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Rethinking enterprise flexibility: a new approach based on management control theory

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Abstract

Purpose – The purpose of this paper is to draw attention to a void in the literature on enterprise flexibility: The Management Control Systems' (MCS) role in the enterprise flexibility and stability discussion. MCS can be instrumental in securing an organization's strategic performance objectives, far beyond the mere managerial control and accounting perspectives of traditional MCS' roles.

Design/methodology/approach – This study is qualitative in nature, and presents a theoretical approach with a conceptual model to address enterprise flexibility and stability jointly; arguing that both should be part of the MCS' design and implementation with a distinct strategic outlook. Several theoretical and practical arguments are presented which reinforce this thesis.

Findings – To operate optimally, enterprises must be able to manage their limited resources in efficient and effective manner. This is especially so when dealing with uncertainty and contingencies on an ongoing basis, while following a defined strategic choice. Such choices are expected to mirror enterprise flexibility types and measures without neglecting enterprise stability requirements, linking both to strategic performance measurement indicators.

Research limitations/implications – Further work is needed to explore not only how different types of enterprise flexibility and stability measures can bring additional benefits to the firm but also how best to apply such types in accordance with business and operations strategies, organizational stability requirements and management control strategies.

Practical implications – MCS can and should take part of an organization's strategic performance measures but these are to be understood from a systemic design perspective of the enterprise system's metacontrollability, addressing flexibility and stability jointly.

Social implications – There is a need to reevaluate the role of MCS and their strategic potential. The approach presented can have valuable potential ramifications and insights for management and information sciences as well as for the enterprise management practitioners as a whole.

Originality/value – This paper provides original research on enterprise flexibility and stability analysis, covering all aspects of MC and its role on the enterprise's metacontrollability. Design and coordination of the seven basic elements which comprise MCS are analyzed, as well as how they influence one another. The paper includes two tables to illustrate the approach being proposed. Table I presents a classification of the literature reviewed in the paper while Table AI presents the choice of the theoretical lens on enterprise flexibility from other authors which contrasts with the model proposed. The role of MCS in the enterprise is also included.

Keywords Performance measurement, Stability, Flexibility, Management control systems, Metacontrollability, Strategic options

Paper type Research paper

1. Introduction

Enterprises must be able to manage and control their resources efficiently and effectively in order to deal with uncertainty and complexity, following certain strategic options and guidelines. Revealingly, management control (MC) was defined by Anthony (1965) as "the process by which managers ensure that resources are obtained and used effectively and efficiently in the accomplishment of the organization's

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objectives." But to accomplish this, enterprises need to exercise an adequate balance between flexibility and stability that mirrors their strategic options and management control systems (MCS) – given their strategic role in the enterprise – should be instrumental in achieving this goal. Notwithstanding the latter, organizations need to adequately manage tensions emerging from forces operating within them to strike a balance between the two. Such balance is to guarantee, on the one hand, the effectiveness and stability of operations under changing conditions and circumstances, and the achievement of the enterprise's strategic objectives on the other. Thus MCS are the drivers of the successful incorporation and management of enterprise flexibility and stability measures in the enterprise.

Unlike most of the literature, this paper addresses both flexibility and stability jointly, from a systemic viewpoint, and then presents a MCS approach to manage them appropriately while, at the same time, securing the enterprise strategic options. Therefore, to operate effectively, enterprises must be able to adequately plan, coordinate, utilize and control their limited physical and managerial resources carefully, dealing with uncertainty and complexity at different levels of the organization on a regular basis, following certain strategic options and objectives (Córdova and Yanine, 2013; Arafa and ElMaraghy, 2012; Kumar *et al.*, 2006). At the same time, they ought to be flexible enough to be able to deal with various forms of uncertainty – perturbations and contingencies generated within and outside of the system (Dreyer and Grønhaug, 2004; Dreyer, 2006; Koh *et al.*, 2006). Perturbations and contingencies affect the enterprise system differently and must be accounted for by MC throughout the enterprise, given their key role (Langfield-Smith, 1997).

While MCS have been explored in the past by the literature with ample research on the relationship between MCS and business strategy (Langfield-Smith, 1997), and how MCS should be tailored explicitly to support the business strategy in order to achieve sustainable competitive advantage and superior performance (Tessier and Otley, 2012; Gond *et al.* 2012; Dent, 1990; Samson *et al.*, 1991; Simons, 1987, 1994, 1995) the linkage with enterprise flexibility and stability has been absent. Authors have analyzed various aspects of enterprise MC, such as strategic alignment, new product development strategies and process planning (Abernethy and Lillis, 1995; Ahrens and Chapman, 2004; Henri, 2006; Jørgensen and Messner, 2009; Anthony and Govindarajan, 2007; Tsamenyi and Cullen, 2010; Tessier and Otley, 2012) but these aspects have not been explicitly associated with enterprise flexibility nor have they been linked to enterprise stability. Also strategic alignment, performance management and enterprise resource planning have been studied in relation to flexibility, as well as the link between manufacturing flexibility and business strategy (Taskin, 2011; Chang *et al.*, 2003).

By their very nature MCS are called to acknowledge the ongoing tensions between flexibility and stability requirements operating within the enterprise, and then deal with them in a way that best reflects the company's strategic options. MCS are those which gather and use information to evaluate the performance of a variety of business processes and the use of organizational resources like human, technological, physical, financial resources and also the organization as a whole, considering socioeconomic and strategic aspects of MC (Verstegen, 2011). Thus MCS are designed and implemented to aid management in steering an organization toward its strategic objectives (Chenhall, 2003). MCs are used by managers to implement desired strategies, yet strategies get implemented not only through MCs, but through various other resources, all of which impact flexibility and stability albeit differently. Resources such

as organizational structure, human resources, culture and technology, among others, are all impacted by flexibility and stability measures. Hence it is fair to say that MCS influence the behavior of organizational resources management in implementing organizational strategies (Chenhall, 2003). Hence MCS are to be designed to deal with the tensions between the need for more flexibility on the one hand and the need for greater stability and control on the other hand, while still, finding the right balance between the two. Stability is just as important as flexibility and it is false pretense to assume that enterprise's stability is the normal state of affairs occurring opposite to or in the absence of flexibility. Likewise it is also false to believe that in the absence of change there will automatically be stability in the system. The "business as usual" state of affairs may disguise the reality on several fronts.

MC actions can determine which type, when, where and how much flexibility is applied but without forsaking stability. Moreover, such MC actions ought to be linked to specific strategic needs and objectives that reflect the strategic options of the enterprise (Córdova and Yanine, 2013). Thus MC actions seek to guarantee – on the one hand – the effectiveness and stability of operations, characteristics both of a robust system, and on the other hand, the achievement of the enterprise's strategic objectives and performance benchmarks. In order to visualize this, one can think of the enterprise as a dynamically complex open system in constant need of MC. Yet such a system must address both:

- the need to be flexible and malleable toward change and adjust itself in different orders of magnitude and frequency upon requirements being impressed upon it; and
- the need to be robust and steadfast in its responses so as to show its resiliency, and effectiveness even when it is called upon to act in such a way as to push itself to the limits.

This paper builds upon a previous paper (Córdova and Yanine, 2013) on the subject, and employs a MC theory approach to enterprise flexibility, viewing both flexibility and stability as desired properties of the enterprise system, realizing that both are equally important and necessary for the enterprise to be a viable system (Checkland, 1999). Both determine the viability of the organization and its capacity to thrive as it will later be seen in the paper. Thus both are to be part of the organization's strategic framework at the operational, business and corporate levels, respectively. The paper is organized as follows: Section 1 reviews the literature on Enterprise Flexibility and elaborates on flexibility and stability as key attributes of the enterprise system, and how they are linked to MC actions, strategies and performance measurement. Section 2 explores systems controllability and examines ways to incorporate flexibility in the enterprise without overlooking enterprise controllability, addressing the need to secure the firm's strategic framework by means of implementing specific flexibility metrics (Córdova and Yanine, 2013; Golden and Powell, 2000). Such metrics are represented by specific enterprise performance measures linked to strategic options, but without neglecting enterprise stability and control (Córdova and Yanine, 2013; Wilkinson, 2006; Hedman and Borell, 2001). The paper ends with conclusions and recommendations for future work on the subject.

1.1 Review of the literature

Flexibility and stability are both properties of the enterprise system's metacontrollability (Córdova and Yanine, 2013). Flexibility is first and foremost the

capacity of an enterprise to respond to change. It is also the property of an enterprise to be malleable, resilient and capable of adjusting itself (Sheffi, 2005) to diverse scenarios and conditions or environments that lie outside of the regular set of conditions for which it was specifically designed. The need for flexibility presents itself when the enterprise is faced with requirements which are exerted upon it demanding actions that go beyond the scope of its regular operations. The flexibility of an enterprise may also be viewed as the capacity of such a system to be successfully managed or controlled in order to meet its objectives.

Stability, on the other hand, is closely tied with control; and is the quality or attribute of an enterprise to be firm and steadfast in maintaining regularity of operations, even upon extreme conditions. It may also be viewed as the quality or property of an organization to preserve its equilibrium when undisturbed (or only slightly disturbed) but to be able to pass to a more stable equilibrium when sufficiently disturbed. In sum one may say that stability is the capacity of a system to maintain its course in spite of forces acting upon it whichever their origin may be (Córdova and Yanine, 2013; Young *et al.*, 2012; Wilkinson, 2006; Hedman and Borell, 2001). Both properties are essential and need to be accounted for and carefully balanced whenever MC actions are taken. Therefore enterprise management is called upon to establish the right balance between stability and flexibility in the enterprise MCS, as both are desired properties or qualities of the system which do not oppose one another but rather complement each other. Indeed both properties must be engineered in the enterprise as part of its metacontrollability just as core capabilities are, not added onto like it is often done through accretions (Córdova and Yanine, 2013).

Dreyer and Grønhaug (2004) point out, based on the economic resource view of strategy, that different, balanced forms of flexibility are required for firms to cope with uncertainty in turbulent environments. Such forms can encompass several topics like modularity, knowledge management, product and organization design, production volume, product variety, enterprise core competences and capabilities, uncertainty and flexibility across the value-chain, and customer service among others (Sanchez and Mahoney, 1996; Salvador *et al.*, 2002; Schilling, 2000; Baldwin and Clark, 2003; Sawhney, 2006; Zhang *et al.*, 2003; Koste *et al.*, 2004; Kara and Kayis, 2004; Gong, 2008; Gong and Hu, 2008; Ming, 2009). Flexibility measures that can help organizations to deal with environmental factors and control issues have also been explored by Volberda and others (Ruiner *et al.*, 2013; Wilkens *et al.*, 2013; Sopelana *et al.*, 2010; Pagell and Krause, 2004; Johnson *et al.*, 2003; Volberda, 1997, 1998; De Leeuw and Volberda, 1996). For example De Leeuw and Volberda (1996) develop a systematic and multidimensional picture of flexibility on the basis of views taken from a systems theory of control. The general idea behind this particular approach is that flexibility can be analyzed as a characteristic of some dual and relative control relation between the organization and its environment, which fosters organizational independence (De Leeuw and Volberda, 1996).

The term metacontrollability comes from meta-control (Green and Welsh, 1988) which is, as the term signals, the highest level of control in a given organizational system and it is embodied in MCS. Such control level must ensure the controllability of the organization as a whole, accommodating flexibility and stability measures appropriately. The metacontrollability of the enterprise lies in the hands of top management which is responsible for designing and implementing the right enterprise MCS to achieve its strategic goals (Córdova and Yanine, 2013). In fact Volberda (1997, 1998) put it quite well when addressing the need of the modern enterprise to be able to

respond to hyper competition quickly and effectively, in a timely manner, because of the myriad of changes in the environment. Volberda (1997) was even more explicit when it comes to management's role, pointing out that "flexibility derives from the repertoire of managerial capabilities and the responsiveness of the organization". Volberda's arguments are well accepted and have been widely diffused in the literature of enterprise flexibility. Moreover, they rest upon a crucial fact that is at the core of the model being proposed here: the realization that, based on a control theory approach to enterprise flexibility (Córdova and Yanine, 2013), "organizational flexibility is inherently paradoxical and requires a constructive friction between change and preservation" (Volberda, 1997). Hence there must be an adequate balance, a careful equilibrium between flexibility and stability in the enterprise MCS in order to achieve the company objectives set forth by the administration.

Management also defines the opportunity and extent to which such resources are utilized, whether these may be managerial, infrastructure, organizational, operational, cultural, technological or strategic (Chenhall, 2003). Management's role is, among others, to monitor and fulfill the organization's strategic needs and objectives and to assess MCS' functional requirements, providing the means necessary to meet such requirements. Hence the metacontrollability of the enterprise, being a dynamic and complex system, depends on its management to adequately address flexibility and stability requirements at every level of the organization, as part of MCS strategies. MCS are therefore responsible for coordinating, amalgamating and effectively leveraging the multiplicity of control actions taking place in the organization.

Several authors have used organizational, hierarchical, temporal or objective criteria to build flexibility taxonomies (De Toni and Tonchia, 1998; Narasimhan and Das, 1999, 2000), but without addressing the flexibility issue in and of itself, as a property which must be built into the enterprise system. Likewise, few studies have focused on the links between flexibility and operations improvements under a certain strategic framework. An exception to this is the rigid flexibility model which appears to address both flexibility and stability jointly, providing one of the most consistent answers to producers squeezed by market volatility (Collins and Schmenner, 1993; Collins *et al.* 1998; da Silveira, 2006). Other authors have studied the linkage between flexibility, discipline, simplicity, quality management and performance measurement in manufacturing (Anand and Ward, 2004; da Silveira, 2006; Khanna, 2009). It has been correctly asserted that flexibility is a multi-dimensional concept (Gerwin, 1993; Upton, 1994), and like agility and simplicity, it is also a property of enterprises that can be interpreted and measured differently (Upton, 1995) at different levels of an organization.

Flexibility holds different meanings at different levels of the organization's hierarchy, depending on the means by which it is to be achieved (Cheng *et al.*, 1997). Since enterprises are essentially open, complex sociotechnical systems constantly being faced with various forms of uncertainty, instability and constraints, they require stability and clarity of purpose to be sustainable as well as flexible. This can be made possible with an adequate degree of flexibility in its various forms at every level to operate in a rational manner, as it has been pointed out by Slack (1997). Change and uncertainty in its various forms are familiar ghosts to organizations of all types that require the ability to cope with the unexpected, both within and outside of the enterprise. Yet they are complex concepts, not always straightforwardly understood and linked to flexibility measures, as the different approaches in literature show (De Toni and Tonchia, 1998; Swamidass and Newell, 1987; Slack, 1997; Ramasesh and Jayakumar, 1991). The main issue appears to be whether or not the measurement of

uncertainty is adequate for either perceived or objective approaches to deal with said uncertainty (Swamidass and Newell, 1987).

The problem of change and uncertainty affecting organizations and the way to deal with them from a control systems theory stand point have also been analyzed extensively by such authors as Chris Argyris (1973, 1985), Carlsson (1989) and by Toffler and Shapiro (1985) in The Adaptive Corporation and Senge and Sterman (1992). All these authors correctly assert, in one way or another, that organizations need to be designed (Volberda, 1997, 1998) to deal with internal and external factors that cause uncertainty, perturbations and chaos. More recently the effort to link various forms of flexibility to the enterprise's strategies and their subsequent implementation was also analyzed (Gebauer and Lee, 2008). Environmental uncertainty, both internal and external, has been argued to be one of the main reasons for a firm to seek flexibility (Gerwin, 1993; Slack, 1997), especially in manufacturing firms (Swamidass and Newell, 1987; Swamidass, 1988).

Under changing circumstances and conditions, organizations of every nature must aim for MCS to be aligned with strategic flexibility forms like those pointed out by Eisenhardt and Martin (2000), which are to be configured, and reconfigured in line with their strategic options, so as to implement strategies to become competitive (Bowman and Hurry, 1993; Courtney *et al.*, 1997; Dickson *et al.*, 2001; Evans, 1991; Moorman and Miner, 1998, cited in Kapasuwan *et al.*, 2007). Strategic flexibility is a set of capabilities built into the resources of the enterprise through a systematic mechanism of interactions and utilization of resources (Hitt *et al.*, 2007) which determine their success or failure. Indeed Hamel and Valikangass (2003) had it right when they pointed out that companies should encompass the capacity to continuously anticipate environmental changes and quickly adapt their actions before such changes show up at their front door and jeopardize their overall performance. Table I shows the summary of the literature reviewed in the paper.

1.2 Establishing the right balance between flexibility and stability

Organizations no doubt need stability as much as they need flexibility in order to operate, because if everything about the organization were to be always changing or change without bound, the organization would be crippled by chaos and disarray. Hence some aspects of organizations must change in a controlled fashion when it is necessary to do so, making it possible for organizations to survive, and even exploit the benefits of changes occurring within the organization itself and in its environment. One can try to understand how to establish the right balance between enterprise flexibility and stability by looking at the enterprise as a control system (Volberda, 1997, 1998). Thus depending on the need or objective being presented upon the system, the enterprise alternates between flexibility and stability phases at all times, in different measures and extent, depending on the situation being faced. This is the ultimate proof of the enterprise flexibility's effectiveness (Córdova and Yanine, 2013).

Likewise, the importance of management flexibility for organizational effectiveness may not be underscored. The enterprise cannot cope effectively with uncertainty and change unless it develops an appropriate set of flexibilities and stability types and metrics which mirror a specific set of strategic options (Córdova and Yanine, 2013). Such set of flexibilities as well as stability measures should therefore be designed in the organization's MCS, realizing that there are regularly a myriad of situations and conditions affecting the enterprise system and these are associated with different levels of uncertainty and variations. These call for different types of flexibility and stability

Table I. Classification of the literature review: a summary of the topics covered in the literature with their respective authors citations at the bottom

The need to be flexible enough to be able to deal with various forms of uncertainty – perturbations and contingencies generated within and outside of the enterprise system and its complexity thereafter following certain strategic options and objectives	While management control systems (MCS) have been explored in the past by the literature with ample research on the relationship between MCS and business strategy and how MCS should be tailored explicitly to support the business strategy in order to achieve sustainable competitive advantage and superior performance, the linkage with enterprise flexibility and stability has been absent	The need to consider socioeconomic and strategic aspects of MCS to aid management in steering an organization toward its strategic objectives	Flexibility and stability as desired properties of the enterprise, realizing that both are equally important and necessary for the enterprise to be a viable system	The need to secure the firm's strategic framework by means of implementing specific flexibility metrics, which are represented by specific enterprise performance measures. Such measures ought to be linked to strategic options, but without neglecting enterprise stability and control requirements
Córdova and Yanine (2013), Arafa and ElMaraghy (2012), Kumar *et al.* (2006), Young *et al.* (2012), Wilkinson (2006), Hedman and Borell (2001), Dreyer and Grønhaug (2004), Dreyer (2006), Koh *et al.* (2006), Sanchez and Mahoney (1996), Salvador *et al.* (2002), Schilling (2000), Baldwin and Clark (2003), Sawhney (2006), Zhang *et al.* (2003), Koste *et al.* (2004), Kara and Kayis (2004), Gong (2008), Gong and Hu (2008), Ming (2009), De Toni and Tonchia (1998), Swamidass and Newell (1987), Slack (1997), Cheng *et al.* (1997)	Langfield-Smith (1997), Tessier and Otley (2012), Gond *et al.* (2012), Ahrens and Chapman (2004), Henri (2006), Jørgensen and Messner (2009), Anthony and Govindarajan (2007), Tsamenyi and Cullen (2010), Verstegen (2011), Chenhall (2003), Dent (1990), Samson *et al.* (1991), Simons (1987, 1994, 1995), Abernethy and Lillis (1995), Anthony (1965)	Verstegen (2011), Chenhall (2003)	Córdova and Yanine (2013), Checkland (1999)	Córdova and Yanine (2013), Young *et al.* (2012), Golden and Powell (2000), Wilkinson (2006), Hedman and Borell (2001), Gebauer and Lee (2008), Eisenhardt and Martin (2000), Bowman and Hurry (1993), Courtney *et al.* (1997), Dickson *et al.* (2001), Evans (1991), Moorman and Miner (1998) cited in Kapasuwan *et al.* (2007), Hitt *et al.* (2007), Taskin (2011), Chang *et al.* (2003)

(*continued*)

The meta-control as the term signals, is the highest level of control in a given organizational system and it is embodied in the enterprise's management control systems	Flexibility is also the property of an enterprise to be malleable, resilient and capable of adjusting itself to diverse scenarios and conditions to achieve the enterprise's strategic goals	Several authors have used organizational, hierarchical, temporal, or objective criteria to build flexibility taxonomies	There are forms of stability and control being preserved by certain managerial approaches, like the rigid flexibility model focused on simplicity and discipline, or Lean Manufacturing (Womack *et al.*, 1990) for example. Interestingly such managerial approaches appear to address both flexibility and stability jointly, providing one of the most consistent answers to producers squeezed by market volatility	Flexibility holds different meanings at different levels of the organization's hierarchy, depending on the means by which it is to be achieved. It can take different forms at every level of the enterprise to operate in a rational manner. Environmental uncertainty, both internal and external, has been argued to be one of the main reasons for a firm to seek flexibility, especially in manufacturing firms.
Green and Welsh (1988), Córdova and Yanine (2013)	Córdova and Yanine (2013), Volberda (1997, 1998), Sheffi (2005), De Leeuw and Volberda (1996)	De Toni and Tonchia (1998), Narasimhan and Das (1999, 2000)	Collins and Schmenner (1993), Collins *et al.* (1998), Womack *et al.* (1990), Anand and Ward (2004), da Silveira (2006), and Khanna (2009)	Cheng *et al.* (1997), Slack (1997), Gerwin (1993), Swamidass and Newell (1987), Swamidass (1988)
The problem of change and uncertainty affecting organizations and the way to deal with them from a control systems theory standpoint have also been analyzed extensively by such authors	Companies should encompass the capacity to continuously anticipate environmental changes and quickly adapt their actions before such changes show up at their front door and jeopardize their overall performance	Flexibility is generally seen by some authors as a situation specific in nature and suited for a particular organizational design of the enterprise. De Leeuw and Volberda (1996) for example, present systematic and multidimensional picture of flexibility on the basis of views taken from the systems theory of control. The general	Correa (1994), when referring to manufacturing enterprises, requests that a clear link be established between desired or required levels of system flexibility, and the resources necessary to achieve them	Companies, especially SMEs have increasingly been concentrating on strategic flexibility options as a means to achieve better performance and acquire new forms of competitive advantage. Thus enterprise strategy should influence flexibility requirements and hence the choice of operations technology

(*continued*)

Table I.

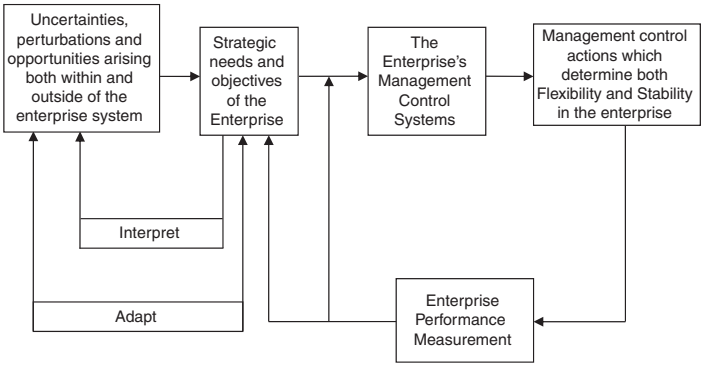
Table I.

		idea is that flexibility can be analyzed as a characteristic of some dual and relative control relation between the organization and its environment, which fosters organizational independence. Flexibility is also a function of management's control capability as well as the controllability of the organization		
Chris Argyris (1973, 1985), Carlsson (1989), Toffler and Shapiro (1985) in The Adaptive Corporation and Senge and Sterman (1992)	Hamel and Valikangass (2003)	Volberda (1997, 1998), De Leeuw and Volberda (1996), Gupta and Buzacott (1996)	Correa (1994)	Upton (1995), Asikhia (2011), Gerwin and Kolodny (1992)
Some authors like Shuiabi *et al.* (2005) believe that the way to increase the level of enterprise flexibility is to increase entropy. They seek to analyze entropy and entropy generating factors as determinants of enterprise flexibility, following the logic of entropy maximization as a way to foster and generate higher degrees of flexibility in operations (Córdova and Yanine, 2013)			The need to reconcile change and stability in the organization. Thus management must balance and adequately manage stability and change as simultaneously occurring experiences in the life of organizations	
Kumar (1987), Piplani and Wetjens (2007), Shuiabi *et al.* (2005)			Leana and Barry (2000), Melin (2010)	

measures under different conditions in the enterprise. Flexibility is generally seen by some authors as a situation specific in nature (Gupta and Buzacott, 1996) and suited to a particular organizational design (Volberda, 1997, 1998) of the enterprise. Gerwin (1993) advocates the need for further research to be aimed at an applied orientation, and the need to link flexibility measures (in terms of the methods and technology being used) to the benefits they carry in different situations.

Likewise Correa (1994), when referring to manufacturing enterprises, requests that a clear link be established between desired or required levels of system flexibility and the resources necessary to achieve them. Figure 1 illustrates the new approach presented whereby flexibility may be achieved by means of specific MC actions of the enterprise, and a double-loop feedback control system represented by a process performance measurement system linked directly to strategic needs and objectives and to the control system itself. It is important to note here that flexibility must be viewed as a necessity of the organization to survive in the face of uncertainty and change. It is true also that stability or continuity is a permanent necessity of the enterprise system upon reaching steady state. Therefore flexibility is not a goal in itself but a means to an end. It is by being flexible and agile, especially when conditions affecting the enterprise merit these attributes, that the enterprise can be able to achieve its strategic needs and objectives and not the other way around. Thus flexibility measurement must always be tied to performance measurement and not otherwise. Not surprisingly in the past 15 years companies, especially SMEs as discussed in Asikhia (2011), have increasingly been concentrating on strategic flexibility options as a means to achieve better performance and acquire new forms of competitive advantage (Upton, 1995). Strategy should influence flexibility requirements and hence the choice of operations technology (Gerwin and Kolodny, 1992). Specific needs and objectives must be linked to specific strategic options of the enterprise. In order to illustrate the approach proposed, a conceptual framework of flexibility originally proposed by Gerwin (1993) is adapted to reflect the MCS perspective to suit the new model. This presents an interesting feedback loop approach that gives support to the systemic view of flexibility and stability analysis employed in this paper, modifying Gerwin's scheme in order to show management's role and to elaborate on the MCS' approach to enterprise flexibility.

However, notwithstanding the importance of MCS and their role in the controllability of the organization and its direct impact on enterprise flexibility and



Source: Own elaboration based on adaptation from Gerwin (1993)

Figure 1.
MC's actions driving the enterprise's metacontrollability requirements tied to strategic needs and objectives

stability, little attention if any has been given to them regarding enterprise flexibility and stability analysis. Likewise little is said in the literature about the sources of variation in the conditions prevailing in the enterprise system and its subsystems (emergent changes of all sorts facing the enterprise) and the uncertainty emanated from such variation. This can be better analyzed and managed from a MC theory perspective. Both flexibility and stability ought to be engineered in the organization and structure of the enterprise, as core capabilities of the system itself forming a coherent whole. Hence if a particular MCS design were to allow the enterprise to transit from a stable and controlled to a more flexible mode and vice versa under certain conditions or circumstances, one must make sure that MCS are designed and engineered in a way that satisfies these requirements.

2. Enterprise system's metacontrollability: engineering a proper use of enterprise flexibility

While flexibility measures may be well prescribed for treating unexpected variations from outside factors which threaten the system with disorder and disarray, the same prescription may not be used just the same and to the same extent for unexpected variations and their derived uncertainties, and then expect similar results (Córdova and Yanine, 2013). For instance, some variations and their derived uncertainties may be dealt with effectively in terms of increasing stocks of raw materials, for example, when there is uncertainty about the availability of the required types and quantities of materials (De Toni and Tonchia, 1998; Swamidass and Newell, 1987; Slack, 1997). This may be due to external conditions such as unreliable suppliers or shipment not readily available, or, on the other hand, an enterprise wanting to produce for stock of finished products when facing the uncertainty of how much the demand for a certain product may vary over a certain period, risking expected sales figures.

However, in the case of perturbations arising within the system, such as an unexpected machine break-down, information system's downtime or the lack of personnel are just a few examples of adverse situations. These factors, which are but a small part of a long list of conditions, ought to be accounted for in the organization's MCS too. MCS are built into the very fabric of the enterprise system, and depend on the right managerial decisions and actions to fend off such perturbations effectively. Hence while perturbations and uncertainty coming from outside forces may be more readily understood, as well as the flexibilities measures that are required to deal with them, the conditions which originate perturbations and uncertainty within the system may not. This is because such factors depend on the way the enterprise system is structured and organized, and also on the resources built into the system, all of which should be accounted for by MCS.

2.1 Linking enterprise flexibility to MC actions and strategic performance measurements

Enterprises must decide, upon uncertainties and unpredictability arising both from outside and from within the systems, when and how to plan and when to act, how to detect and recover from errors, how to handle conflicting goals and decisions, etc. In short, MC at every organizational level must effectively plan, coordinate, and utilize limited resources in an effort to optimize the systems' throughput as a result of transformation of their given inputs and outputs at any given time. As the tasks and decision-making environments become increasingly complex and uncertain, explicit

constraints and boundaries are needed in order to impose a more adequate control structure for the planning, perception and action of the enterprise system. This is done to improve system performance, ensuring that their decision-making options are mapped to specific strategic options and not the other way around. This is essential in making sure that the enterprise system and subsystems will achieve their goals while strategic options remain secured.

Some authors (Kumar, 1987; Piplani and Wetjens, 2007; Shuiabi *et al.*, 2005) believe that the way to increase the level flexibility in the enterprise is simply to increase entropy. They seek to analyze entropy and entropy generating factors as determinants of enterprise flexibility, following the logic of entropy maximization as a way to foster and generate higher degrees of flexibility in operations (Córdova and Yanine, 2013). But a systemic view of the enterprise system will lead to the realization that increasing entropy levels in the organization is not necessarily a good thing (Córdova and Yanine, 2013). The MCS approach to enterprise flexibility and controllability presented in this paper is quite different. It asserts is that flexibility is not directly linked to entropy and therefore entropy analysis and much less entropy maximization is not the right course as a means to maximize flexibility. On the contrary, too much entropy might be detrimental to the purpose of generating higher degrees of flexibility. Entropy is a measure of disorder in any system and the enterprise is no exception, since the more information (in all of its forms) there is in the system, the more entropy there is (Córdova and Yanine, 2013).

It is however unclear how systems can maintain their balance between flexibility and stability requirements and at the same time keep their strategic coherence as tasks and environments increase in diversity. The problem is that, as companies grow bigger and more versatile, complexity increases and so does entropy, wherein complex interactions among decisions and actions within the system increase as well, to the point where it becomes difficult to predict the system's overall performance tied with flexibility-linked effectiveness. Worse yet it becomes much more difficult to secure the link between this effectiveness and the enterprise's strategic options. Therefore, one way in which management can try to limit the amount of flexibility in the enterprise to a level and scope that is adequate and manageable based on the system's requirements and objectives, is to limit the options available in operations (too many options and too much leeway in operations is just as bad as not having options at all), thus preventing it from spinning out of control. This may be achieved by adding top-down constraints upon the system's available actions and allow it to take advantage of regularities in its domain to coordinate actions in a more recursive fashion, thus reducing entropy and complexity at different levels of the system. This will help prevent or at least attenuate these adverse conditions from happening. Examples of this approach can be found in Lean Manufacturing (Womack *et al.*, 1990), and the Rigid Flexibility Model (Collins *et al.*, 1998; Collins and Schmenner, 1993; da Silveira, 2006), both of which are examples of a controlled approach to manufacturing enterprise flexibility.

The approach advocated in this paper, which stems from systems thinking, control theory and cybernetics, asserts that MCS play a crucial role not yet fully understood in the context of enterprise flexibility. It is basically one in which strategic options are closely linked to enterprise performance measurements (Córdova and Yanine, 2013), just like Lean Manufacturing (Womack *et al.*, 1990), the Rigid Flexibility Model (Collins *et al.*, 1998), and other similar ideas regarding manufacturing flexibility (Collins and Schmenner, 1993; Anand and Ward, 2004; da Silveira, 2006; Khanna, 2009). Such strategic performance benchmarks must be mirrored by the company's

operational and business strategic options by means of adequate and opportune MC actions of the system.

System reliability and effectiveness is increased by advocating an operations model whose pillars are adaptability, simplicity and agility, maintaining specific operational constraints and system's boundaries to secure its quick, agile and effective response. This may be done while incrementally layering on additional options in operations behavior to handle exceptions and extreme, unbounded situations. Thus, the separation of regular or nominal and exceptional behaviors in the organization increases system understandability and controllability by isolating different concerns: the enterprise MCS' behavior during normal, regular operations and during exceptional conditions (Córdova and Yanine, 2013). At both instances system efficiencies and responsiveness are maximized, while strategies for handling exceptions (the unexpected or contingencies) can be developed as needed. Furthermore, complex interactions are minimized by constraining the applicability of behaviors to specific situations, so that only manageable, predictable subsets will be active at any one time.

2.2 The metacontrollability of the enterprise: tying the knot among key elements of the enterprise system

The metacontrollability of the enterprise is in the hands of upper management, and is responsible for defining flexibility type, flexibility metrics, process performance measures and benchmarks and the strategic objectives they serve. For this, management has to decide on how strategic flexibility and stability requirements are designed and implemented at every level in the organizations through the enterprise's MCS; however, they must seek to make the above possible without overlooking their implications in the organization's controllability at every level (Córdova and Yanine, 2013), something that also impacts the stability and continuity of the enterprise. In light of the above, MCS are to be comprised of seven basic elements which must be strategically interconnected and operationalized in order to correctly determine the enterprise requirements for flexibility (or stability) at any given time. This will in turn determine what control action is needed to generate such flexibility or stability measure. Figure 2 shows the seven basic elements which determine the controllability of the enterprise system and their interrelations. These are:

(1) enterprise management;

(2) strategic goals and company policies at all levels;

(3) process performance measurement systems;

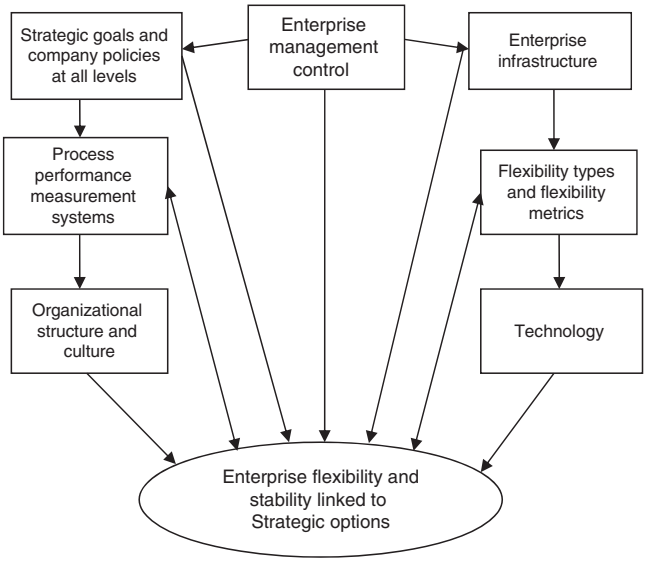
(4) flexibility types and flexibility metrics;

(5) organizational structure and culture;

(6) enterprise infrastructure; and

(7) technology.

The above fundamental elements comprise the MCS of every organization, particularly industrial enterprises and drive performance by responding to the metacontrollability (flexibility and stability) requirements of the enterprise system. How these elements are assembled and coordinated will ultimately determine the type of organization, its control capability and operational characteristics including strategic flexibility types. However differently, they all impact both: enterprise flexibility and stability



Source: Own elaboration

Figure 2.
The 7 elements of the MCS' model, their interrelationships and impact on enterprise's flexibility and stability

capabilities and determine the enterprise system's viability in terms of its capacity to adequately manage both in a balanced way. Most importantly, it will determine its capacity to effectively manage and satisfy the enterprise system's needs and objectives for flexibility and stability. The most important of all seven is of course the enterprise management, as it acts as the main articulator, upon whose shoulders the metacontrollability of the entire enterprise system rests. Hence, at the heart of the system, there is always management which is responsible for the right and timely interplay between flexibility and stability at every level and in every unit of the company.

The degree and extent to which flexibility and stability are to be used in the enterprise system, as well as the lack of either one at any one time, depends on enterprise management capacity and skills to design and articulate all these elements correctly at every level, to sustain the enterprise control system capabilities. The supra control of the enterprise – the metacontrollability of the organization – will depend on management's capacity to act upon the other elements in an effective and timely manner. It will also depend on how well these are strategically aligned and coordinated. This is a key measure of strategic coherence, where ach one of these elements has to be a logical part of the whole as in any well designed complex system. Hence the effectiveness of the enterprise as a whole relies on its management.

The approach presented here is systemic in nature and is supported by the authors' vision of how different flexibility and stability types and measures derived from each one of the seven basic elements (Figure 2) can impact the metacontrollability of the organization as a whole. Pointed arrows indicate one way or two-way communication and relation, as well as how certain elements determine or influence the design and the management options of other systems. The key issue being raised here, which is not addressed by the rest of the literature, is that both properties: flexibility and stability have an impact on the enterprise metacontrollability which can be determined by MCS

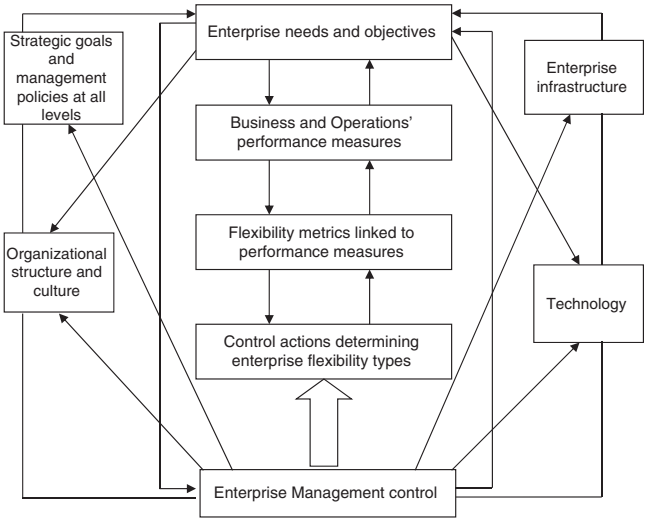
design. Thus the way we design and implement MCS impacts both properties and this ought to be linked to strategic options. Hence they must be jointly addressed and carefully engineered in MCS' design for strategic purposes.

2.3 Discussion

Figure 3 illustrates the metacontrollability of the enterprise system with flexibility metrics linked to performance measurement to ensure strategic options are served. The metacontrollability is determined by management and driven by MC actions upon the rest of the enterprise control system's elements. The model shows the elements' interconnectedness and the need for them to be aligned and be compatible with MCS design and implementation choice, wherein flexibility metrics are linked to performance measurement just as stability metrics are linked to control actions. It is evident, by looking at the sketch, that management is the key player in the controllability of the enterprise, and as said earlier, exercises its control over the five elements which comprise the MCS of the enterprise.

It is management's responsibility to choose MC designs and performance measures correctly and to elaborate on them in order to adequately support the enterprise needs and strategic objectives including flexibility and stability requirements which follow strategic options. Thus the organization's strategic choices must clearly reflect the needs and objectives of the company, and if misalignments were to occur as a result of feedback from the enterprise performance measurement systems, appropriate actions ought to be taken in a timely manner to correct the problem and thus to allow the enterprise system to thrive.

As Figure 3 shows, enterprise needs and objectives placed at the top constitute the basic beacon which must guide the management's efforts to engineer enterprise flexibility at every level. As can be seen, enterprise needs and objectives are clearly impacted by all the elements comprising MCS, which in turn are controlled by management. It is management which ultimately determines the other elements and their successful interaction as well as the dynamics taking place in the MCS functions determining flexibility and stability.



Source: Own elaboration

Figure 3.
The 7 elements' interconnectedness and how MC actions support and determine the metacontrollability of the enterprise

3. Conclusions and future work

MCS have thus far been underscored and underutilized in terms of their true role and strategic relevance in securing an adequate balance between flexibility and stability in the enterprise, being tied to strategic performance measures. MCS are responsible for providing the necessary flexibility and stability measures to the organization when and where it needs them. At the same time, MCS control when and how much of both are needed over a certain time frame, and all of this dynamic behavior is tied to specific strategic options designed within the enterprise.

The new approach asserts that both properties: flexibility and stability depend on what is termed the metacontrollability of the enterprise wherein concrete actions can mirror strategic options (Córdova and Yanine, 2013). Furthermore, the strategic role of MCS goes beyond performance measurement, internal company norms and regulations compliance or quality assurance to encompass all aspects of the enterprise that influence the relationship among enterprise flexibility, performance measurement systems and strategic options. Also MCS may be instrumental in allowing organizations to fulfill their strategic needs and objectives, while helping decision making anticipate future problems. Hence enterprise flexibility and stability metrics should be designed in and be a part of MCS as they are responsible for adequately supporting the organization's business and operations performance measurement. Without adequately engineering specific strategic flexibility and stability measures in MCS' design, the enterprise system as a whole would not be able to attain its best performance levels in a sustainable manner. At the same time management would become blind to the enterprise's strategic performance options tied to the enterprise's metacontrollability, a consequence of systemic failure.

Likewise, MCS' design must provide feedback to management in terms of the effectiveness of such measures in order for the system to learn and adjust itself until it finds the fine tuning necessary for flexibility and stability needs to be met. An example of this is provided in the model proposed, whereby the business and operational performance measurement systems are closest to enterprise needs and objectives. It is clear that the information being gathered through this performance measurement system will in turn determine which MC actions are necessary and when. The higher the degree of cohesion, integration and coherence reached among the elements comprising the model proposed, the higher the difference between poor performance, overall rigidity of operations and the high strategic performance level being sought. This higher level of strategic performance being sought is dependent upon the agility and degree of flexibility of the organization which must be part of the enterprise's MCS design while maintaining the necessary level of stability and control. Hence both flexibility and stability should be ingrained in the enterprise's MCS.

The paper presents two tables which have been included to enhance the approach proposed here. Table I presents a thorough classification of the literature reviewed in the paper while Table AI presents the different enterprise flexibility research lines from other authors in the literature including the role of MCS and their distinct differences with the approach presented here.

3.1 Implications of this research on theory and practice: MCS

MCS are vital in ensuring enterprise policy standards, business and operational objectives. They are responsible for safeguarding enterprise capabilities especially at the operational level, making sure that companies operate efficiently and remain competitive while achieving their goals. They have become the subject of great interest

in the last two decades, yet, inexplicably, they have been absent from the enterprise flexibility and stability discussion until now. This paper offers to fill the void by presenting a new theoretical model to approach enterprise flexibility and stability jointly from a strategic perspective, focusing on MCS. It asserts that to operate optimally, enterprises must be able to manage their limited resources in the most efficient and effective manner, especially so when dealing with uncertainty and contingencies on an ongoing basis, while following a set of defined strategic choices. Such choices however are expected to mirror enterprise flexibility types and measures, linking them to strategic performance measurement indicators; but in so doing enterprises must be able to acknowledge tensions between flexibility and stability forces, and manage these in a way that best reflects their strategies. To address this dichotomy, a novel approach to enterprise flexibility has been presented here based on MC theory, where both flexibility and stability are to be determined by MCS' design choice which will no doubt impact the enterprise system's metacontrollability.

The linkage between MCS' design and enterprise flexibility and stability is everywhere to be found, exists in every part of the organization and impacts all areas albeit differently. From a functional point of view MCS allow organizations to fulfill their strategic objectives, while helping decision making anticipate future problems. MCS also help to control the evolution of the business, allowing better control of enterprise resources administration and spending, assigning responsibilities and evaluating the fulfillment of business processes and company policies.

Ultimately MCS allow stakeholders to verify the effectiveness of the enterprise strategic planning. In essence, MCS make it possible to evaluate the effectiveness of the MC function in the organization – area in which enterprise flexibility and stability play a very active and visible role – while facilitating the reporting of all the vital information for a suitable performance of the different people in charge of enterprise management and the decision-making processes. Thus the most suitable information is made available for the different people in charge of reviewing the enterprise costing systems, providing all the suitable information when and where it is needed. It is for this very reason that the design choice and the implementation of a MCS in the company must respond to the strategic needs and objectives of each enterprise, based among others, according to its nature and organizational structure. Enterprise flexibility and stability are vital in securing such needs and objectives and therefore should be engineered in MCS's design and implementation.

As seen thus far, flexibility and stability are both necessary properties of any organization, and are determined to a large extent by the enterprise MCS employed by the organization. Such MCS are comprised of the seven fundamental elements shown earlier, all of which impact the enterprise flexibility and stability of the firm differently albeit with equal importance, as explained earlier. Flexibility and stability are both systemic in nature and thus cannot be explained by isolated actions or relegated to a phenomenon that can be explained by entropy (Kumar, 1987; Piplani and Wetjens, 2007; Shuiabi *et al.*, 2005). Worse yet is the idea of trying to increase flexibility by resorting to resources accretion in a single place without considering the dynamics and the interconnectedness of the enterprise elements as a whole. Therefore it is management's role and responsibility to handle the controllability of the enterprise system and to safeguard a healthy balance between flexibility and stability in the MCS design. Hence, both enterprise flexibility and stability depend on MCS design and implementation choices, something which becomes evident upon examining different types of organizations, each with very different aims, scope and strategic objectives.

Among the more relevant aspects to be considered for MCS choice and implementation, the following are salient elements affecting in a direct manner the effectiveness of MC: the enterprise strategies, the enterprise infrastructure, the financial control system, the organization's performance measurement and management, the organizational structure and culture, and particular technology options. Thus MCS provide information for any decision-making process thus controlling the evolution of the business. Nevertheless, consideration should be given to the fact that flexibility measures are not one and the same at all times but have a strong linkage with culture and customs everywhere.

In light of the above, one can concur with Pritsker (1990) that the enterprise is a complex, open system; a place where change and uncertainty are constant factors, just as the tensions derived from them are, not only in manufacturing but in service industries as well. One of the roles of management is to use organizational resources effectively at every level to try to cope with ever changing conditions and circumstances imposed by operations requirements and constraints, and by the enterprise's ongoing interaction with its environment. It is precisely for this reason that MCS are fundamental in securing such effectiveness and competitive performance measures, both of which are directly impacted by enterprise flexibility as well as stability measures.

Therefore it is no doubt that the formidable challenge of coping with change and with the uncertainty derived from it begs the question of which type, when, where and how much flexibility is needed and how should it be applied so as not to affect the stability of the enterprise. Such aspects and considerations are an important part of MCS' design, focus and scope, making it difficult to understand why and how they have been absent from the enterprise flexibility discussion altogether.

3.2 Research limitations

Notwithstanding the importance of MCS and their unquestionable impact on the metacontrollability of the enterprise system, hence their direct impact on enterprise flexibility and stability, little attention if any has ever been given to them regarding this issue. Perhaps to the extent that MCS have been relegated to performance measurement and quality issues rather than being studied for how they really stand from a System thinking viewpoint. It is essential to understand that flexibility and stability are both two-sides of a single coin; they mirror each other as organizational properties that are closely intertwined, interacting with one another (Leana and Barry, 2000; Melin, 2010).

Flexibility, like stability, is an important property of the enterprise system as a whole, not only at the operations level, but at the systemic level too. Both stability and flexibility are indeed indispensable for the enterprise's performance, as both are fundamental properties that require careful design and aim. As such they are to be designed and built into the enterprise MCS in order for these to adequately respond to the enterprise's needs and objectives as the model depicted in Figure 3 shows. Finally, it is important to say that the theoretical model presented here is rooted in Systems Thinking and draws from control theory and the metacontrollability concept applied to the enterprise system as a whole. While there is no empirical work yet to support it, there is nevertheless a strong theoretical framework being built in the paper whose structure can adequately hold the theories behind the research study.

The theoretical framework supporting the paper is based on existing theories and constructs, and introduces the various concepts being discussed and analyzed from a

diversity of research areas all connected to enterprise flexibility. Hence the theoretical framework presented describes and explains why the research problem under study exists – the void in the literature – drawing from pertinent research studies. Likewise, the paper has opted to employ a conceptual analysis of the subject matter, looking to connect all relevant and pertinent pieces of knowledge that help build the conceptual framework, offering new insight developed as a result of said analysis. Eventually, authors will seek to use the case study method to validate the theoretical framework or model being proposed.

3.3 Future research recommendations

Further work is needed, in both the theoretical and empirical realm, to explore not only how different types of enterprise flexibility and stability in MCS can bring additional benefits to the firm but also how best to apply these types, looking at both sides of the coin, not just one side. Hence enterprise flexibility must be designed and applied in accordance with organizational stability and MC strategies. There is also the need for further research on how different forms of flexibility and stability can coexist in the enterprise and create synergies rather than antagonize, and how to balance different strategic objectives which are impacted by both properties at different organizational levels, for example. Thus future work will be devoted to these very issues as well as to exploring the validity and applicability of particular types of enterprise flexibility and stability measures engineered in MCS that may be better suited for particular types and forms of organizations under different sets of conditions and circumstances.

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(The Appendix follows overleaf.)

Appendix

Table AI.
The different enterprise flexibility research lines from other authors in the literature including the role of MCS in the enterprise, and their distinct differences with the new approach presented here

Enterprise flexibility research line 1	Enterprise flexibility research line 2	Enterprise flexibility research line 3	Enterprise flexibility research line 4	Enterprise flexibility research line 5	Enterprise flexibility research line 6
Companies should encompass the capacity to continuously anticipate environmental changes and quickly adapt their actions to maintain their overall performance. To be malleable, resilient and capable of adjusting itself to diverse scenarios and conditions to achieve the enterprise's strategic goals. To be able to deal with various forms of uncertainty, perturbations and contingencies in the enterprise system and their complexities thereafter	The role of management control systems (MCS) in the enterprise and how they impact various aspects of enterprise management, such as strategic alignment, new product development strategies, and process planning. Yet, so far, no direct linkage with enterprise flexibility or stability has been forthcoming in the literature	The need to secure the firm's strategic framework by means of implementing specific flexibility metrics, which are represented by specific enterprise performance measures. Such measures ought to be linked to strategic options, but without neglecting enterprise stability and control requirements	The meta-control as the term signals is the highest level of control in a given organizational system and it is embodied in the enterprise's management control systems	Several authors have used organizational, hierarchical, temporal, or objective criteria to build flexibility taxonomies	There are forms of stability and control being preserved by certain managerial approaches, like the rigid flexibility model focused on simplicity and discipline, or Lean Manufacturing (Womack *et al.*, 1990) for example
Córdova and Yanine (2013), Arafa and ElMaraghy (2012), Kumar *et al.* (2006), Young *et al.* (2012), Wilkinson (2006), Hedman and Borell (2001), Dreyer and Grønhaug (2004), Dreyer (2006), Koh *et al.* (2006), Sanchez and Mahoney (1996), Salvador *et al.* (2002), Schilling (2000), Baldwin and Clark (2003), Sawhney (2006), Zhang *et al.* (2003), Koste *et al.* (2004), Kara and Kayis (2004), Gong (2008), Gong and Hu (2008), Ming (2009), De Toni and	Langfield-Smith (1997), Tessier and Otley (2012), Gond *et al.* (2012), Ahrens and Chapman (2004), Henri (2006), Jørgensen and Messner (2009), Anthony and Govindarajan (2007), Tsamenyi and Cullen (2010), Verstegen (2011), Chenhall (2003), Dent (1990),	Córdova and Yanine (2013), Young *et al.* (2012), Golden and Powell (2000), Wilkinson (2006), Hedman and Borell (2001), Gebauer and Lee (2008), Eisenhardt and Martin (2000), Bowman and Hurry (1993), Courtney *et al.* (1997), Dickson *et al.* (2001), Evans (1991), Moorman and Miner	Green and Welsh (1988), Córdova and Yanine (2013)	De Toni and Tonchia (1998), Narasimhan and Das (1999, 2000)	Collins and Schmenner (1993), Collins *et al.* (1998), Womack *et al.* (1990), Anand and Ward (2004), da Silveira (2006), Khanna (2009)

(*continued*)

Enterprise flexibility research line 1	Enterprise flexibility research line 2	Enterprise flexibility research line 3	Enterprise flexibility research line 4	Enterprise flexibility research line 5	Enterprise flexibility research line 6
Tonchia (1998), Swamidass and Newell (1987), Slack (1997), Cheng *et al.* (1997), Volberda (1997, 1998), Sheffi (2005), De Leeuw and Volberda (1996)	Samson *et al.* (1991), Simons (1987, 1994, 1995), Abernethy and Lillis (1995), Anthony (1965)	(1998), cited in Kapasuwan *et al.* (2007), Hitt *et al.* (2007), Taskin (2011), Chang *et al.* (2003)			
Enterprise flexibility research line 7	Enterprise flexibility research line 8	Enterprise flexibility research line 9	Enterprise flexibility research line 10	Enterprise flexibility research line 11	Enterprise flexibility research line 12
The problem of change and uncertainty affecting organizations and the way to deal with them from a control systems theory standpoint have also been analyzed extensively by such authors	Flexibility is generally seen by some authors as a situation specific in nature and suited for a particular organizational design. Flexibility is also a function of management's control capability as well as the controllability of the organization	Companies, especially SMEs have increasingly been concentrating on strategic flexibility options as a means to achieve better performance and acquire new forms of competitive advantage. Thus enterprise strategy should influence flexibility requirements and hence the choice of operations technology	Some authors like Shuiabi *et al.* (2005) believe that the way to increase the level of enterprise flexibility is to increase entropy. They seek to analyze entropy and entropy generating factors as determinants of enterprise flexibility, following the logic of entropy maximization as a way to foster and generate higher degrees of flexibility in operations (Córdova and Yanine, 2013)	The need to reconcile change and stability in the organization. Thus management must balance and adequately manage stability and change as simultaneously occurring experiences in the life of organizations	Flexibility holds different meanings at different levels of the organization's hierarchy, depending on the means by which it is to be achieved. It can take different forms at every level of the enterprise. Environmental uncertainty, both internal and external, has been argued to be one of the main reasons for a firm to seek flexibility, especially in manufacturing firms
Chris Argyris (1973, 1985), Carlsson (1989), Toffler and Shapiro (1985) in The Adaptive Corporation, and Senge and Sterman (1992)	Volberda (1997, 1998), De Leeuw and Volberda (1996), Gupta and Buzacott (1996)	Upton (1995), Asikhia (2011), Gerwin and Kolodny (1992)	Kumar (1987), Piplani and Wetjens (2007), Shuiabi *et al.* (2005)	Leana and Barry (2000), Melin (2010)	Cheng *et al.* (1997), Slack (1997), Gerwin (1993), Swamidass and Newell (1987), Swamidass (1988), Correa (1994)

Table AI.

A new approach to enterprise flexibility based on management control theory

Management control systems (MCS) are responsible for providing the necessary flexibility and stability measures to the organization when and where it needs them. At the same time, MCS control when and how much of both are needed over a certain time frame, and all of this dynamic behavior is tied to specific strategic options designed within the enterprise. The new approach asserts that both properties: flexibility and stability depend on what is termed the metacontrollability of the enterprise wherein concrete actions can mirror strategic options (Córdova and Yanine, 2013). Furthermore, the strategic role of MCS goes beyond performance measurement, internal company norms and regulations compliance or quality assurance to encompass all aspects of the enterprise that influence the relationship among enterprise flexibility, performance measurement systems and strategic options. Indeed MCS are vital in ensuring that companies operate efficiently and effectively in all fronts while securing an adequate balance between flexibility and stability at every level of the organization that can mirror the enterprise's strategic options. Also MCS may be instrumental in allowing organizations to fulfill their strategic needs and objectives, while helping decision making anticipate future problems.

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