She concludes that management control systems, in particular PM systems, facilitate organizational learning. Although Henri (2006) finds a negative relation between diagnostic controls and organizational learning, he uses a narrow definition of the diagnostic use of performance measures. Furthermore, his univariate statistics reveal a positive relation between diagnostic controls and learning.

Organizations must be oriented to learning in order to learn (Hult & Thomas, 1998). An organization is oriented to learning when it has “a culture amenable to learning” and thus is able to improve its understanding of the environment over time (Galer & Van Der Heijden, 1992, p. 11). As discussed above, I expect that the beliefs, boundary, and diagnostic systems will facilitate an organization’s orientation to learning and formally hypothesize:

H3a: The emphasis firms place on a beliefs system is positively associated with an organization’s orientation to learning.

H3b: The emphasis firms place on a boundary system is positively associated with an organization’s orientation to learning.

H3c: The emphasis firms place on the use of performance measures in a diagnostic system is positively associated with an organization’s orientation to learning.

An interactive control system is a double loop learning system, which is a more difficult type of learning tool than is a single loop system (Argyris, 1977). The purpose of interactive controls is to enhance managers’ abilities to anticipate and effectively manage future uncertainties (Simons, 2000) yet organizational learning is predicated on learning from past events (Levitt & March, 1988). Levitt and March (1988) posit that the lack of experience and complexity of a given situation can inhibit learning. Since interactive systems are intended to engage managers in scanning and seeking behaviors that may result in emergent strategy (i.e., new behaviors and experiences), interactive systems likely help managers handle situations that are high in complexity and with which the managers may have little experience.

However, Simons (1990, 1991, 2000) specifically singles out the interactive system as a facilitator of organizational learning. It is a system that firms
implement to ease the information processing demands and facilitate the learning process by using vertical channels throughout the organization (Galbraith, 1973). The control system shapes new strategies, suggests new ideas and possibilities, and promotes curiosity and seeking behavior (Dent, 1990; Hopwood, 1987; Simons, 1994). It also provides a signal downward in the organization regarding the important arena for proposing and implementing new ideas (Simons, 1990, 1991). Abernethy and Brownell (1999) provide empirical support of the relation between interactive controls and organizational learning. In a study of 63 hospitals they find that an interactive control system facilitates organizational learning and that organizational learning is greater when the budgeting system is used interactively rather than diagnostically (see also Henri, 2006). Therefore, I hypothesize the following:

H3d: The emphasis firms place on the use of performance measures in an interactive control system is positively associated with an organization’s orientation to learning.

Management control and top management attention

Time and processing capability are two constraints faced by top managers (Schick, Gordon, & Haka, 1990; Simons, 1990, 2000). Schick et al. (1990, p. 215) state that information overload “occurs when the demands on an entity for information processing time exceed its supply of time”. Monitoring multiple control systems can require tremendous managerial attention, thus top management has to choose where to focus their attention. One of the top managers in Marginson’s (2002, p. 1026) case study states, “There is a constant need to prioritize issues that need addressing. There is never sufficient time or resources to see all issues simultaneously”.

Top management attention is needed to process the information required to properly manage strategic concerns. Simons (2000) asserts that reliance on the beliefs, boundary, and diagnostic systems can facilitate the efficient use of management attention. Strategic concerns that are more routine in nature have a smaller information deficit (i.e., the difference between the amount of information needed to manage the concern and the amount of available information) and can be managed using the beliefs, boundary, and diagnostic systems that align employee behavior, define limits of acceptable behaviors, and use exception reporting, respectively. On the other hand, the interactive control system is designed to help the organization manage those issues that have larger information deficits and therefore, are more costly to the firm in terms of the managerial attention they consume (Galbraith, 1973). Simons (1991) in his field study of 30 health care products firms, finds that managers experience information overload quickly when focusing attention on a broad spectrum of control attributes. He documents that managers limit interactive systems to include only one system since it consumes such large amounts of top management attention. Overall, the interactive control system is more “costly” that the other systems, due to the information deficit the system is intended to accommodate. This discussion supports the following hypotheses:

H4a: The emphasis firms place on a beliefs system is positively associated with the efficient use of management attention.

H4b: The emphasis firms place on a boundary system is positively associated with the efficient use of management attention.

H4c: The emphasis firms place on the use of performance measures in a diagnostic control system is positively associated with the efficient use of management attention.

H4d: The emphasis firms place on the use of performance measures in an interactive control system will consume management attention.

Learning, attention, and firm performance

Organizations must be oriented to learning in order to learn. The extant literature maintains that organizational learning is associated with improved performance (Levitt & March, 1988; Slater & Narver, 1995). It is well-accepted that organizational learning is critical to maintaining competitive advantage in today’s global, competitive business world and some believe that learning
is the only way to compete in the long-term (Hult & Thomas, 1998; Slater & Narver, 1995). Tippins and Sohi (2003) provide empirical evidence that organizational learning is positively associated with firm performance. They investigate information technology competencies and find that improved firm performance results in the presence of organizational learning. Chenhall (2005) provides additional evidence directly relevant to the management accounting arena. He finds support that organizational learning enhances delivery outcomes. Furthermore, he concludes that organizational learning mediates the relation between customer dimensions of a PM system and service delivery. This leads to

H5a: Orientation to learning is positively associated with firm performance.

Top managers are only able to process a limited amount of information; they also have a constrained attention span (Schick et al., 1990; Simons, 2000). An environment characterized by an inefficient use of management attention will result in ineffective managerial actions. Conversely, efficient use of managerial attention allows top managers to focus more strongly on the critical success factors and core competencies of the organization that are associated with enhanced performance. This leads to the following hypothesis:

H5b: Efficient use of management attention is positively associated with firm performance.

Methods

Sampling frame

Data sources include Compustat and survey data. For inclusion in the sampling frame, firms had to have less than $2 billion in sales. This study investigates the use of control systems by top management and surveying one person regarding organizational practices in firms with greater than $2 billion in sales is considered problematic. To enable analysis of non-response bias, selected firms are required to have certain archival data available in Compustat. I also discarded all non-US firms. To enhance the likelihood of being able to generalize results, I use a random sample of 1000 firms from the sampling frame of 4400 firms.

Survey and respondents

I use a three-page survey instrument, which I pre-tested on three business professors and five financial/accounting officers for clarity, understandability, ambiguity, and face validity (Dillman, 1978). Upon revision, I sent the survey, a personalized cover letter, and a stamped return envelope to the chief financial officer (CFO) of each company. I chose CFOs as informants since they are knowledgeable about the firm’s MCS. In addition, because of the restriction on firm size, they occupy a position in which they have knowledge about strategic issues and other items asked in the survey. As an incentive to respond, I promised to provide the participants an executive summary of the results. In an attempt to increase the response rate, I sent two follow-up mailings. I was unable to confirm a relevant mailing address either via the telephone or via the internet for 24 firms, leaving a sample of 976 firms.

The mailing process resulted in 122 responses (12.5% response rate). I investigated non-response bias by comparing non-respondents to respondents across several financial accounts. The results are presented in Table 1, Panel A. I randomly sampled the population of Compustat firms during early Spring of 2004. The 2002 Compustat data was the most recent data available at the time of the survey. There are no statistically significant differences between early and late respondents for total assets, sales, number of employees, or property, plant and equipment. I also compared early respondents to late respondents, based on return date, for all survey constructs. The results are shown in Table 1, Panel B. With the exception of operating risk I found no significant differences. Early respondents had significantly higher operating risk than did late respondents (mean 6.11 vs. 5.74, p < 0.05). Overall, the results support the absence of significant non-response bias. To assess

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6 For precedent see Fullerton and McWatters (2002).
the extent of common method bias, I ran a Hartman’s one-factor test on the 54 survey questions used to form the constructs. The factor solution yielded 14 factors with eigenvalues > 1.0. The first factor explained 30% of the total variance. Overall, the results support the absence of significant single-source bias (Podsakoff & Organ, 1986).

In unreported descriptive statistics, the pattern of SIC classifications for respondents mirrors the sample frame. The two largest groups of respondent firms are manufacturers (54 firms) and service firms (33 firms). There are also 10 mining firms, 10 financial services firms, eight transportation firms, five retailers, and two wholesalers. On average, the sample respondents have sales of $281.60 million, total assets of $455.13, and 1334 employees.

Variable measures

To establish validity of the survey variables, I assess both content and construct validity (Nunnally, 1978). I assess content validity through (1) a review of questions for face validity, (2) the process of variable construction, and (3) computation of an empirical measure of internal consistency. I assess construct validity through (1) specifying an appropriate domain of observables underlying the construct and using validated measures where possible, (2) factor analyses, which reveal relations among the observables and support the unidimensionality of constructs, (3) multiple question loadings in excess of 0.30 in support of convergent validity, and (4) lack of significant cross-loadings in support of discriminant validity. I took several steps in performing these assessments. First, I thoroughly reviewed the existing literature to establish appropriate domains. Second, I used previously validated questions where appropriate. Third, I discussed the topic with several financial and accounting managers with the express purpose of gaining more knowledge about the domain being measured. Fourth, several academicians, along with the financial and accounting managers, reviewed the questions for face validity. Fifth, I conducted empirical tests (i.e., reviewed range of responses, calculated Cronbach’s Alpha, and factor analyses) suggested by Nunnally (1978) to help establish both content and construct validity. An abbreviated version of the survey is found in Appendix “Abbreviated survey questions” (note

<table>
<thead>
<tr>
<th>Variable</th>
<th>Respondents (n = 122)</th>
<th>Non-respondents (n = 864)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Panel A: Respondents vs. non-respondents</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total assets (in millions)</td>
<td>455.13</td>
<td>371.95</td>
</tr>
<tr>
<td>Net sales (in millions)</td>
<td>281.60</td>
<td>248.90</td>
</tr>
<tr>
<td>Number of employees (in thousands)</td>
<td>1.33</td>
<td>1.75</td>
</tr>
<tr>
<td>Property, plant and equipment (in millions)</td>
<td>122.32</td>
<td>98.61</td>
</tr>
<tr>
<td><strong>Construct Early respondents (n = 37) vs. late respondents (n = 38)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operational strategic uncertainties</td>
<td>4.93</td>
<td>4.93</td>
</tr>
<tr>
<td>Competitive strategic uncertainties</td>
<td>4.69</td>
<td>4.54</td>
</tr>
<tr>
<td>Technological strategic uncertainties</td>
<td>5.51</td>
<td>5.63</td>
</tr>
<tr>
<td>Operations risk</td>
<td>6.11**</td>
<td>5.74**</td>
</tr>
<tr>
<td>Competitive risk</td>
<td>4.12</td>
<td>3.86</td>
</tr>
<tr>
<td>Boundary controls</td>
<td>5.70</td>
<td>5.63</td>
</tr>
<tr>
<td>Belief controls</td>
<td>4.74</td>
<td>5.01</td>
</tr>
<tr>
<td>Diagnostic controls</td>
<td>5.29</td>
<td>5.23</td>
</tr>
<tr>
<td>Interactive controls</td>
<td>5.07</td>
<td>4.93</td>
</tr>
<tr>
<td>Attention</td>
<td>4.91</td>
<td>4.90</td>
</tr>
<tr>
<td>Learning</td>
<td>5.10</td>
<td>5.26</td>
</tr>
<tr>
<td>Performance</td>
<td>4.52</td>
<td>4.20</td>
</tr>
</tbody>
</table>

* The sample was divided into early, middle, and late respondents based on return date of survey.

** Means are significantly different at p-value < 0.05.
that several questions are reverse-coded). The factor analyses used to construct the variables are reported in Table 2. Responses to these survey questions are averaged to form the final score for the variable. Descriptive statistics for the multi-item variables are reported in Table 3.

Strategic risk

Since this study is cross-sectional in nature, I capture a variety of types of strategic risk using Simons (2000) identification of three types of strategic risk firms’ face. Operations risk results from a breakdown in core internal business processes such as manufacturing or processing and impedes the firm’s ability to implement its strategy (Simons, 2000). I measure operations risk (OPRSK) through four survey questions that ask respondents how critical the firm’s safety, quality, reliability, and efficiency of their operations are to organizational success. Competitive risk (CPRSK) is the risk inherent in the marketplace. Customers, suppliers, the existence of substitute products, and new entrants to the marketplace can pose problems that make it difficult for a firm to successfully create value and remain competitive (Simons, 2000). I measure CPRSK using six questions that capture supplier, customer, and competitor pressure. Asset impairment risk (ASRSK) is the risk that balance sheet assets such as inventory, receivables, and investments will become impaired. Based on the discussion in Simons (1990), I use data from Compustat to calculate days sales outstanding (accounts receivable (data12)/sales (data2)*365), inventory turnover (COGS data41/inventory (data3)), intangible intensity (intangibles (data33)/total assets (data6)), and capital intensity (net ppe (data8)/total assets (data6)).

The exploratory factor analysis reveals that the ten questions used to measure strategic risk load on three factors. I label the first one OPRSK since the four questions chosen ex ante to measure operational risk load on factor 1. Three of the six questions related to competitive risk – ease of entry to the industry, customer switching costs, and nature of the competition – load on the second factor which I label CPRSK. Two of the remaining three questions load on a third factor, which has an unreliable Cronbach’s Alpha of 0.39 and is not used in the final analysis. The sixth question cross-loads on two factors and is removed from the final analysis (DeVellis, 1991). Overall, the constructs capture 53% of the explained variance. The Cronbach’s Alpha for operational and competitive risk is 0.66 and 0.62, respectively. Thus, the analysis uses two survey proxies for strategic risk, along with archival measures of days sales outstanding, inventory turnover, intangible intensity, and capital intensity.

Strategic uncertainties

Strategic uncertainties are uncertainties that top managers monitor to ensure organizational goal achievement (Simons, 1990). Similar to strategic risk, I try and measure a variety of types of strategic uncertainties (STRUNC) by asking respondents to assess the extent to which top managers monitor various uncertainties in order to ensure that the goals of the firm are achieved. I include 12 different types of uncertainties in order to capture uncertainties relevant across firms in the cross-section that may follow different strategies (Simons, 1990). The factor analysis reveals three constructs. Diffusion of knowledge, scale and scope effects, input costs, and internal product innovations load on factor 1, which I label operational uncertainties (OPUNC). Product introductions in adjacent industries, competitor market tactics, and new industry entrants load on factor 2, which I label competitive uncertainties (COUNC). I label the third factor technological uncertainties (TEUNC) since changes in product technology and new technology load. Two questions are not used in the final analysis since they cross-load on two factors. Overall, the constructs capture 63% of the explained variance. The Cronbach’s Alphas for the three factors are 0.78, 0.75, and 0.92, respectively. Thus, the analysis uses three proxies to capture strategic risk.

Control systems

This study is based on the LOC framework; therefore, I measure the extent firms’ emphasize boundary, beliefs, diagnostic, and interactive controls (Simons, 2000). Boundary systems (BOUND) are the controls that reign in the workforce and establish the out-of-bounds for employee actions. I measure BOUND using four questions that ask respondents to indicate the organization’s use of a code of business conduct
### Table 2

Construct validity

<table>
<thead>
<tr>
<th>Strategic uncertainties</th>
<th>Operational uncertainties</th>
<th>Competitive uncertainties</th>
<th>Technological uncertainties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in product technology</td>
<td>-0.12</td>
<td>0.010</td>
<td><strong>0.951</strong></td>
</tr>
<tr>
<td>New technology</td>
<td>-0.032</td>
<td>-0.001</td>
<td><strong>0.959</strong></td>
</tr>
<tr>
<td>Change in buyer tastesa</td>
<td>0.304</td>
<td>0.494</td>
<td>0.146</td>
</tr>
<tr>
<td>Product introductions adjacent industries</td>
<td>0.031</td>
<td><strong>0.625</strong></td>
<td>0.257</td>
</tr>
<tr>
<td>Diffusion of knowledge</td>
<td><strong>0.635</strong></td>
<td>-0.002</td>
<td>0.097</td>
</tr>
<tr>
<td>Marketing innovationsa</td>
<td>0.344</td>
<td>0.315</td>
<td>0.020</td>
</tr>
<tr>
<td>Scale effects (product depth)</td>
<td><strong>0.805</strong></td>
<td>-0.125</td>
<td>0.130</td>
</tr>
<tr>
<td>Scope effects (product breadth)</td>
<td><strong>0.948</strong></td>
<td>-0.159</td>
<td>0.001</td>
</tr>
<tr>
<td>Input costs</td>
<td><strong>0.577</strong></td>
<td>-0.185</td>
<td>-0.219</td>
</tr>
<tr>
<td>Internal product innovations</td>
<td><strong>0.679</strong></td>
<td>-0.094</td>
<td>0.097</td>
</tr>
<tr>
<td>Competitor market tactics</td>
<td>0.070</td>
<td><strong>0.812</strong></td>
<td>-0.070</td>
</tr>
<tr>
<td>New industry entrants</td>
<td>-0.146</td>
<td><strong>0.920</strong></td>
<td>-0.082</td>
</tr>
<tr>
<td>Std. Cronbach’s Alpha (variance extracted)</td>
<td>0.78 (54%)</td>
<td>0.75 (66%)</td>
<td>0.92 (93%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk</th>
<th>Operations</th>
<th>Competitive</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td><strong>0.761</strong></td>
<td>-0.43</td>
<td>0.101</td>
</tr>
<tr>
<td>Reliability</td>
<td><strong>0.749</strong></td>
<td>-0.068</td>
<td>-0.053</td>
</tr>
<tr>
<td>Safety</td>
<td><strong>0.667</strong></td>
<td>0.033</td>
<td>0.059</td>
</tr>
<tr>
<td>Efficiency</td>
<td><strong>0.604</strong></td>
<td>0.160</td>
<td>-0.029</td>
</tr>
<tr>
<td>Substitute productsa</td>
<td>-0.086</td>
<td>0.382</td>
<td>0.715</td>
</tr>
<tr>
<td>Difficult to change suppliers</td>
<td>0.055</td>
<td>-0.104</td>
<td><strong>0.777</strong></td>
</tr>
<tr>
<td>Customers set price</td>
<td>0.118</td>
<td>-0.249</td>
<td><strong>0.523</strong></td>
</tr>
<tr>
<td>Ease of entry to industry (rev)</td>
<td>-0.018</td>
<td><strong>0.824</strong></td>
<td>0.090</td>
</tr>
<tr>
<td>Customer switching costs (rev)</td>
<td>0.196</td>
<td><strong>0.707</strong></td>
<td>-0.191</td>
</tr>
<tr>
<td>Extent competition is fragmented</td>
<td>-0.064</td>
<td><strong>0.633</strong></td>
<td>0.138</td>
</tr>
<tr>
<td>Std. Cronbach’s Alpha (variance extracted)</td>
<td>0.66 (50%)</td>
<td>0.62 (57%)</td>
<td>0.39 (62%)</td>
</tr>
</tbody>
</table>

### Boundary system

<table>
<thead>
<tr>
<th>Factor (0.73)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defines appropriate behavior</td>
</tr>
<tr>
<td>Informs about off-limits behavior</td>
</tr>
<tr>
<td>Communicate risks to be avoided</td>
</tr>
<tr>
<td>Workforce aware of code of conduct</td>
</tr>
<tr>
<td>Standardized Cronbach’s Alpha</td>
</tr>
</tbody>
</table>

### Belief system

<table>
<thead>
<tr>
<th>Factor (0.78)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mission statement communicates values</td>
</tr>
<tr>
<td>Top managers communicate values</td>
</tr>
<tr>
<td>Workforce is aware of values</td>
</tr>
<tr>
<td>Mission statement inspires</td>
</tr>
<tr>
<td>Standardized Cronbach’s Alpha</td>
</tr>
</tbody>
</table>

### Performance measurement

<table>
<thead>
<tr>
<th>Factors (0.66)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnostic</td>
</tr>
<tr>
<td>Progress towards goals</td>
</tr>
<tr>
<td>Monitor results</td>
</tr>
</tbody>
</table>
and systems that communicate areas/actions that should be avoided. Beliefs systems (BELIEF) are the controls that inspire the workforce to take desired actions. I measure BELIEF using four questions that assess the use of an organizational mission statement and communication of core values. Factor analyses reveal that BOUND and BELIEF are uni-dimensional with explained variance of 73% and 78%, respectively. The Cronbach’s Alphas are 0.87 and 0.91, respectively.

This table reports the results of factor analyses by broad construct. I use principal components with promax rotation to estimate the factor analyses and extract all factors with eigenvalues > 1. The variance extracted for each factor analysis is reported in parentheses in the top line of each table. I report the standardized Cronbach’s Alpha for each factor. For constructs with multiple factors, I report the variance extracted for each factor in parentheses following the standardized Cronbach’s Alpha. For ease of presentation, loadings > 0.300 that are used in the final measurement of constructs are highlighted in bold.

* Question loaded > 0.30 on two factors and was dropped from the final measurement of constructs.

<table>
<thead>
<tr>
<th>Factors (0.66)</th>
<th>Diagnostic</th>
<th>Interactive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compare outcomes</td>
<td>0.755</td>
<td>0.137</td>
</tr>
<tr>
<td>Review key measures</td>
<td>0.775</td>
<td>0.091</td>
</tr>
<tr>
<td>Enable discussion</td>
<td>0.911</td>
<td>-0.091</td>
</tr>
<tr>
<td>Enable continual debate</td>
<td>0.918</td>
<td>-0.099</td>
</tr>
<tr>
<td>Provide common view</td>
<td>0.936</td>
<td>-0.070</td>
</tr>
<tr>
<td>Tie organization together</td>
<td>0.900</td>
<td>-0.044</td>
</tr>
<tr>
<td>Focus on common issues</td>
<td>0.951</td>
<td>-0.082</td>
</tr>
<tr>
<td>Focus on critical success factors</td>
<td>0.934</td>
<td>-0.085</td>
</tr>
<tr>
<td>Develop common vocabulary</td>
<td>0.803</td>
<td>0.015</td>
</tr>
<tr>
<td>Top mgrs pay little attention (rev)</td>
<td>-0.058</td>
<td>0.821</td>
</tr>
<tr>
<td>Top mgrs rely heavily on others (rev)*</td>
<td>-0.456</td>
<td>0.590</td>
</tr>
<tr>
<td>Operating mgrs involved infrequent (rev)</td>
<td>0.138</td>
<td>0.542</td>
</tr>
<tr>
<td>Top managers pays day-to-day attention</td>
<td>0.049</td>
<td>0.819</td>
</tr>
<tr>
<td>Top managers interpret information</td>
<td>0.197</td>
<td>0.600</td>
</tr>
<tr>
<td>Operating managers frequently involved</td>
<td>0.288</td>
<td>0.621</td>
</tr>
<tr>
<td>Std Cronbach’s Alpha (variance extracted)</td>
<td>0.96 (73%)</td>
<td>0.84 (62%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Factors (0.73)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Focus attention</td>
<td>0.893</td>
<td></td>
</tr>
<tr>
<td>Effectively leverage time</td>
<td>0.893</td>
<td></td>
</tr>
<tr>
<td>Reduce need for constant monitoring</td>
<td>0.745</td>
<td></td>
</tr>
<tr>
<td>W/O control attention spread thinly</td>
<td>0.873</td>
<td></td>
</tr>
<tr>
<td>Standardized Cronbach’s Alpha</td>
<td>0.87</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Factors (0.80)</th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning is the key to improvement</td>
<td>0.920</td>
<td></td>
</tr>
<tr>
<td>Values include learning</td>
<td>0.913</td>
<td></td>
</tr>
<tr>
<td>No learning endangers our future</td>
<td>0.903</td>
<td></td>
</tr>
<tr>
<td>Learning is an investment</td>
<td>0.843</td>
<td></td>
</tr>
<tr>
<td>Standardized Cronbach’s Alpha</td>
<td>0.92</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Factors (0.69)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organizational performance</td>
<td>0.865</td>
<td></td>
</tr>
<tr>
<td>Organizational profitability</td>
<td>0.854</td>
<td></td>
</tr>
<tr>
<td>Relative market share</td>
<td>0.825</td>
<td></td>
</tr>
<tr>
<td>Productivity</td>
<td>0.784</td>
<td></td>
</tr>
<tr>
<td>Standardized Cronbach’s Alpha</td>
<td>0.85</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Min</td>
<td>Mean</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-----</td>
<td>------</td>
</tr>
<tr>
<td><strong>Operational uncertainties</strong></td>
<td>1.0</td>
<td>4.84</td>
</tr>
<tr>
<td>Diffusion of knowledge</td>
<td>1.0</td>
<td>4.74</td>
</tr>
<tr>
<td>Scale effects (product depth)</td>
<td>1.0</td>
<td>4.63</td>
</tr>
<tr>
<td>Scope effects (product breadth)</td>
<td>1.0</td>
<td>4.78</td>
</tr>
<tr>
<td>Input costs</td>
<td>1.0</td>
<td>5.03</td>
</tr>
<tr>
<td>Internal product innovations</td>
<td>1.0</td>
<td>5.03</td>
</tr>
<tr>
<td><strong>Competitive uncertainties</strong></td>
<td>1.0</td>
<td>4.63</td>
</tr>
<tr>
<td>Product introductions adjacent industries</td>
<td>1.0</td>
<td>4.31</td>
</tr>
<tr>
<td>Competitor market tactics</td>
<td>1.0</td>
<td>4.99</td>
</tr>
<tr>
<td>New industry entrants</td>
<td>1.0</td>
<td>4.61</td>
</tr>
<tr>
<td><strong>Technological uncertainties</strong></td>
<td>1.0</td>
<td>5.49</td>
</tr>
<tr>
<td>Change in product technology</td>
<td>1.0</td>
<td>5.53</td>
</tr>
<tr>
<td>New technology</td>
<td>1.0</td>
<td>5.45</td>
</tr>
<tr>
<td><strong>Operations risk</strong></td>
<td>3.5</td>
<td>5.93</td>
</tr>
<tr>
<td>Quality</td>
<td>4.0</td>
<td>6.39</td>
</tr>
<tr>
<td>Reliability</td>
<td>4.0</td>
<td>6.43</td>
</tr>
<tr>
<td>Safety</td>
<td>1.0</td>
<td>4.83</td>
</tr>
<tr>
<td>Efficiency</td>
<td>3.0</td>
<td>6.07</td>
</tr>
<tr>
<td><strong>Competitive risk</strong></td>
<td>1.0</td>
<td>4.06</td>
</tr>
<tr>
<td>Ease of entry to industry (rev)</td>
<td>1.0</td>
<td>3.18</td>
</tr>
<tr>
<td>Customer switching costs (rev)</td>
<td>1.0</td>
<td>4.63</td>
</tr>
<tr>
<td>Extent competition is fragmented</td>
<td>1.0</td>
<td>4.36</td>
</tr>
<tr>
<td><strong>Beliefs system</strong></td>
<td>1.0</td>
<td>4.74</td>
</tr>
<tr>
<td>Mission statement communicates values</td>
<td>1.0</td>
<td>4.90</td>
</tr>
<tr>
<td>Top managers communicate values</td>
<td>1.0</td>
<td>4.98</td>
</tr>
<tr>
<td>Workforce is aware of values</td>
<td>1.0</td>
<td>4.98</td>
</tr>
<tr>
<td>Mission statement inspires</td>
<td>1.0</td>
<td>4.07</td>
</tr>
<tr>
<td><strong>Boundary system</strong></td>
<td>2.0</td>
<td>5.58</td>
</tr>
<tr>
<td>Defines appropriate behavior</td>
<td>1.0</td>
<td>5.53</td>
</tr>
<tr>
<td>Informs about off-limits behavior</td>
<td>2.0</td>
<td>5.88</td>
</tr>
<tr>
<td>Communicate risks to be avoided</td>
<td>2.0</td>
<td>5.26</td>
</tr>
<tr>
<td>Workforce aware of code of conduct</td>
<td>1.0</td>
<td>5.64</td>
</tr>
<tr>
<td><strong>Diagnostic</strong></td>
<td>1.0</td>
<td>5.21</td>
</tr>
<tr>
<td>Progress towards goals</td>
<td>1.0</td>
<td>5.22</td>
</tr>
<tr>
<td>Monitor results</td>
<td>1.0</td>
<td>5.61</td>
</tr>
<tr>
<td>Compare outcomes</td>
<td>1.0</td>
<td>5.59</td>
</tr>
<tr>
<td>Review key measures</td>
<td>1.0</td>
<td>5.43</td>
</tr>
<tr>
<td>Enable discussion</td>
<td>1.0</td>
<td>5.18</td>
</tr>
<tr>
<td>Enable continual debate</td>
<td>1.0</td>
<td>4.99</td>
</tr>
<tr>
<td>Provide common view</td>
<td>1.0</td>
<td>4.94</td>
</tr>
<tr>
<td>Tie organization together</td>
<td>1.0</td>
<td>4.88</td>
</tr>
<tr>
<td>Focus on common issues</td>
<td>1.0</td>
<td>4.93</td>
</tr>
<tr>
<td>Focus on critical success factors</td>
<td>1.0</td>
<td>5.26</td>
</tr>
<tr>
<td>Develop common vocabulary</td>
<td>1.0</td>
<td>5.07</td>
</tr>
<tr>
<td><strong>Interactive</strong></td>
<td>1.0</td>
<td>5.00</td>
</tr>
<tr>
<td>Top mgrs pay little attention (rev)</td>
<td>1.0</td>
<td>5.11</td>
</tr>
<tr>
<td>Operating mgrs involved infrequent (rev)</td>
<td>1.0</td>
<td>4.83</td>
</tr>
<tr>
<td>Top managers pays day-to-day attention</td>
<td>1.0</td>
<td>4.85</td>
</tr>
</tbody>
</table>
Diagnostic systems (DIAG) provide routine information to managers about key measures and progress towards goals. In contrast, interactive systems (INTER) require tremendous top management involvement. Although firms may use many control systems either interactively or diagnostically, this study investigates the use of the PM system for two reasons. First, an effective PM system is viewed as being increasingly important to the success of firms in today’s competitive environment thus, in the cross-section, the PM system should be important across firms. Second, the results of this study can contribute to a long stream of research on performance measures (see e.g., Ittner & Larcker, 1998).

I measure both DIAG and INTER using questions and concepts from Henri (2006), Simons (2000), and Kaplan and Norton (1996). Since both sets of questions enquire about the PM system, I use an exploratory factor analysis across all questions to ensure discriminant validity. Eleven questions about goals, monitoring, commonalities, and key success factors load on factor 1, which I label diagnostic controls (DIAG). Seven questions specifically mention the involvement of top and/or operating managers load on factor 2, which I label interactive controls (INTERACT). The distinguishing feature between DIAG and INTERACT is the involvement of top and operating managers. Bisbe, Batista-Foguet, and Chenhall (2007) identify five dimensions that define the theoretical properties of an interactive control. That is, Simons’ notion of an interactive control appears to be comprised of a set of five linked dimensions. In this study, interactive control corresponds to two of the properties having to do with the involvement of top and operating managers. The three (i.e., face-to-face challenges, focus on strategic uncertainties, and inspirational involvement) remaining properties are omitted in this study (see also Section “Validity tests for statistical robustness”). Overall, the constructs capture 66% of the explained variance. The Cronbach’s Alphas for DIAG and INTERACT are 0.96 and 0.84, respectively.

### Table 3 (continued)

<table>
<thead>
<tr>
<th></th>
<th>Min</th>
<th>Mean</th>
<th>Median</th>
<th>Max</th>
<th>Std. dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top managers interpret information</td>
<td>1.0</td>
<td>5.23</td>
<td>6.0</td>
<td>7.0</td>
<td>1.40</td>
</tr>
<tr>
<td>Operating managers frequently involved</td>
<td>1.0</td>
<td>4.98</td>
<td>5.0</td>
<td>7.0</td>
<td>1.59</td>
</tr>
<tr>
<td>Learning</td>
<td>1.0</td>
<td>5.06</td>
<td>5.3</td>
<td>7.0</td>
<td>1.19</td>
</tr>
<tr>
<td>Learning is the key to improvement</td>
<td>1.0</td>
<td>5.02</td>
<td>5.0</td>
<td>7.0</td>
<td>1.36</td>
</tr>
<tr>
<td>Values include learning</td>
<td>1.0</td>
<td>4.98</td>
<td>5.0</td>
<td>7.0</td>
<td>1.37</td>
</tr>
<tr>
<td>No learning endangers our future</td>
<td>1.0</td>
<td>5.25</td>
<td>5.5</td>
<td>7.0</td>
<td>1.33</td>
</tr>
<tr>
<td>Learning is an investment</td>
<td>1.0</td>
<td>4.98</td>
<td>5.0</td>
<td>7.0</td>
<td>1.31</td>
</tr>
<tr>
<td>Attention</td>
<td>1.5</td>
<td>4.95</td>
<td>5.0</td>
<td>7.0</td>
<td>1.11</td>
</tr>
<tr>
<td>Focus attention</td>
<td>1.0</td>
<td>5.32</td>
<td>6.0</td>
<td>7.0</td>
<td>1.29</td>
</tr>
<tr>
<td>Effectively leverage time</td>
<td>1.0</td>
<td>4.93</td>
<td>5.0</td>
<td>7.0</td>
<td>1.27</td>
</tr>
<tr>
<td>Reduce need for constant monitoring</td>
<td>1.0</td>
<td>4.45</td>
<td>5.0</td>
<td>7.0</td>
<td>1.40</td>
</tr>
<tr>
<td>W/O control attention spread thinly</td>
<td>2.0</td>
<td>5.09</td>
<td>5.0</td>
<td>7.0</td>
<td>1.32</td>
</tr>
<tr>
<td>Performance</td>
<td>2.0</td>
<td>4.32</td>
<td>4.3</td>
<td>7.0</td>
<td>1.14</td>
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<tr>
<td>Organizational performance</td>
<td>2.0</td>
<td>4.37</td>
<td>4.0</td>
<td>7.0</td>
<td>1.39</td>
</tr>
<tr>
<td>Organizational profitability</td>
<td>1.0</td>
<td>4.11</td>
<td>4.0</td>
<td>7.0</td>
<td>1.69</td>
</tr>
<tr>
<td>Relative market share</td>
<td>2.0</td>
<td>4.34</td>
<td>4.0</td>
<td>7.0</td>
<td>1.29</td>
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<tr>
<td>Productivity</td>
<td>2.0</td>
<td>4.46</td>
<td>4.0</td>
<td>7.0</td>
<td>1.18</td>
</tr>
</tbody>
</table>

7 These questions are from Henri (2006); however, he uses these questions to measure two constructs: interactive and diagnostic uses. In this study, all nine questions load on one factor. Also see the sensitivity test in Section “Validity tests for statistical robustness”.

8 In addition, this distinction is consistent with Simons (1994, p. 171) who states that interactive control systems are “formal systems used by top managers to regularly and personally involve themselves in the decision activities of subordinates” (see also Simons, 1991, p. 49, 2000, p. 216).
questions that ask about the ability to focus attention, effectively leverage time, reduce need for constant monitoring, and how the control system impacts attention. Organizational learning is dependent upon whether the organization has a culture that is suitable and enables learning (Galer & Van Der Heijden, 1992). I use a previously validated scale (Henri, 2006; Hult & Thomas, 1998) comprised of four questions to capture learning (LEARN). Performance is measured using a previously validated scale (Roth & Jackson, 1995). I ask the respondents to assess their organizational performance relevant to their goals on four dimensions: overall, profitability, market share, and delivery system. I use this measure since it was previously validated for both service and manufacturing firms and thus should be relevant in the cross-section. The survey measure of performance correlates positively with an archival measure of return-on-assets defined as pre-tax income divided by total assets ($r = .179, p < .05$). Factor analysis reveals that the three constructs are uni-dimensional and explain 73%, 80%, and 69% of the variance, respectively. The Cronbach’s Alphas are 0.87, 0.92, and 0.85, respectively.

**Summary of constructs**

The constructs, with the exception of asset impairment risk, are measured using Likert-scale survey questions with an available range of 1–7. The descriptive statistics presented in Table 3 for the survey questions reveals that all questions, with the exception of operations risk, include a broad range with a minimum of either 1 or 2 and a maximum of 7. Although operations risk has a contracted range, at the minimum it still encompasses a four-point scale. The factor analyses reveal unidimensional constructs, with acceptable explained variance. In addition, all constructs used in the final analyses have acceptable Cronbach’s Alphas (Nunnally, 1978).

Although the constructs are theoretically distinct and measured using either validated scales or questions drawn from the underlying literature, it is still likely that they are correlated with one another. Since this study models these variables as distinct constructs, I present a multitrait matrix in Table 4. While the use of factor analyses for risk, strategic uncertainties, diagnostic, and interactive controls

---

**Table 4**

Multitrait matrix*  

<table>
<thead>
<tr>
<th>ATTEN (1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
<th>(9)</th>
<th>(10)</th>
<th>(11)</th>
<th>(12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.87</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.440**</td>
<td>0.91</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.359**</td>
<td>0.520</td>
<td>0.87</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.073</td>
<td>-0.011</td>
<td>0.062</td>
<td>0.62</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.275**</td>
<td>0.386**</td>
<td>0.250**</td>
<td>0.009</td>
<td>0.75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.533**</td>
<td>0.580**</td>
<td>0.398**</td>
<td>0.059</td>
<td>0.371**</td>
<td>0.96</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.214</td>
<td>0.421**</td>
<td>0.289**</td>
<td>0.113</td>
<td>0.276**</td>
<td>0.633**</td>
<td>0.84</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.363**</td>
<td>0.485**</td>
<td>0.356**</td>
<td>-0.013</td>
<td>0.284**</td>
<td>0.500**</td>
<td>0.343**</td>
<td>0.92</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.196**</td>
<td>0.303**</td>
<td>0.230*</td>
<td>0.043</td>
<td>0.326**</td>
<td>0.376**</td>
<td>0.259**</td>
<td>0.443**</td>
<td>0.66</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.318**</td>
<td>0.359**</td>
<td>0.235**</td>
<td>-0.094</td>
<td>0.498**</td>
<td>0.376**</td>
<td>0.191*</td>
<td>0.378**</td>
<td>0.243**</td>
<td>0.78</td>
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<td></td>
</tr>
<tr>
<td>0.359**</td>
<td>0.296**</td>
<td>0.230*</td>
<td>-0.145</td>
<td>0.156</td>
<td>0.375**</td>
<td>0.215*</td>
<td>0.384**</td>
<td>0.271**</td>
<td>0.207*</td>
<td>0.85</td>
<td></td>
</tr>
<tr>
<td>0.101</td>
<td>0.251**</td>
<td>0.065</td>
<td>-0.335**</td>
<td>0.363**</td>
<td>0.151</td>
<td>0.061</td>
<td>0.179*</td>
<td>0.118</td>
<td>0.372**</td>
<td>0.240**</td>
<td>0.92</td>
</tr>
</tbody>
</table>

* The diagonal of the matrix is the Cronbach’s Alpha for each variable. The remainder of the tables reports the bi-variate correlation coefficients.

**p-value significant at <0.05, 0.01, respectively.**
clearly demonstrate that empirically the six constructs are distinct, the multitrait matrix provides additional evidence. The diagonal of the matrix (the “reliability diagonal”) contains the Cronbach’s Alpha for each latent construct and shows the internal consistency or reliability. The remainder of the table is a correlation matrix between the pairs of variables. In order to demonstrate that the dimensions are distinct, the correlation coefficients within a column should be less than the coefficient alphas found in the diagonal (Churchill, 1979). Examining Table 4 shows that the internal reliability is much higher than the inter-item reliability. The correlation coefficients range up to 0.58 and many of the pairs of variables are significantly correlated. The Cronbach’s Alphas range between 0.62 and 0.96. This analysis provides strong evidence of discriminant validity since the Cronbach’s Alphas exceed the inter-item correlations in all cases. Based on the results of both the factor analyses and the multitrait matrix I conclude that there is strong empirical support for discriminant validity.\textsuperscript{12}

Results

I use the AMOS 4.0 software program, with default maximum likelihood estimation technique\textsuperscript{13}, to estimate a system of equations described in Fig. 1.\textsuperscript{14} I use SEM since it forces a decision regarding whether the entire model is satisfactory (Kline, 1998). It brings to the table a macro-view of the control framework and provides a big picture perspective. Simons (2000) asserts that the success of the control framework is contingent on the proper use of all four control systems; thus a model focus is appropriate. Due to a sample size of 122 observations, the constructs are treated as manifest variables\textsuperscript{15} using the summated scores described earlier in Section “Methods”.

The analysis proceeds in three steps. First, I estimate a base model based on Fig. 1. I trim the model for insignificant links that are not hypothesized. I then trim the model guided in part by empirics. Model trimming is used to derive a parsimonious, well-fitting base model (Kline, 1998), which results in a base model that provides evidence on the holistic model. The results for this step are presented in Table 5. Second, I use the trimmed base model arrived at in the first step as a basis of discussion for the specific hypotheses. Third, the existence of a well-fitting model does not ensure that the model is the only appropriate model (Kline, 1998). Therefore, I generate six alternative models for comparison against the base model. This analysis is presented in Table 6. I show a graphical depiction of the significant results contained in the final mode in Fig. 2.

Generation of trimmed base model – step 1

The analysis is exclusive of ASRSK, CORSK, and TEUNC. None of these variables have significant explanatory power. All remaining path results are robust to either the inclusion or exclusion of ASRSK, CORSK, or TEUNC in the model, thus they are removed for the sake of parsimony. I use the Chi-square, the Chi-square divided by the model degrees of freedom (CMINDF), the comparative fit index (CFI), the goodness of fit index (GFI) and the root mean square error of approximation (RMSEA) as indicators of model fit. An insignificant Chi-square (Joreskog, 1969), a CMINDF ratio less than 5 (Wheaton, Muthen, Alwin, & Summers, 1977), a CFI and GFI close to

\textsuperscript{12} As a robustness check of discriminant validity, I also perform a technique suggested by Fornell and Larcker (1981) that compares the variance extracted for each construct to the squared correlation. The variance extracted for the latent variables ranges from 0.50 to 0.92, which in all cases exceeds the squared interpair correlations. Thus, I conclude that the discriminant validity of the constructs is robust across multiple tests.

\textsuperscript{13} Kurtosis and skewness indicate that the data is within tolerable levels of univariate normality. Kline (1998) suggests that skewness greater than 3.0 and kurtosis greater than 10.0 may suggest that a problem with the data. Kline (1998, p. 83) notes multivariate non-normality can usually be identified through univariate procedures.

\textsuperscript{14} The analysis is run using data from 122 surveys. I found no evidence of multicollinearity or heteroscedasticity. Specification tests for multicollinearity included reviewing the tolerance and variance inflation factor for each coefficient, and for heteroscedasticity included the review of plots of the residuals and the White test.

\textsuperscript{15} This technique is used when working with small sample sizes since it reduces the number of parameters that are estimated thus accommodating smaller samples.
In alternative model 1 I trim the path from competitive uncertainty to the diagnostic system. This path is not significant nor is it hypothesized. The $X^2$ difference test is insignificant which indicates

1 (Arbuckle & Wothke, 1999; Bentler, 1990), and an RMSEA of less than 0.08 (Browne & Cudeck, 1993) indicates good fit. As shown in Table 5, the base model is reasonably well-fitting.

### Table 5

<table>
<thead>
<tr>
<th>Dependent variable ($R^2$)</th>
<th>Independent variable</th>
<th>Base model</th>
<th>Trimmed model (Alt. 1)</th>
<th>Trimmed model (Alt. 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIAG (0.213)</td>
<td>COUNC</td>
<td>0.023</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>OPUNC</td>
<td>0.129**</td>
<td>0.135**</td>
<td>0.137**</td>
</tr>
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<td></td>
<td>OPRSK</td>
<td>0.112**</td>
<td>0.115**</td>
<td>0.119**</td>
</tr>
<tr>
<td></td>
<td>BELIEF</td>
<td>0.278***</td>
<td>0.280***</td>
<td>0.303***</td>
</tr>
<tr>
<td></td>
<td>BOUND</td>
<td>0.057</td>
<td>0.058</td>
<td></td>
</tr>
<tr>
<td></td>
<td>INTERACT</td>
<td>0.462***</td>
<td>0.464***</td>
<td>0.470***</td>
</tr>
<tr>
<td>BELIEF (0.188)</td>
<td>COUNC</td>
<td>0.177**</td>
<td>0.177**</td>
<td>0.177**</td>
</tr>
<tr>
<td></td>
<td>OPUNC</td>
<td>0.273***</td>
<td>0.273**</td>
<td>0.273**</td>
</tr>
<tr>
<td></td>
<td>OPRSK</td>
<td>0.150**</td>
<td>0.150**</td>
<td>0.150**</td>
</tr>
<tr>
<td></td>
<td>BOUND</td>
<td>0.044</td>
<td>0.044</td>
<td></td>
</tr>
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<td></td>
<td>INTERACT</td>
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<td>0.478***</td>
<td>0.530***</td>
</tr>
<tr>
<td>BOUND (0.096)</td>
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<td>0.027</td>
<td>0.027</td>
</tr>
<tr>
<td></td>
<td>OPUNC</td>
<td>0.090</td>
<td>0.090</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BELIEF</td>
<td>0.478***</td>
<td>0.478***</td>
<td>0.530***</td>
</tr>
<tr>
<td>INTERACT (0.117)</td>
<td>COUNC</td>
<td>0.141*</td>
<td>0.141*</td>
<td>0.116*</td>
</tr>
<tr>
<td></td>
<td>OPUNC</td>
<td>−0.065</td>
<td>−0.065</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BELIEF</td>
<td>0.352***</td>
<td>0.352***</td>
<td>0.337***</td>
</tr>
<tr>
<td>ATTEN (0.381)</td>
<td>DIAG</td>
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<td>0.538***</td>
<td>0.543***</td>
</tr>
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<td>0.255***</td>
<td>0.256***</td>
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<tr>
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<td>0.105</td>
<td>0.105</td>
<td>0.106</td>
</tr>
<tr>
<td></td>
<td>INTERACT</td>
<td>−0.315***</td>
<td>−0.315***</td>
<td>−0.316***</td>
</tr>
<tr>
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<td>0.303***</td>
<td>0.279***</td>
</tr>
<tr>
<td></td>
<td>BELIEF</td>
<td>0.351***</td>
<td>0.351***</td>
<td>0.350***</td>
</tr>
<tr>
<td></td>
<td>BOUND</td>
<td>0.070</td>
<td>0.070</td>
<td>0.067</td>
</tr>
<tr>
<td></td>
<td>INTERACT</td>
<td>−0.041</td>
<td>−0.041</td>
<td></td>
</tr>
<tr>
<td>PERF (0.166)</td>
<td>ATTEN</td>
<td>0.210***</td>
<td>0.210***</td>
<td>0.209***</td>
</tr>
<tr>
<td></td>
<td>LEARN</td>
<td>0.292***</td>
<td>0.292***</td>
<td>0.292***</td>
</tr>
</tbody>
</table>

| Model fit                |                      |            |
| df                       | 15                   | 16         | 22                     |
| CMINDF                   | 1.650                | 1.553      | 1.291                  |
| RMSEA                    | 0.073                | 0.068      | 0.049                  |
| GFI                      | 0.962                | 0.962      | 0.957                  |
| CFI                      | 0.974                | 0.977      | 0.983                  |

| $X^2$ difference test    |                      |            |
| $X^2$ difference (df)    | 0.107 (1)            | 2.417 (4)  |
| $p$-value                | Ns                   | Ns         |

This table presents the results of a structural equation model. The trimmed model (Alternative 1) removes the insignificant paths from strategic factors to the control systems as hypothesized in H2c and H2d. The trimmed model (Alternative 2) is guided by both underlying theory and empirical results and removes the paths from strategic factors to the boundary system, from the boundary to the diagnostic control system, and from the interactive control system to learning orientation.

***, **, *: Significant at $p$-value < 0.01, 0.05, 0.10, respectively (one-tailed).
Table 6
Comparison of trimmed base model to alternative models

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Independent variable</th>
<th>Trimmed base model</th>
<th>Alt. 1</th>
<th>Alt. 2</th>
<th>Alt. 3</th>
<th>Alt. 4</th>
<th>Alt. 5</th>
<th>Alt. 6</th>
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<td>0.137**</td>
<td>0.137**</td>
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Alternative model specification

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<th>Independent variable</th>
<th>Trimmed base model</th>
<th>Alt. 1</th>
<th>Alt. 2</th>
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Model fit

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<th>GFI</th>
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<td>0.983</td>
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<tr>
<td>GFI</td>
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<td>0.087</td>
<td>0.957</td>
<td>0.087</td>
<td>0.957</td>
<td>0.087</td>
<td>0.957</td>
<td>0.087</td>
</tr>
</tbody>
</table>

$p^*$, **, *** Significant at $p$-value < 0.01, 0.05, 0.10, respectively (one-tailed), except for the alternative model specification tests, which are two-tailed.
that the model has not been overly trimmed (Kline, 1998). Inspection of the model reveals that emphasis on the boundary system is influenced by the emphasis placed on the beliefs system and not by strategic factors the firm faces. In other words, the results suggest that strategic factors influence the emphasis placed on the beliefs system, which in turn, influences the emphasis placed on the boundary system. Thus, in alternative model 2, I trim the paths from the strategic factors to the boundary system. I also trim the path from the interactive system to learning. The results suggest that the interactive use of performance measures influences the diagnostic use of performance measures, which in turn, influences learning. In addition, I trim the path from operational uncertainty to the interactive control system. The results indicate that the beliefs and diagnostic systems are used to manage operational uncertainty. Finally, I trim the path from the boundary system to the diagnostic system, since strategic factors and the interactive and beliefs systems explain the use of the diagnostic system. I leave the insignificant paths between the emphasis placed on the boundary system and each of attention and learning since eliminating these paths would purely be empirically driven (i.e., the model does not contain an alternative explanation since there are no other paths originating from the boundary system). Trimming the paths to derive alternative model 2 results in an insignificant $\chi^2$ difference suggesting that the model has not been overly trimmed (Kline, 1998). The final trimmed model (i.e., Model Alt. 2) is well-fitting with an insignificant $\chi^2 (p = 0.163)$, a CMINDF = 1.291, a GFI = 0.957, a CFI = 0.983, and an RMSEA = 0.049.

In summary, I conclude that many of the relations posited to exist in the LOC framework are well-represented by the data. In general, the extent to which firms face strategic risk and uncertainty drive the emphasis placed on control systems, which in turn, influence learning, attention, and performance. However, contrary to the framework and to prior literature, I find that the interactive

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![Graphical depiction of significant results.](image-url)
Discussion of hypotheses – step 2

The path coefficients reported in the trimmed model (Alt. 2), Table 5 provide evidence on the hypotheses. The first set of hypotheses suggests the existence of relations among control systems. The emphasis firms place on the beliefs system is positively associated with the emphasis they place on the boundary system ($p < 0.01$), the diagnostic system ($p < 0.01$) and the interactive system ($p < 0.01$), which provides support for H1a–H1c. These findings are consistent with the argument that the beliefs system influences and complements each of the other control systems in the LOC framework. In addition, H1e is supported since the interactive use of performance measures helps explain the diagnostic use of performance measures ($p < 0.01$). Overall, these results provide support that controls are inter-related and are complementary. I find no evidence that the controls are substitutes.

The second set of hypotheses predicts that the extent to which firms face strategic risk and uncertainties is positively associated with the emphasis firms place on the beliefs, boundary, and interactive systems, and that strategic factors that likely lend themselves to relatively precise measurement are associated with the diagnostic use of performance measures. H2a is supported since firms facing higher levels of operational risk ($p < 0.05$), competitive uncertainty ($p < 0.05$) and operational uncertainty ($p < 0.01$) place more emphasis on the beliefs system. H2b is not supported since strategic factors are not associated with the emphasis placed on a boundary system. H2c is supported since firms facing higher strategic factors of operational uncertainty and operational risk emphasize the diagnostic use of a PM system ($p < 0.05$). There is also some support for H2d since the extent to which firms face competitive uncertainty is marginally associated with the interactive use of a PM system ($p < 0.10$). Although not hypothesized, I also find that operational risk is associated with an interactive use of performance measures ($p < 0.05$). The results provide support that the role of the PM system varies depending on the strategic uncertainty and risk the firm faces. The PM system is used interactively when the firm faces competitive uncertainty, but not either technological or operational uncertainties. It is also used interactively when the firm faces operational risk, but not either asset impairment or competitive risk. One interesting observation is that the PM system is used both diagnostically and interactively in conjunction with operating risk. This is consistent with Marginson’s (2002) finding that firms may use some parts of their PM system interactively while using other parts diagnostically.

The remaining hypotheses investigate outcomes associated with the emphasis firms place on control systems. The third set of hypotheses predicts that a firm’s orientation to learning is higher when firms place more emphasis on their control systems. The coefficients on the paths from each of DIAG and BELIEF to LEARN provide support for hypotheses 3A and 3C. As firms place more emphasis on diagnostic uses of the PM system and the belief system, they have an organization more amenable to learning ($p < 0.01, p < 0.01$, respectively). Emphasis of the boundary system and the interactive use of the PM system are not associated with organizational learning, which indicates that hypotheses 3b and 3d are not supported.

Simons (1990) suggests that the structure found in formal

\footnote{As expected, the interactive use of the PM system and the boundary system are each positively correlated with an organization’s orientation to learning when inspecting the bi-variate correlations shown in Table 4 ($p$-value $< 0.05$ for both relations). This result is robust to the path model when the interactive use of the performance measurement system or the boundary system is modeled as the only driver of organizational learning ($p < 0.01$); however, when all control attributes are modeled as drivers of organizational learning then the interactive use of the performance measurement system and the boundary system do not significantly influence organizational learning. These results are robust using OLS as well. The VIF is less than 2.5 indicating that multicollinearity is not likely an issue. This indicates that an interactive control system and a boundary system are not significantly associated with learning when controlling for the beliefs and diagnostic control systems.}
management control systems facilitates organizational learning. However, the results imply that the interactive control system may be more organic and influence organizational learning through the formal structure of the diagnostic control system.

The fourth set of hypotheses predicts a relation between the efficient use of management attention and each of the control systems. H4a, 4b and 4c predict that emphasis on a beliefs system, a boundary system, and a diagnostic control system will facilitate the efficient use of management attention. In other words, these types of control “free up” management attention and facilitate the efficient use of a constrained resource. The significant coefficients on the paths between ATTEN and each of DIAG and BELIEF ($p < 0.01$, $p < 0.01$, respectively) provide support for hypotheses 4a and 4c. Hypothesis 4b is not supported. In contrast, hypothesis 4d predicts that the interactive use of the PM system consumes management attention. In other words, a “cost” of using an interactive control system is the use of management attention. The negative coefficient on the path between INTERACT and ATTEN ($p < 0.01$) provides support for hypothesis 4d. Hypothesis 5a and 5b predicts that the efficient use of attention and higher levels of organizational learning are associated with higher levels of firm performance. The results show that higher performance is associated with higher levels of both attention ($p < 0.01$) and organizational learning ($p < 0.01$), thus these two hypotheses are supported.

Comparison to alternative models – step 3

Although the trimmed model presented in Table 5 is well-fitting, there is no assurance that it is the only model. The purpose of this section is to compare the trimmed base model to alternative models to rule out alternative model specifications (Kline, 1998). The first five alternative model specifications in Table 6 build the model by adding a path. When building a model, a significant $\chi^2$ difference test indicates that the alternative model is better-fitting than the base model (Kline, 1998). Alternative 1 proposes that the relation between interactive and diagnostic controls is non-recursive. That is, not only does the interactive system influence the diagnostic system, but the diagnostic system may also influence the interactive system. This stems from Simons (2000) who depicts the relation between the interaction and diagnostic systems as being bi-directional. Alternatives 2 and 3 investigate the relation between learning and attention. Organizational learning consumes attention, that is, attention can be viewed as a cost of learning. Levitt and March (1988) assert that “mechanisms of attention within a memory structure” are necessary to facilitate learning. To be complete I run two alternative models (2 and 3) which adds a path from LEARN to ATTEN, and from ATTEN to LEARN, respectively. Both the path coefficient and the $\chi^2$ difference test on each of these first three alternative models are insignificant, which indicates that the alternative model is not better-fitting than the original model.

In the base model I hypothesize that the interactive use of performance measures influence the diagnostic use of performance measures. In addition, it is possible that the interactive system influences each of the boundary and beliefs systems. As top managers gain information through the interactive system regarding emergent strategies, it is possible that the firm adjusts its acceptable boundaries and the firm’s vision or mission statement. For example, Simons (1994) finds that as emerging strategy is clarified managers draft new mission statements and redefine the boundary system. Tounmela (2005) also argues that the dialogue stemming from an interactive control system can lead the firm to place more emphasis on the boundary and beliefs system in order to communicate the new strategy. Thus, alternative model 4 adds a path from INTERACT to BOUND and alternative model 5 adds a path from INTERACT to BELIEF. Although the path coefficient and $\chi^2$ difference test on alternative 5 are insignificant, there is support for accepting model 4. The interactive system positively influences the emphasis firms place on the boundary system ($p < 0.10$) and the $\chi^2$ difference test is significant ($p < 0.10$), indicating that alternative model 4 is better-fitting than the trimmed base model.

Finally, alternative model 6 trims the mediating effects of ATTEN and LEARN. This model allows the control systems to directly affect performance.
The only significant path is between DIAG and PERF \((p < 0.01)\) indicating that diagnostic use of the PM system is significantly associated with performance. However, the \(X^2\) difference test is significant \((p < 0.10)\) indicating that the model has been overly trimmed and thus, the base model is better fitting.

In summary, I conclude that alternative model 4 in Table 6 is a better-fitting model than the base model. The other alternative models are not better-fitting than the base model and are thus rejected. The significant paths in alternative model 4 are depicted graphically in Fig. 2.

**Validity tests for statistical robustness**

In order to ensure that the SEM model results are robust I perform several validity tests. First, I demonstrate the robustness of the relations with performance. The measure of performance is perceptual; obtained from the survey respondents. I calculate an archival measure of performance, return-on-assets (ROA). I use ROA as the archival proxy since it may closely approximate the survey measure of performance which asks about performance relative to the organization’s goals during the past year. I run the SEM model using ROA instead of PERF and find that the statistical inferences are unchanged although the \(p\)-value for both of the paths: LEARN to PERF and ATTN to PERF, are marginally significant at \(p < 0.10\). That the relation is somewhat weaker is not surprising since there may be lags between when the effects of the relations contained in the LOC model have an effect on ROA. The archival measure of performance is skewed, thus I use bootstrapping, which does not assume normality, to estimate the standard errors.

Second, I replace the summated variables with factor scores and find that the statistical model inferences are unchanged. Third, questions about the extent to which the PM system enable discussion and enable continual debate are perhaps more characteristic of an interactive system although they load on the diagnostic factor (Bisbe et al., 2007). I remove these two questions from the diagnostic construct and re-run the SEM analyses. The significance and direction of results are not changed; therefore, I conclude that the inclusion of these two questions is not driving the results. Fourth, although earlier statistical checks suggested that normality of the model variables does not appear to be a concern, a strict assumption of maximum likelihood estimation of an SEM model is multivariate normality. I perform an additional robustness check as suggested by Kline (1998) and use bootstrapping (200 samples with replacement), which does not assume multivariate normality to estimate \(p\)-values. I find that the results are qualitatively unchanged. Finally, Kline (1998) states that a sample size of <100 may be problematic. Although, the sample size in this study is 122, which is within the guidelines stated by Hair, Anderson, Tatham, and Black (1995) and Kline (1998), I also estimate two sub-models as follows: (1) antecedents of control systems and (2) outcomes of control systems. This increases the number of observations per parameter estimated to be above the threshold of five as recommended by Hair et al. (1995). The statistical inferences are unchanged.

**Conclusions**

This study provides evidence on the LOC framework. It finds that two types of strategic elements – strategic uncertainties and strategic risk – drive the importance and role of control systems. It also documents that each of the diagnostic and beliefs systems facilitate the efficient use of management attention, while the interactive system consumes management attention (i.e., a “cost” of control). Organizational learning is enhanced by emphasis on the beliefs system as well as use of the diagnostic system. Both organizational learning and attention are positively associated with performance. Finally, it finds that the interactive system influences the diagnostic and boundary systems and the beliefs system influences each of the three other systems.

Similar to most studies, there are limitations. This study relies on survey data from 122 respondents. Steps were taken to ensure the reliability of the data (i.e., random sample, pre-test of instrument, construct and content validity). All diagnostic
tests show that there is no reason to expect bias (common method test, non-response bias); moreover, I also use an archival measure of performance to demonstrate the robustness of the results. However, measures may be noisy and caution should be taken when generalizing the results to other populations. In addition, this study relies on cross-sectional data. Although the relations in the path model are substantiated by underlying theory, cause-and-effect relations cannot be demonstrated empirically. In spite of the limitations, this study results in five implications for theory and practice.

First, this study demonstrates that many of the controls in the LOC framework are inter-dependent and complementary. Specifically, the results show that the interactive system is inter-dependent with both the boundary system and the diagnostic use of performance measures, the latter of which is consistent with Henri (2006) who argues that dynamic tension results from the use of performance measures in dual roles. An important implication for organizations is that in order to realize the full benefits of the performance measurement system they must use them both diagnostically and interactively. The findings are also consistent with Chenhall and Morris (1995) who argue that structure is necessary for interactive type controls to be effective. In this study, the diagnostic system provides the structure that enables the interactive system to be effective since the diagnostic system is a mechanism by which the employees learn of the new strategy and consequently, the new goals and objectives with which to align behavior. The boundary system also provides structure through delineating the areas off-limit to employees. I also find that use of the beliefs system positively influences all other systems. This is consistent with Pearce and David (1987) who state that the beliefs system provides the foundation for the firm’s identity and value system. The positive relations between the beliefs system and each of the three remaining control systems positively affect organizational outcomes implying that the relations are complementary.

The total standardized effect of the four control systems on performance are 0.514; however, if the control systems are isolated by removing the paths among them, the total standardized effect of the four control systems on performance decreases to 0.328 (the Chi-squared difference test is significant at $p < 0.01$). This result suggests that managers must consider all four control systems when designing their control system. It also provides empirical evidence that the control systems are complementary. This is consistent with Simons (2000) who argues that an effective control system, comprised of the four control levels working in harmony and balance, facilitates organizational performance.

Second, strategy not only drives the importance of controls, but also the role of controls. I find that two types of strategic uncertainties (competitive uncertainty and operational uncertainty) are associated with the importance of control systems. Examining the standardized coefficients for strategic uncertainties shows that operational uncertainties have the largest effect on the diagnostic and beliefs systems, while competitive uncertainties drives interactive controls. This implies that the interactive control system is used to scan the external environment while the other systems are focused more on the internal environment. I also find that the firm uses the PM system both diagnostically and interactively to manage operational risk. These results are consistent with Galbraith (1973) who says that firms implement mechanisms to process information; as uncertainty increases the information deficit increases leading to increased reliance on mechanisms that facilitate the processing of information. The results suggest that there are relatively precise measures of operational risk and uncertainty since both are used diagnostically. However, it is likely that measures of competitive uncertainty are relatively less precise since competitive uncertainty is managed with an interactive system. Both the diagnostic and interactive systems are used to manage operational risk, which implies not only that the measures of operational risk are relatively precise, but that the information deficit associated with operational risk is such that firms need both systems to effectively manage it. The results also indicate that organizations may implement other types of control systems outside the scope of this study to effectively manage asset impairment and technological risk, which future research could investigate.
Third, the interactive use of the PM system is not associated with organizational learning. There is a significant bi-variate correlation between organizational learning and use of the interactive system. In addition, if paths between the other systems and organizational learning are restricted to zero in the structural equation model then the path between the interactive use of the PM system and organizational learning is positive and significant. The empirical results in this paper suggest that it is the structured, formal process of the diagnostic system that brings to life the benefits of the interactive system. This finding illustrates the importance of studying multiple control systems. Studies that focus only on interactive controls may contend that organizational learning is enhanced; however, when controlling for other control systems (i.e., beliefs and diagnostic controls), the direct link between the interactive system and learning does not contain any additional explanatory power. Rather, the interactive system affects learning through the diagnostic system.

Fourth, although there is a cost of control, overall, the four control components have a positive impact on performance, with a total standardized effect of 0.514. The results demonstrate that there is a cost associated with the interactive use of performance measures since it consumes management attention. However, the net effect of the four controls on attention is positive. Moreover, if the interactive system is removed from the control environment, the total standardized effect of the remaining control systems on performance falls to 0.438. Therefore, the benefits of the control systems outweigh the costs.

Finally, this study shows that emphasis on control systems influences performance through their affect on learning and management attention. Sensitivity tests demonstrate that the direct relation between control systems and performance is weak; however, the effects become apparent when LEARN and ATTEN are included in the model. This is consistent with Luft and Shields (2003) who state that if the relation between two variables is weak then including appropriate intervening or mediating variables can help researchers detect effects. Thus this paper presents a more complete model of the relation between control systems and firm performance.

Acknowledgement

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Appendix 1. Examples of beliefs and boundary control systems

The following examples are direct quotes taken directly from Infor’s and Manugistics corporate websites at the time of the development of this project in 2005/2006.

Example of Infor (formerly Mapics) mission statement

Infor’s mission is to solve the essential, industry-specific challenges that others cannot. We accomplish this mission through: Our solutions – Infor’s vertically focused solutions have been developed, enhanced, and proven effective through decades of practical application. Our people – the average Infor consultant has an advanced degree and over 10 years of experience in the industries we serve. Our reach – Infor has the global infrastructure and expertise to manage the complexity of an increasingly international marketplace. Our passion – we are committed to making you successful by being the very best software provider for the industries we serve. Our values – we treat our customers, employees, and partners with honesty, respect, and integrity.

Example of Infor (formerly Mapics) vision statement

Infor’s vision is to become the leading global software provider in all of the markets we serve. Through on-going investments in products and people, an unwavering commitment to our customers,
and execution of an aggressive worldwide growth strategy, we will continually enhance our ability to address the specialized, complex, and increasingly global requirements of select manufacturing and distribution industries.

*Example of Manugistics Code of Conduct*

This Code of Conduct clarifies the responsibilities that Manugistics employees and officers have to each other, to our clients, and to our communities. It helps us understand the responsibilities we share, and alerts us to important legal and ethical issues that may arise. You will not find every Manugistics rule, policy or standard here. What you will find are the basic values of how we choose to do business. The spirit of this Code of Conduct governs the interpretation of any other policies, guidelines or rules adopted by Manugistics. All employees and officers of Manugistics Group, Inc. (including its subsidiaries) are responsible for conducting themselves in compliance with this Code of Conduct, other Company policies, and applicable laws and regulations. In addition, all members of the Board of Directors, in regard to their Manugistics duties, are responsible for conducting themselves in compliance with applicable provisions of this Code of Conduct and other Company policies, and applicable laws and regulations.

*Example of specific boundary taken from Manugistics' Code of Conduct*

You [a Manugistic employee] may not accept any discount or other preferential treatment that you know has been offered to you personally because of your position with Manugistics…

*Appendix 2. Abbreviated survey questions*

**Technological strategic uncertainties**

Q2. To what extent does top management in your organization monitor the following strategic uncertainties in order to ensure that the goals of the firm are achieved (1 = to a small extent, 7 = to a large extent):

(a) Changes in product technology that affect the relative cost/efficiency to user.
(b) New technology.

**Competitive strategic uncertainties**

Q2. To what extent does top management in your organization monitor the following strategic uncertainties in order to ensure that the goals of the firm are achieved (1 = to a small extent, 7 = to a large extent):

(d) Product introductions in adjacent industries.
(k) Market tactics of competitors.
(l) New industry entrants.

**Operational strategic uncertainties**

Q2. To what extent does top management in your organization monitor the following strategic uncertainties in order to ensure that the goals of the firm are achieved (1 = to a small extent, 7 = to a large extent):

(e) Diffusion of proprietary knowledge outside the org.
(g) Scale effects (product depth).
(h) Scope effects (product breadth).
(i) Input costs.
(j) Internal product innovation.

**Operational risk**

Q1. To what extent are the following factors critical to achieving your organization’s strategy? (1 = to a small extent, 7 = to a large extent):

(a) The safety of our operations.
(b) The quality of our operations.
(c) The reliability of our operations.
(d) The efficiency of our operations.

**Competitive risk**

Q4. To what extent do firms enter your industry easily? (reverse coded (RC)) (1 = very easy, 7 = very difficult).
Q5. To what extent is it difficult for a customer to leave your firm and begin a relationship with a new firm in your industry? (RC) (1 = very easy to change firms, 7 = very difficult to change firms).

Q7a. To what extent is your competition fragmented (i.e., fragmented is one in which many firms hold small relative market share) (1 = to a small extent, 7 = to a large extent).

Product risk

Q6. To what extent is it difficult for your firm to leave one supplier and begin a relationship with another supplier? (1 = very easy to change suppliers, 7 = very difficult to change suppliers).

Q7b. To what extent is your firm concerned about the threat of substitute products? (1 = to a small extent, 7 = to a large extent).

Beliefs system

Q10. Please indicate the extent to which the following items describe your organization (1 = not descriptive, 7 = very descriptive):

(a) Our mission statement clearly communicates the firm’s core values to our workforce.
(b) Top managers communicate core values to our workforce.
(c) Our workforce is aware of the firm’s core values.
(d) Our mission statement inspires our workforce.

Boundary system

Q11. Please rate the extent to which you agree or disagree with the following (1 = strongly disagree (SD), 7 = strongly agree (SA)):

(a) Our firm relies on a code of business conduct to define appropriate behavior for our workforce.
(b) Our code of business conduct informs our workforce about behaviors that are off-limits.
(c) Our firm has a system that communicates to our workforce risks that should be avoided.
(d) Our workforce is aware of the firm’s code of business conduct.

Diagnostic control system

Q12. Please rate the extent to which your top management team currently relies on performance measures (PM), or performance measurement system to (1 = to a small extent, 7 = to a large extent):

(a) Track progress towards goals.
(b) Monitor results.
(c) Compare outcomes to expectations.
(d) Review key measures.
(e) Enable discussion in meetings of superiors, subordinates and peers.
(f) Enable continual challenge and debate of underlying data, assumptions, and action plans.
(g) Provide a common view of the organization.
(h) Tie the organization together.
(i) Enable the organization to focus on common issues.
(j) Enable the organization to focus on critical success factors.
(k) Develop a common vocabulary in the organization.

Interactive control system

Q13. Please indicate the extent to which you agree or disagree with the following statements (1 SD, 7 = SA):

(a) Top management pays little day-to-day attention on the PM system (RC).
(b) Top management relies heavily on staff specialists in preparing and interpreting information from the PM system (RC).
(c) Operating managers are involved infrequently and on an exception basis with the PM system (RC).
(d) Top management pays day-to-day attention to the PM system.
(e) Top management interprets information from the PM system.
(f) Operating managers are frequently involved with the PM system.
Organizational learning

Q9. Please indicate the extent to which the following items describe your organization (1 = not descriptive, 7 = very descriptive):

(a) Learning is the key to improvement.
(b) Basic values include learning as a key to improvement.
(c) Once we quit learning we endanger our future.
(d) Learning is viewed as an investment, not an expense.

Management attention

Q9. Please indicate the extent to which the following items describe your organization (1 = not descriptive, 7 = very descriptive):

(e) The control systems in place allow top management to focus attention on critical issues.
(f) The control systems in place allow top management to effectively leverage their time.
(g) The control systems in place reduce the need for top managers to constantly monitor firm activities.
(h) Without our control systems the attention of top managers would be spread more thinly.

Performance

Q9. For each performance indicator, circle the number that best indicates the degree of conformance to your organization’s goals over the past year on (1 = very poor performance, 4 = met goals, 7 = very good performance):

(a) Overall organizational performance.
(b) Overall organizational profitability.
(c) Relative market share for primary products.
(d) Overall productivity of the delivery system.

References


