The Promise of Management Control Systems for Innovation and Strategic Change

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This chapter proposes a framework for analysing the different roles that formal management control systems (MCS) may play in managing various types of innovation, and, the effect that these innovations have on changes in business strategy. Traditionally, MCS have been associated with mechanistic organizations (Burns and Stalker 1961), where their purpose was to reduce variety and implement standardization as portrayed in the cybernetic model (Ashby 1960; Anthony 1965). Accordingly, they were frequently perceived as a hindrance to any innovation and change effort in the organization. For example, Ouchi (1979) used an innovation-intensive activity, an R&D department, to illustrate clan control—a control approach that rejects formal MCS and instead relies on social norms. Tushman and O'Reilly (1997: 108) summarize this view: 'With work requirements becoming more complex, uncertain, and changing, control systems cannot be static and formal. Rather, control must come in the form of social control systems that allow directed autonomy and rely on the judgment of employees informed by clarity about vision and objectives of the business.'

Recent theory and empirical studies have questioned these commonly held assumptions about the negative effect of MCS on innovation and laid the foundations for this topic to develop. They highlight instead the positive effect that MCS may have on innovation and develop alternative interpretations to the command-and-control view. Rather than a rigid mould that rejects the unexpected, MCS may be flexible and dynamic, adapting and evolving to the unpredictable needs of innovation, but stable enough to frame cognitive models, communication patterns, and actions. This new way of looking at MCS is consistent with innovation being not a random exogenous event that certain organizations happen to experience, but rather an organizational process susceptible to management that explains why certain organizations are more successful than others.

This emerging line of research identifies how MCS enhance the learning, communication, and experimentation required for innovation in strategy formation. However, it has not yet considered different types of innovation, different ways in which innovation emerges, and how innovation gets embedded in the strategy of the firm. Without a model that frames MCS within this context, the advancement of our knowledge about these systems is likely to remain unstructured, with anecdotal pieces of evidence unrelated to each other and relying on diverse concepts that are not specifically designed for this task.

The strategic management field has also made important progress to better understand the impact of innovation on strategy. Researchers in this field have argued for specific approaches that bring innovation into the formulation and implementation of strategic change. They propose new 'mental models' (Markides 1997; Christensen and Raynor 2003) for strategy formulation. These models redefine an organization's self-image (Boulding 1956) and help managers break away from static views and create new strategies for the future. These researchers also examine the implementation of innovation as a key aspect of strategic change from a strategic process perspective: how to design organizational structures that are more innovative (Chesbrough 2000), how to design supportive cultures (Tushman and O'Reilly 1997), and how innovation 'happens' (Van de Ven et al. 1999; Burgelman 2002). These advances offer a fertile ground to extend the relationship between strategic process and MCS (Langfield-Smith 1997, 2005) and recognize the importance of MCS to strategic change.

This chapter provides the background and develops a typology of MCS based on current knowledge on innovation and strategic change. It examines strategy as a process, leaving aside its content aspect (Chenhall 2005). Strategic process literature (Mintzberg 1978; Barnett and Burgelman 1996; Burgelman 2002) focuses on how strategy happens within organizations: that is, how organizational forces shape the formulation, implementation, and the interplay of these two components of strategy, sometimes through incremental improvements and at other times through significant redefinitions. As such, it offers the concepts to ground the proposed model.

The chapter is organized as follows. The first part of the chapter gives an overview of recent developments within MCS literature. These developments have moved the field beyond their traditional role as implementation tools in stable environments towards a facilitating role to formulate and implement strategy in dynamic environments. Next, the chapter develops the strategic process framework that is used in

developing the model of MCS. The final part presents the model. MCS are argued to be relevant to the implementation and the evolution in the formulation of current strategy as well as to nurturing radical innovation that fundamentally redefines the future strategy of an organization.

The promise of MCS for innovation

Our understanding of MCS has evolved very significantly over the last decade: from systems that imposed standardization and rejected innovation both at the operational and at the strategic level, to systems that support organizations in their effort to respond and adapt to changing environments. This section summarizes this evolution and describes how recent theory and evidence identifies MCS as a key aspect of innovation.

The purpose of early formulations of MCS was to guide the organization through the implementation of its explicit goals, which were decided at the strategic planning level (Anthony 1965). A further elaboration of this formulation became known as the cybernetic model (Ashby 1960), where implementation happened through mechanisms that minimized deviations from expected performance. The functioning of a thermostat, where a control mechanism intervenes when the temperature deviates from the preset standard, has been a frequent metaphor for this model. This characterization describes an important role of MCS and, as such, it is commonly integrated in current formulations—for instance as diagnostic systems (Simons 1995).

Because the purpose of the cybernetic model is to minimize deviations from pre-established objectives, it limits the use of MCS to mechanistic organizations (Burns and Stalker 1961) where standardized routines are repeatedly performed with few if any changes. MCS also reinforce the extrinsic, command and control, contractual relationships of hierarchical organizations. Therefore, their use in formulating and implementing innovation strategies—where uncertainty, experimentation, flexibility, intrinsic motivation, and freedom are paramount—is limited to minor improvements. They are purposefully designed to block innovation for the sake of efficiency and make sure that processes deliver the value they are intended to generate. Learning is anticipatory and accrues from planning ahead of time, from examining the different alternatives before the organization dives into execution, and from outlining a path. Empirical studies confirmed these predictions

(Chapman 1997; Chenhall 2005, Langfield-Smith 2005). For instance, Abernethy and Brownell (1999) report higher reliance on personnel control in R&D departments. Rockness and Shields (1988) echo these conclusions.

Given the characteristics of the cybernetic model, it is not surprising that MCS were perceived as stifling innovation and change (Ouchi 1979; Amabile et al. 1996; Tushman and O'Reilly 1997). Accordingly, researchers relied on informal processes such as culture (Tushman and O'Reilly 1997), communication patterns (Allen 1977), team composition (Dougherty 1992), and leadership (Clark and Fujimoto 1991) to manage innovation. Uniformity and predictability—the hallmarks of the cybernetic model—are at odds with the need for the rich informational environment with intense communication to create the abrasiveness (Leonard-Barton 1992) required for ideas to spark, intense communication inside the organization and with outside parties to nurture ideas (Dougherty 1992), a supportive organization that rewards experimentation (Tushman and O'Reilly 1997), and a strong leader with the authority to execute the vision (Clark and Fujimoto 1991). Walton (1985) argues for a human resource model of coordination and control based on shared values that substitute 'rules and procedures'. In support of these ideas, Damanpour's meta-analysis (1991) of empirical work on organizational determinants of innovation reveals a negative association between innovation and formalization.

However, recent empirical evidence questions the validity of this interpretation. Formalization is positively related to satisfaction in a variety of settings (Jackson and Schuler 1985; Stevens et al. 1992). Environmental uncertainty has repeatedly been associated with intense MCS (Khandwalla 1972; Chenhall and Morris 1986, 1995; Simons 1987). Directly investigating the role of accounting in highly uncertain conditions, Chapman (1998: 738) used four case studies and concluded: '[T]he results of this exploratory study strongly support the idea that accounting does have a beneficial role in highly uncertain conditions.' Howard-Grenville (2003) used an ethnographic approach in one high-technology company to document the relevance of organizational routines to confront uncertain and complex situations. Abernethy and Brownell (1997) use Simons' model to examine the use of budgets 'as a dialogue, learning, and idea creation machine' during episodes of strategic change. The learning aspect associated with budgets (Lukka 1988) and participative budgeting (Shields and Shields 1998) also breaks from the command-and-control view to suggest a different view, less rigid and more open to innovation. Ahrens and Chapman (2002, 2004) in their detailed field

study of a restaurant chain identified MCS as not only a traditional tool for standardizing strategy implementation but also an effective tool for supporting flexible adaptation to unexpected contingencies. Mouritsen's *BusinessPrint* case study (1999) also reflects the tension between an efficiency-focused control strategy relying on a 'paper' version of management control and an innovation-focused control strategy relying on a 'hands-on' version of management control. Similar observations have been made in product development studies (Zirger and Maidique 1990; Cooper 1995; McGrath 1995; Brown and Eisenhardt 1997; Nixon 1998; Davila 2000; Cardinal 2001).

Conceptual work proposes new approaches to explain these empirical observations. The capability of an organization to innovate depends on its ability to accumulate, assimilate, and exploit knowledge (Fiol 1996). This ability depends not only on its informal processes, but also on the mechanisms that support them. The concept of enabling bureaucracy (Adler and Borys 1996: 68) is designed to 'enhance the users' capabilities and to leverage their skills and intelligence' as opposed to 'a fool-proofing and deskilling rationale' typical of a cybernetic model. Organizations exploit the knowledge through flexible, transparent, user-friendly routines that facilitate learning associated with the innovation process. Formal systems need not be coercive controls that suppress variation; rather they may support the learning that derives from exploring this variation. In this way, enabling bureaucracies constantly improve organizational processes through constant interaction between the formalized process and its users; as such, they are able to bring innovation into the learning routines of the organization. Simons' interactive systems (1995) have similar learning properties. They provide the information-based infrastructure to engage organizational members in the communication pattern required to address strategic uncertainties. A key feature of these systems is that they allow top management to influence the exploration associated with innovation and strategic change.

Another line of research offers additional arguments through the concept of adaptive routines. Weick et al. (1999) describe routines as resilient because of their capacity to adapt to unexpected events. This concept portrays routines as flexible to absorb novelty rather than rigid to suppress it. They also offer organizational members a stable framework to interpret and communicate when facing unexpected events. They 'usefully constrain the direction of subsequent experiential search' (Gavetti and Levinthal 2000: 113). These authors argue that a learning model where companies jointly rely on planning and learning-by-doing

performs better in uncertain environments. Feldman and Rafaeli (2002) extend this argument to include routines as drivers of key patterns of communication among organizational members. Miner et al. (2001) describe the constant interaction between routine activities and improvization in new product development.

These studies highlight the positive role that MCS may play on innovation. They develop alternatives to the command-and-control view of the cybernetic model. Rather than being viewed as a rigid mould that rejects the unexpected, MCS are theorized as flexible and dynamic frames adapting and evolving to the unpredictable bends of innovation, but stable enough to frame cognitive models, communication patterns, and actions.

Evolving views on the process of innovation and strategic change

The organizational process associated with innovation at operational and strategic levels (both inextricably intertwined) includes the organizational forces that identify, nurture, and translate the seed of an idea into value. Rather than a random exogenous event that certain organizations happen to experience, innovation can be an organizational process susceptible to management that explains why certain organizations are more successful than others. Grounded in strategic process literature, this section identifies four processes that capture the effect of different types of innovation on strategic change: from innovations that modify the current strategy but keep the organization within its current strategy trajectory to innovations that radically redefine the future strategy of the organization. Table 1 summarizes the four types described in

Table 1   Strategic concepts for MCS

	Type of innovation defining strategic change	
	Incremental	**Radical**
Locus of innovation		
Top management formulation	Deliberate strategy	Strategic innovation
Day-to-day actions	Emergent strategy / intended strategic actions	Emergent strategy / autonomous strategic actions

the section along two dimensions. The first one is the locus of innovation—whether it happens at the top management level or throughout the organization. The second dimension is the type of innovation—whether it incrementally modifies the current strategy (incremental innovation) or it radically redefines the future strategy (radical innovation).

The initial concept of strategy described the process as linear, with formulation being followed by implementation (Andrews 1971). Changes to strategy were designed at the top of the organization as part of the formulation stage, with MCS having no role and coming in only at the implementation stage. Over time, the concept of strategy evolved to include different aspects (Hoskisson et al. 1999; Chenhall 2005). One of these aspects examines strategy as an internal evolutionary process where formulation and implementation happen simultaneously. Because both stages happen together, strategic change is not an isolated event at the beginning of the process; rather it is embedded throughout the process. Mintzberg (1978) identified strategy as having a *deliberate* component that comes from top management's formulation and implementation efforts and an *emergent* component that happens through day-to-day decisions. Innovation is shaped from the top but also as organizational members interpret and adapt the deliberate strategy to execute their task. *Realized* strategy is the strategy that ends up happening and it is a combination of deliberate and emergent strategies. In the absence of an emergent strategy, this model becomes the traditional Andrews' model; but the presence of this new component—emergent strategy—reflects the impact on strategy of innovations that happen throughout the organization to adapt to unexpected events. Within this formulation, MCS' role is still limited to implementing the deliberate strategy—much as in Andrews' two-stage model, with little if any effect on the emergent strategy. It is only with Simons' concepts (1995) of interactive and boundary systems that MCS become relevant in managing emergent strategy.

Burgelman (1983), building on Bower's resource allocation model (1970), further advanced the evolutionary perspective. He identifies innovation in strategy as not only happening within the current business model (incremental innovation) but also as being able to redefine it (radical innovation). This is an important distinction that is absent from the idea of emergent strategy.

Innovation that incrementally changes the current strategy of the organization builds upon competencies already present in the organization or those that are relatively easy to develop or acquire. Because it

moves within an existing technology trajectory or business model, the organization can readily identify its effect and it entails fewer organizational and industry changes; it also involves lower risks and the associated lower expected returns (Ettlie et al. 1984; Green et al. 1995; Damanpour 1996). In contrast, innovation that radically redefines the future strategy is high-risk and high expected return; it significantly upsets organizations—shifting the power structure (Damanpour 1991), redefining the relevance of core competencies, and requiring a redesign of the competitive strategy—and changes dramatically the industry structure.

The concept of *induced strategic actions* incorporates the idea that top management can only guide actions (Burgelman 1983). Top management does not formulate a deliberate strategy that is randomly mixed with the emergent strategy. Rather, top management knows that the deliberate strategy will never be implemented and instead of trying to force it, top management focuses on defining the guidelines that shape the emergent strategy. Induced strategic actions are 'oriented toward gaining and maintaining leadership in the company's core businesses' (Burgelman 2002: 11). They embed the objectives that top managers have defined as the strategy of the organization rather than prescribe what the organization should do. Day-to-day actions within the guidelines end up defining the realization of strategy. In this sense, these actions incorporate emergent strategy. Because they move the organization forward within the frame of the existing business model, these actions tend to be incremental refinements that push the performance frontier (Quinn 1980). Strategy evolves through incremental innovations—embedded in the evolution of objectives and in day-to-day actions. These innovations are low risk; do not upset the existing image of strategy, organizational processes, structures, and systems; and do not significantly change the parameters of industry competition. Even if incremental, these innovations are not necessarily cheap—incremental improvements in existing technologies may be expensive propositions and incremental changes to a business model can require significant investments in enabling technologies. Moreover, if these innovations are well executed they may cumulate over long enough periods of time into significant competitive advantage.

Induced strategic actions are managed through the *structural context* of the organization—which includes structures, MCS, and culture—that top managers design to coordinate the actions so that they are consistent with the business strategy (Burgelman 2002). MCS as part of the structural context, are designed to encourage employees' actions to

happen within the strategy that top management has defined. However, they do not dictate actions; rather they provide the framework that people within the organization refer to when acting. Because MCS provide the framework for action, day-to-day actions can embrace incremental innovations that end up defining the realized strategy.

Burgelman's model identifies an additional strategic process that may lead to significant redefinitions of the strategy. *Autonomous strategic actions* are outside the current strategy of the firm and they emerge throughout the organization from individuals or small groups. In contrast to an emergent strategy embedded within intended strategic actions, autonomous strategies are emergent but outside the current strategy. An example of a successful autonomous action is Intel's transition from a memory strategy to a microprocessor strategy (Burgelman 2002). The shift into microprocessors did not start at the top of the organization; rather by accepting and rejecting certain orders, developing the manufacturing technology, and designing the products, middle management shifted Intel's strategy towards microprocessors without much top management awareness. By the time top management decided to shift Intel's deliberate strategy, these products were already a substantial percentage of company sales.

Autonomous strategic actions are based on radical innovations—innovations grounded on significantly different technologies, organizational capabilities, and departing from the current strategic trajectory of the firm. Because they may happen throughout the organization and do not fit within the current strategy, the structural context does not provide adequate tools to support radical innovation. Structural context redefines actions to make them coherent with the current strategy. To do so, it reduces variation to bring about consistency. Autonomous strategies require a context that encourages variation—where variation increases the likelihood of an autonomous strategic action to happen, where selection disregards the coherence of actions with the current strategy, and where the retention process encourages the translation of action into a new business strategy. This *strategic context* 'serves to evaluate and select autonomous strategic actions outside the regular structural context' (Burgelman 2002: 14). Research on the strategic context (Noda and Bower 1996) has adopted a variation–selection–retention model of cultural evolutionary theory (Weick 1979), examining how various organizational forces affect this process.

Autonomous strategic actions happen anywhere in the organization without top management being aware of such initiatives shaping up—given the low likelihood of success, most radical innovation efforts are

invalidated before they even attract top management's attention. However, radical innovations are not limited to independent efforts at the bottom of the organization, rather top management itself can be an important innovator (Rotemberg and Saloner 2000). In the same way that top management shapes the current strategy through its definition of the deliberate strategy, it may choose to fully redefine the strategy of the organization and then it becomes the source of radical innovations. The concept of *strategic innovation* captures the idea of radical innovation happening at the top of the organization. Strategic innovation is 'a fundamental re-conceptualization of what the business is about, which in turn leads to a dramatically different way of playing the game in the industry' (Markides 2000: 19). The strategic context of the top management team—different from the strategic context that they define for the rest of the organization—leads these managers to significantly change the strategy currently being pursued. Strategic innovation captures how strategy can be radically modified through the strategy formulation process that happens at the top of organizations. Top management's role in formulation is not limited to strategic incrementalism (Quinn 1980), which has been a frequent criticism and is blamed on static mental models (Mintzberg 1994). New models of strategy formulation have been proposed to provide perspectives that contemplate opportunities for radical innovations (Hamel and Prahalad 1994; Markides 2000; Christensen and Raynor 2003; Prahalad and Ramaswamy 2004). From a strategic process perspective, the strategic context of top management becomes another critical design variable to facilitate strategic innovation, a design variable where MCS are likely to play a relevant role (Lorange et al. 1986).

Incremental changes to the current strategy that originate at the top of the organization are reflected in deliberate strategy. Radical changes championed at the top lead to strategic innovation. When the innovation happens throughout the organization, it translates into emergent strategy through induced strategic actions when it is within the current strategy and through autonomous strategic actions when it is outside the current strategy.

A model of MCS design for innovation

Empirical evidence and theory reviewed earlier in the chapter point to a relevant role of MCS in innovation processes. However, they do not yet

describe the effect of different types of innovation, different ways in which innovation emerges, and how innovation gets embedded in the strategy of the firm. Without a model that frames MCS within this context, the advancement of our knowledge about these systems is likely to remain unstructured. This section develops a typology of MCS based on current knowledge of the impact of different types of innovation (incremental and radical) and of the impact of the strategic process on strategic change: it is illustrated in Table 2.

MCS as structural context: executing deliberate strategy

The role of MCS to implement strategy has long been accepted (Anthony 1965). As part of the structural context, they support the translation of deliberate strategy into actions. Their relevance comes from their ability to execute efficiently and with speed—an important aspect when competitive advantage depends on timely delivery. They simplify the application of knowledge and leverage resources. Their strength—and, at the same time, their weakness—is their effectiveness in translating deliberate strategies into action plans, monitoring their execution, and

Table 2 A model of MCS for innovation strategy

Components of strategy	Organizational context	MCS role
Current strategy		
Deliberate strategy	Structural context	Support the execution of the deliberate strategy and translate it into value
Induced strategic actions	Structural context	Provide the framework for incremental innovations that refine the current strategy throughout the organization
Future strategy		
Autonomous strategic actions	Strategic context	Provide the context for the creation and growth of radical innovations that fundamentally redefine the strategy
Strategic innovation	Strategic context	Support the building of new competencies that radically redefine the strategy

identifying deviations for correction. In the process of enhancing efficiency, they potentially sacrifice the organization's ability to innovate.

In certain environments innovation is unwanted and MCS that focus on delivering value do not give up much by forgoing flexibility. At the extreme, they specify every action in every contingent state. These standard operating procedures are required in high-risk environments—such as day-to-day operations of power generating plants where these systems integrate vast amount of knowledge and small deviations may have devastating consequences. Chip fabrication plants and their procedures are copied to the smallest detail from one site to another because the science is so complex that even small changes in the design may have large effects on productivity. MCS deliver the consistency and reliability to avoid costly mistakes. They specify how to execute procedures, how to identify significant deviations, and how to react to them.

Detailed standard operating procedures are at one extreme of the efficiency criterion—where innovation is ruled out in favour of safety. Efficiency also plays an important part in action controls (Merchant 1985)—systems that influence organizational actors by prescribing the actions they should take. These systems limit the action space and code certain behaviours with the objective of reducing risk (and the associated experimentation) and waste. Certain boundary systems—statements that define and communicate specific risks to be avoided, mostly business conduct boundaries—also block innovation in certain directions to reduce risk exposure (Simons 1995).

MCS also assist efficiency by facilitating delegation. They are the foundation of management by exception. Supervisors delegate execution to subordinates knowing that MCS will monitor and capture any deviation from expectations. These systems leverage resources because they permit supervisors to reduce the attention that they devote to activities managed by exception. Anthony's original formulation best describes these systems: systems for strategy implementation first translate strategic plans into operational targets, then monitor whether these targets are achieved, and finally take actions to correct deviations from targets. Diagnostic systems, a 'primary tool for management-by-exception' (Simons 1995: 49), capture this concept.

Another aspect of MCS that rely on preset goals to deliver value is accountability. Goals have a motivational rather than a monitoring purpose and managers are held accountable to these goals. In contrast to standard operating procedures, here innovation is not such a block as it is disregarded. Managers can be innovative in achieving their goals, but these systems do not capture these innovations. They only create

the motivational setting for managers to deliver performance. Diagnostic systems can also play this role to 'motivate, monitor, and reward achievement of specified goals' (Simons 1995: 5). Sales targets exemplify this argument; these targets are intended to motivate salespeople to deliver regardless of how they do it (other than conduct boundaries), thus ignoring any learning that may accrue to the individual salespeople. Budgets, the most common MCS to implement strategy, also use targets against which performance is compared. They do not specify actions but focus on the financial consequences of these actions. Because these systems typically track process outcomes, they have also been defined as results controls—systems that influence organizational actors by measuring the result of their actions.

The purpose of these MCS is to transform the current strategy into a set of actions that deliver the expected value. Accordingly, these systems are valued in terms of efficiency (ability to leverage existing resources) and speed (ability to quickly execute; at the expense of innovation and experiential learning). Because they forgo the latter two aspects, they are only effective in stable, mechanistic environments where the thermostat metaphor is most robust. Relying exclusively on these systems when these rather unique environmental conditions do not hold leads to coercive systems—systems that impose work procedures when granting voice (repair capability), context (transparency), and decision rights (flexibility) to the user are more appropriate (Adler and Borys 1996). The unsuitability of MCS to innovation, discussed in previous sections, comes from limiting these systems to their role in executing the deliberate strategy. When only this role is contemplated and innovation is needed (as most environments require), MCS become coercive and dysfunctional, sacrificing the long term for the sake of short-term performance. But when the organization has MCS to guide the emergent strategy, to craft radically new strategies, and to build strategic innovations, the role discussed in this section—executing the current strategy—is crucial to translate innovation into value.

MCS as structural context: guiding induced strategic actions

MCS can be designed to capture the learning that happens as processes are periodically enacted. Most environments are dynamic, with new situations emerging that require innovative solutions outside the existing codified knowledge. Systems to execute the current strategy ignore

these solutions as noise to the process. In contrast, systems that guide induced strategic actions capture and code these experiences to improve execution. Learning here is not as much anticipatory as experiential. The interaction between day-to-day actions and deliberate strategy leads to knowledge creation and a better understanding of how to refine the current strategy; MCS can be designed to capture these incremental innovations to the current strategy.

Different interpretations of product development manuals in two companies exemplify this distinction. Both companies were in the medical devices industry. A first look at their product development process would suggest that both had good processes in place, with stages and gates, clear procedures intended to liberate development teams' attention from routine activities, and checklists to coordinate the support activities of all departments. However, when talking with the managers of the process two distinct realities emerged. In the first company, the manager saw her job as disciplining the project teams to follow the routine. She made sure that all the documents were in place, that every gate was properly documented, that every step in the process was carefully followed. Her objective was to maintain the routines—no change and strict adherence to it, which she saw as a blueprint to be closely followed. She perceived deviations from the manual as exceptions that required corrective action. Her interpretation of the manual was a system to facilitate efficient and speedy product development, not a system to capture and code new knowledge. Project managers saw her role as controlling them. In contrast, the manager in the second company saw her role very differently. She saw the routine as an evolving adaptive tool. She sat down with project teams to tailor the process to the project's needs, to make sure that the routine provided value to the teams. Not only was the routine adaptive, most importantly, the manager reviewed each finished project with the project team to update the product development manual and make it even more helpful the next time. Deviations from expectations were opportunities to bring about improvements to the current processes. The manual was alive, constantly evolving and incorporating learning. The product development manager saw MCS as not only helping execution but also capturing learning, which in the former company was lost.

In contrast to systems to deliver value where the knowledge is explicit, coded in the systems that govern the innovation process, systems for incremental innovation are intended to structure the interactions involved, support any search required, and translate the tacit

knowledge—in the heads of the people but not being systematically accessed—generated every time a process is transformed into explicit knowledge (Nonaka 1994).

Innovation is a pivotal aspect of these types of MCS. By stimulating innovation, these systems refine existing organizational processes. Quality circles, a tool within the total quality management movement (Cole 1998), provide an illustration of these systems. Teams involved in quality circles have the sole purpose of improving existing processes. The organization funds them to gain competitive advantage through constant incremental innovations to current processes. They may do so by providing the infrastructure to periodically interact with external constituencies. Product development systems offer another illustration of systems with the objective of refining current processes. Systems within product development can be designed to establish constant feedback mechanisms with potential customers through market research, product concept development, and prototyping (Hippel 2001). These formalized, information-based procedures bring knowledge inside the company to stimulate innovation and translate it into a product. Because of the nature of customer knowledge, these innovations are typically incremental. Here, MCS are part of the enabling bureaucracy, maintaining a constant conversation between the current knowledge base and the current experiences of organizational members. MCS are not imposed regardless of the particular events facing employees; rather they support work by clarifying the context, giving voice and decision rights to adapt to employee needs. Moreover, they capture the knowledge developed and code it to enhance the ability of supporting organizational tasks. This knowledge, which advances existing processes, is associated with incremental innovation.

Finally, these MCS are part of the structural context and as such they have an effect on the strategic process. As part of the structural context of the firm, they are in charge of moving the current strategy forward. Because of the dynamism of the strategic process, top management needs to stimulate the relentless advancement of the current business model through incremental innovations in technology, products, processes, and strategies. These systems purposefully engage the organization in search activities, typically bounded by the framework that strategy defines, thus leading in most cases to incremental innovation. They provide clear goals, with the freedom and resources needed for innovation, the setting to exchange information and search for new solutions, and consistent information to gauge progress over time.

Because the information captured through these MCS is associated with the current strategy of the firm, the discussion tends to stay close to the current deliberate strategy and seldom leads to radical innovations in the business model. Planning mechanisms, such as strategic planning and budgeting, inasmuch as they facilitate exchange of information that stimulates organizational members to explore alternatives previously not considered—through budgetary participation or what-if analyses, they advance the current business model and code this progress into expectations.

Interactive systems—that top managers use to involve themselves regularly and personally in the decision activities of subordinates—stimulate discussion around the strategic uncertainties of the current business model (Simons 1995). The fact that interactive systems are defined at the top management level positions them as more adequate for incremental innovation, with the objective of making the strategy more robust to these uncertainties. The discussion around information deemed critical to the current business model that is stimulated by interactive systems frames the innovation such that current strategy is consolidated rather than totally redefined. In contrast to enabling bureaucracies that embed learning at the operational level, interactive systems capture incremental innovation associated with the formulation of the current strategy of the firm.

MCS as strategic context: crafting autonomous strategic actions

Autonomous strategic actions, which radically change the future strategy of a company, are more unpredictable than incremental innovation. They may happen anywhere in the organization, at any point in time. The process from ideation to value creation is much less structured, with periods when the path forward—technology, complementary assets, business assumptions, or interface with the organization—is unclear. Because radical innovation is outside the current strategy, it is managed through the strategic context rather than the structural context.

Autonomous strategic actions can be interpreted as a variation, selection, and retention process (Weick 1979). Because of the low odds associated with radical innovation, an organization that wants to follow an aggressive innovation strategy needs to create the appropriate setting

to generate variation, put in place the context to select among very different alternatives, and design the organization to create a new business (Barnett and Burgelman 1996). An important piece of this soil is culture and, not surprisingly, it has received significant attention (Amabile et al. 1996; Tushman and O'Reilly 1997). However, the importance of culture does not imply that formal systems are unsuited and case studies suggest the need to examine them also (Van de Ven et al. 1999). For instance, organizations need to think how to organize, motivate, and evaluate people; how to allocate resources; how to monitor and when to intervene; and how to capture learning in a setting much more uncertain and alien than the current business model (Sathe 2003).

Because of their association with predictability, routines, and the structural context, MCS have received scant attention in this setting (Christiansen 2000). However, their presence has an effect on radical innovation and they can be used proactively to define the strategic context. Moreover, the fact that their characteristics in this role are almost opposite to those of traditional systems makes them an interesting research setting. They encourage experimentation, discovery, exceptions; the goals associated with these systems are broad and the path to them unknown; they support local efforts and nurture their way up the organization; they provide information for decision-making in a highly uncertain setting; and they contemplate value creation alternatives seldom used in routine processes.

Motivating organizational members to explore, experiment, and question encourages variation. Strategic intent (the gap between current resources and corporate aspirations: Hamel et al. 1994), stretch goals (Dess et al. 1998), or belief systems (Simons 1995) are potential approaches to create the motivation to experiment beyond the current strategy. The existence of stable goals that people can relate to has been found to enhance creativity (Amabile et al. 1996). However, strategy is about choosing, and strategic boundary systems (Simons 1995) impose a certain structure upon exploration and experimentation. Variation also gains from exposure to learning opportunities. Internal processes, such as interest groups, that bring together people with different training and experiences (Dougherty and Hardy 1996), and external collaborations that allow organizational members to explore alternative views may lead to the creative abrasion (Leonard-Barton 1995) needed for radical innovation. Access to resources, through slack that permits initial experimentation and funding that facilitates the growth of the project, is another

aspect of the variation stage. Finally, variation requires the existence of systems to facilitate information exchange so that promising ideas are identified and supported. The roles of 'scouts' and 'coaches' (Kanter 1989) or the concept of an 'innovation hub' (Leifer et al. 2000) where ideas receive attention are examples of solutions through formal systems to the radical innovation management.

The resource allocation process also relies on MCS. However, the descriptions available about these systems (Van de Ven et al. 1999; Christiansen 2000) suggest a very different design. The requirements are sufficiently different from those within the structural context to suggest separating both types of funding processes, with resources being committed prior to examining the investment opportunities (Christensen and Raynor 2003). Because of their higher level of technological, market, and organizational risks, and longer time horizons, radical innovations appear as less attractive than incremental innovations using criteria—usually financial criteria—applied to the latter type of innovations. Radical innovations require a funding process that relies to a larger extent upon the qualitative appreciation of different types of experts, generates commitment from various organizational players to provide specific resources, and has frequently been compared to venture capital investments (Chesbrough 2000). In addition to the resource allocation process, the selection stage—when the innovation moves from the seed stage to a business proposition—requires MCS beyond resources to monitor and intervene in the project if required, to balance the tension between having access to organizational resources and protecting the innovation from the structural context that is designed to eliminate significant deviations, and to develop the complementary assets that the innovation requires.

The retention stage—when the innovation becomes part of the corporate strategy and is integrated into the structural context of the organization—has been identified as a key stage in the process (Van de Ven et al. 1999; Leifer et al. 2000; Burgelman 2002). The outcomes available are not limited to incorporating the innovation within the current organization—as it would happen with incremental innovation. In addition, the innovation may redefine the entire organization, become a separate business unit or a separate company as a spin-off, be sold as intellectual capital to another firm that has the complementary assets, or be included in a joint venture (Chesbrough 2000). Moreover, the transition has to be carefully managed, especially if it becomes part of the existing organization, and MCS help structuring this integration through planning, incentives, and training.

MCS as strategic context: building strategic innovation

Probably because of the mystique associated with a change down in the organization being able to redefine an industry or because of the management challenge of identifying, protecting, nurturing, and helping an idea succeed against the odds, autonomous strategic actions have received the most attention (Van de Ven et al. 1999; Hamel 2000; Burgelman 2002). However, top management is often the origin of radical innovations. Sometimes, these managers are the entrepreneurs that create the organization out of their idea; in other cases, they identify the need for a radical change and formulate the strategy that will respond to this need. Strategic innovation, the process of formulating a strategy at the top management level that radically changes the current strategy, also requires a well-managed strategic context. In the same way that structural context has two dimensions relevant to MCS—a dimension that delivers the value from the current strategy and another one that stimulates incremental innovation through induced strategic actions—strategic context has two dimensions. One dimension, presented in the previous section, stimulates the creation and nurturing of radical innovations throughout the organization. The other dimension, examined in this section, supports top management in evaluating the need for radical changes and the opportunities to formulate strategies that build upon radical innovations. In both cases, a successful radical innovation will be incorporated as part of the corporate strategy and the structural context will be redesigned to implement and refine this new strategy.

MCS that support incremental innovation may be a relevant part of the strategic context. These systems examine ways in which the current strategy can be improved and, accordingly, they supply information on strategic uncertainties. Most of the time, this information leads to refinements; but careful analysis may in some cases suggest radical changes. For instance, measurement systems such as balanced scorecards rely on maps of the current strategy (Kaplan and Norton 1996); the information that they provide may be used not only as a monitoring system to track how the organization implements the strategy, but also as interactive systems (Simons 1995) that highlight opportunities for incremental improvements, and for radical changes in strategy that respond to risks that threaten the current strategy. A similar analysis is applicable to any other system used to monitor the current strategy, such as strategic planning systems, budgets, or profitability reports.

Creating a certain level of uneasiness with the status quo, through stretch goals, demanding objectives help stimulate search. Having adequate systems to capture and move these ideas up to top management, traditional systems such as budgets or strategic planning systems may fulfil this role, as may alternatives such as second-generation suggestion systems (Robinson and Stern 1997). Once the initial idea is formulated, experimentation and exploration of the idea benefits from progress reports, analysis of external developments, and open questions to the future of the innovation.

Finally, strategic innovation benefits from MCS that carefully monitor the environment (Lorange et al. 1986). From business opportunities associated with changes in regulation, trends in customer needs, potential acquisitions, opening of new markets, or new technologies, top management relies on a strategic context that will keep it informed about these developments—through not only informal networks but also MCS that extend top management information network beyond a limited set of informants. Moreover, discovery events require further analysis involving local experiments, where MCS play a significant role in leveraging the learning associated with them, and building economic models that rely on control systems such as scenario planning.

Managing learning in strategic innovation also contrasts with learning in the structural context. While incremental innovation relies to a large extent on plans that work as a reference point to gauge learning, the explicit knowledge that frames these plans is not there for radical innovation. Instead, MCS help proactively manage the learning process. The planning involved does not outline specific reference points; rather it lays out the motivation for developing new competencies, deploys the resources to developing competencies, and puts together the measurement systems to adapt the new business model as learning evolves. MCS also structure a constant back-and-forth between vision and action through periodic meetings and deadlines to review progress. In contrast to incremental innovation, where systems to deliver value compare plans with progress to make sure that the project is on track, systems to build competencies use these periodic deadlines to pace the organization and to bring together different players to exchange information and crystallize knowledge. These meetings are comparable to board meetings in start-ups. Board meetings pace the organization, force management to leave tactics and look at the strategy, and bring together people with different backgrounds to give the company a fresh new look.

Conclusions

The aim of this chapter is to highlight an important link between strategy and MCS, namely the role of these systems in bringing innovation to strategy. This idea, grounded on the strategic process literatures' concepts of structural and strategic contexts, forms the basis of the model proposed. Traditional MCS research has focused on the role they play as tools to implement the deliberate strategy of the organization. More recently, their role within the learning process associated with incremental innovations to the current strategy—where they provide the infrastructure for this learning to happen—has been researched. While the attention to these two aspects of MCS as a critical part of the structural context of organizations is granted, our current understanding of how these systems affect the strategic context is much less developed. Descriptions of radical innovations to strategy challenge the unproven assumption that MCS are unsuited for these types of innovation. However, these descriptions do not directly deal with the role of MCS and their evidence is incomplete and lacks the theoretical background required to structure this question. The model presented in the chapter proposes two different aspects of MCS within the strategic context of the firm. The first one supports radical innovation efforts throughout the organization. The second one deploys the infrastructure that top management needs to recognize potential risks to their current strategy and identifies opportunities that grant a redefinition of the strategy.

Certain MCS are more attuned to the particular demands of each of these four roles, but they should not be seen as mutually exclusive categories. For example, the execution of a particular project—governed through systems to implement deliberate strategy—may raise some questions that lead to a radical idea. Similarly, systems to refine the current strategy may uncover a potential risk that leads to strategic innovation. Moreover, strategic process and MCS, as an important part of the organizational context, are dynamic. In particular, the role of MCS will change as the strategy changes. Young strategies may require that organizations put more emphasis on systems for incremental innovation to accelerate the learning process associated with refining a new strategy. As strategies mature, the weight on these incremental learning mechanisms is expected to decay in favour of systems to implement strategy. Similarly, the emphasis on the strategic context may vary with the success of the current strategy, with the location of relevant knowledge, or with the dynamism of the environment.

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