Interactive Control Systems: Review and Discussion of the Empirical Literature

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Abstract

This article contributes to a growing body of literature on the interactive control system (ICS) by reviewing and discussing three themes poorly defined: (1) the properties, (2) the determinants, and (3) the outcomes of ICS.

Two issues remain unanswered in the literature on the properties of ICS: (1) the misspecification, and (2) the complication of interpretation and replication. A chronological overview of the indicators used in the literature (post hoc evidences) is provided. Based on the conceptual reference of Bisbe et al. (2007), the article first contributes in proposing a classification of these indicators. This article also aims to describe the determinants investigated in the management literature and, by doing this, develop a better understanding on the potential value of the contingency theory to determine the use of ICS. The third objective is to examine and to classify the outcomes of ICS. The review highlights the fact that most qualitative studies concentrated on the behavioural effects of ICS while the quantitative studies do investigate organizational outcomes principally.

Finally, reviewing the literature on the properties, determinants and outcomes allows to outline the shortcomings in the management literature on ICS and therefore offers potential areas for future research.

Keywords

ICS, literature review, dimensions, determinants, outcomes

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1.0 INTRODUCTION

The number of studies dealing with the interactive control systems (ICS) of Simons\(^2\) is increasing significantly (Abernethy & Brownell, 1999; Van der Stede, 2001; Marginson, 2002; Bisbe & Otley, 2004; Bruining, Bonnet & Wright, 2004; Ferreira & Otley, 2005, 2006; Tuomela, 2005; Henri, 2006; Bisbe, Batista-Foguet & Chenhall, 2007; Kober, Ng & Paul, 2007; Naranjo-Gil & Hartmann, 2007; Widener, 2007). It signifies that “progress continues to be made on this front” (Chenhall & Chapman, 2006:36). This article contributes to this growing body of literature by reviewing and discussing three themes poorly defined: (1) the properties, (2) the determinants, and (3) the outcomes of ICS.

Despite that ICS\(^3\) seems to be the most studied levers of control of the Simons framework, two issues remain unanswered in the literature on the properties of ICS. First, a misspecification takes place. More specifically, most researchers consider ICS as a unidimensional construct (the sum of reflective indicators). In this case, the omission of one indicator does not have very serious consequences as all indicators are supposed to be interchangeable and to covary. Nevertheless, from a conceptual reasoning, Bisbe et al. (2007) suggest ICS to be an emergent multidimensional construct with reflective indicators for each dimension. Based on this conceptual development, the indicators used in empirical studies were supposed to assess the different dimensions constitutive of the construct, which leads to a misspecification issue whether a theme (‘dimension’) is not operationalized.

Second, in addition to the misspecification, a lack of capitalization may be outlined. In fact, most quantitative and qualitative studies come into sight to overlook what has already been investigated and, due to these moderate reviews of the literature, ICS is often reinterpreted and measured differently. Hence, interpretation and replication are complicated. Based on these two remarks, a chronological overview of the indicators used in the literature (post hoc evidences) is provided. Based on the conceptual reference of Bisbe et al. (2007), the

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\(^2\) Bisbe, Batista-Foguet & Chenhall (2007) recalls that the works of Simons conceptualize the styles of use of MCS but other conceptualizations might exist. As the ‘interactive’ use is the focus of this article, we do not aim at developing the others. Although the article allows to make progress in this notion, it does not entail that the other conceptualizations have less interest than the Simons’ framework.

\(^3\) The term ‘interactive control system’ (ICS) does not refer to a set of technical attributes of the management control system (Ahrens & Chapman, 2004:273). An appropriate label is the ‘interactive use of management control system’ highlighting a type of use of the management information. But, for a matter of convenience, the acronym ICS will be used throughout this article.
first contribution is to propose a classification of these indicators and then offers an avenue for improvement in the next research on ICS.

Besides the properties, the literature on the determinants of ICS may also be reviewed. ‘Perceived strategic uncertainty’ is the principal determinant suggested by Simons. This determinant resembles to the traditional ‘perceived environmental uncertainty’ contingency (Duncan, 1972; Gordon & Narayanan, 1984; Milliken, 1987; Gerloff, Muir & Bodensteiner, 1991; Fisher, 1996; Chong & Chong, 1997; Chenhall, 2003; Ditillo, 2004). But, while contingency theory has inspired many researchers in the design of MCS (Lawrence & Lorsch, 1967; Thompson, 1967; Hayes, 1977; Waterhouse & Tiessen, 1978; Otley, 1980; Fisher, 1995 & 1998; Chapman, 1997; Hartmann & Moers, 1999 & 2003; Gerdin & Greve, 2004 & 2008), it is difficult a priori to use the same contingencies to study the use of MCS. Therefore, this article also aims to describe the determinants investigated in the management literature and, by doing this, develop a better understanding on the potential value of the contingency theory to determine the use of ICS, which is in line with Ahrens & Chapman (2004) and Wouters & Wilderom (2008).

In addition to the review of the literature on the properties and the determinants, the outcomes of ICS is examined which is the third contribution of this article. With the classification framework of Marginson (2002) reused by Bisbe et al. (2007), the outcomes of ICS can be categorized according to (i) the effects of ICS for strategic activities and (ii) the organizational outcomes. So far, most qualitative studies concentrated on the effects of ICS on the managers’ strategic activities in order to understand how and why Simons’ framework works. Unlike the qualitative studies, the quantitative studies do not investigate the impact on the managers’ activities but organizational outcomes principally.

Finally, reviewing the literature on the properties, determinants and outcomes allows to outline the shortcomings in the existing management literature on ICS. Consequently, these shortcomings offer potential areas for future research that will be elaborated in the conclusion.

The remainder of this paper is organised as follow: Section 2 defines the general notion of interactive control system as initially explained by the Simons’ different scientific outputs. Section 3 focuses on the properties of ICS and, more specifically, on what indicators have been utilized so far to quantitatively and qualitatively measure the construct. From the Simons’ qualitative investigations, a chronological view is opted in order to show step-by-step how ICS have been evolving. This view outlines to what extent the ‘interactive’ construct
has been poorly defined. Section 4 concentrates on the determinants of ICS. Based on the framework of Marginson (2002), section 5 summarizes the outcomes of ICS. Throughout the article, avenues for research are proposed.

2.0 INTERACTIVE CONTROL SYSTEM: THE SIMONS’ DEFINITION

The first part of the paper proposes a summary of the integrated theory for the control of strategy, as articulated by R. Simons in his seminal 1995’s book, Levers of Control, focusing in particular on his concept of interactive control systems.

The core question addressed by Simons can be summarized as follows: how control systems can help an organization to successfully formulate and implement its business strategy, defined as “how a firm competes and positions itself vis-à-vis its competitors” (Simons, 1995:6).

Relying on Mintzberg’s work on strategy, on one side, and, in particular, on the distinction between intended strategy and emergent strategy and, on the other side, on Argyris’ work on single and double loop learning, Simons has developed an integrated theory for the control of strategy based on four levers of control: beliefs systems, boundary systems, diagnostic control systems and interactive control systems. Together, these systems aim to foster organizational innovation and performance accordingly (Tuomela, 2005; Henri, 2006; Widener, 2007). Consequently, Simons’ thoughts break from “the common line of research (...) that affirms that a widespread use of formal MCS [Management Control Systems] is in fact incompatible with innovation” (Bisbe & Otley, 2004:710).

Simons (1995:34) defines a beliefs system as “the explicit set of organizational definitions that senior managers communicate formally and reinforce systematically to provide basic values, purpose and direction to the organization.” In many organizations, it communicates the vision of the organization and it is translated into a mission statement. It relates to strategy as a perspective as “an ingrained way of perceiving the world” (Mintzberg 1987:16).

According to Simons (1995:39), “boundary systems delineate the acceptable domain of activity for organizational participants. They establish limits, based on defined business risks, to opportunity seeking”. Their role is to control strategy as a position, “a means of locating an organization in […] an ‘environment’” (Mintzberg, 1987:15). They define the strategic domain in which the organization will compete and the accepted level of risk it can accept.
For Simons, the beliefs and boundary systems will together define the strategic domain of the organization.

The diagnostic control systems are defined by Symons (1995:59) as “the formal information systems used to monitor organizational outcome and correct deviations from preset standards of performance”. They are used to control strategy as a plan, “a consciously intended course of action” (Mintzberg, 1987:11). They control the implementation of the intended strategy and rely essentially on single loop learning. They focus the attention on critical performance variables that condition the achievement and successful implementation of the strategy.

For Simons, the classical definition of Management Control Systems (MCS) such as the one by Anthony’s “Management control is defined as the process by which managers assure that resources are obtained and used effectively and efficiently in the accomplishment of the organization’s objective” (Anthony, 1965:ii), covers only a subset of the control systems, the diagnostic control systems, and focuses on the control of the intended strategy of the organization.

Simons (1995:95) defines the interactive control systems (ICS) as “formal information systems managers use to involve themselves regularly and personally in the decision activities of their subordinates”. Furthermore they “focus attention and force dialogue throughout the organization. They provide frameworks or agendas for debate and motivate information gathering outside of routine channels” (Simons, 1995:96). ICS relate to strategy as a “pattern in a stream of actions” (Mintzberg, 1987:12) and will be used to help the emergence of strategy. ICS rely heavily on double loop learning. ICS focus on the strategic uncertainties that an organization is facing.

DCS and ICS are used to implement and formulate the strategies of the organization.

Before analysing in depth the interactive control systems concept proposed by Simons, it is important to bear in mind his warning that “control of business strategy is achieved by integrating the forces of beliefs systems, boundary systems, diagnostic control systems and interactive control systems. The power of the control levers does not lie in how each is used alone but rather in how they complement each other when used together” (Simons, 1996:153). As far as we know, Widener (2007) is the only one empirical quantitative study

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4 Even if some double loop learning may occur in diagnostic control systems.
trying to test the integrated theory of control of strategy proposed by Simons. Most studies that we will discuss in the next sections have focused on one or two levers of control: the diagnostic and interactive control systems.

By focusing only on ICS in this paper, a part of the picture may be missed since some of the control effects of ICS work in conjunction with other control levers.

The diagnostic mode and the interactive mode are two different ways of using control systems.

In his book, Simons does not offer a precise definition of an interactive control system (ICS) construct but has provided different ways of characterizing an ICS. Contrary to the DCS that focus on critical performance variables, the ICS focus on the strategic uncertainties defined as “the uncertainties and contingencies that could threaten or invalidate the current strategy of the business [...]. Strategic uncertainties derive from senior’s management’s perception of the known and unknown contingencies that could threaten or invalidate the assumptions underlying the current strategy” (Simons, 1995:94).

Simons (1995: 96-97) starts by offering four defining characteristics of an ICS:

1. Information generated by the system is an important and recurring agenda addressed by the highest levels of management;
2. The ICS demands frequent and regular attention from operating managers at all levels of the organization;
3. Data generated by the system are interpreted and discussed in face-to-face meetings of superiors, subordinates and peers;
4. The system is a catalyst for the continual challenge and debate of underlying data, assumptions and plans.

In order to be used interactively, a control system should meet five conditions according to Simons (1995:108-109):

1. It must require the reforecasting of future states based on revised current information;
2. The information contained in a control system must be simple to understand;
3. A control system must be used not only by senior managers but also by managers at multiple levels of the organization;
4. A control system must trigger revised action plans;

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5 Marginson (2002) looks at the various levers of control in a UK company using the case study method.
5. A control system must collect and generate information that relates to the effects of strategic uncertainties on the strategy of the business.

Based on these various characteristics, Simons (1995:109-110) identifies five control systems that he sees as candidates to be used interactively:

1. Project management systems;
2. Profit planning systems (such as profit plans, budgets...);
3. Brand revenue budgets;
4. Intelligence systems;
5. Human development systems.

It is interesting to note that the list of potential ICS provided is shorter than the list of diagnostic control systems cited by Simons (1995:61). Standard costing systems, MBO systems, expense centers budgets and business plans are diagnostic control systems that seem not to be used interactively. By looking at the various characteristics of the ICS cited above, one can assume that expenses center budgets and standard costing systems, for example, are excluded because they are not relevant in the same time for the top management and several management levels of the organization. This seems to contradict or at least to limit the validity of the following quote from a previous Simon’s work: Any diagnostic control system can be made interactive by continuing and frequent top management attention and interest (Simons, 1994:171).

Looking at the various citations on what constitutes an ICS in Simons’s work, there is no one clear unique definition of the ICS construct is. In order to define the ICS, different attributes are proposed with slight modification in their definitions in the successive published works of Simons.

As far as we know, the only systematic tentative to define theoretically the ICS construct proposed by Simons was done by Bisbe et al. (2007: 796) that have used thematic analysis procedures to identify 5 features that characterize an ICS. Based on a review of 108 quotations through the multiple Simons’ studies and a conceptual reasoning, Bisbe et al. (2007:797) build five non-observable dimensions: (1) an intensive use by top management, (2) an intensive use by operating managers, (3) a pervasiveness of face-to-face challenges and

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6 Another reason cited by Simons may be the complexity of the accounting information in an ABC system.
debates, (4) a focus on strategic uncertainties, and (5) a non-invasive, facilitating and inspirational involvement.

In the next section, we will review a set of empirical studies that have used at least partially the ICS construct.

3.0 VARIOUS DIMENSIONS OF AN INTERACTIVE CONTROL SYSTEM

As far as we know, seven quantitative studies investigate ICS, at least partially: Abernethy & Brownell (1999), Davila (2000), Van der Stede (2001), Bisbe & Otley (2004), Henri (2006), Naranjo-Gil & Hartmann (2007), and Widener (2007). In each study, the respective authors sent a questionnaire in which they ask the respondents to score items (‘indicators’). These items of each seven studies are summarized in Table 1 and constitute the indicators selected by the authors to approach the ICS construct.

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Insert Table 1 about here
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Along the development of quantitative studies, as far as we know, four studies investigate ICS qualitatively: Marginson (2002), Bruining et al. (2004), Tuomela (2005), and Kober et al. (2007). In fact, applying a qualitative methodology to the study of ICS allows to generate more detailed information than large-sample quantitative studies (Eisenhardt, 1989; Miles & Huberman, 1984; Yin, 2003) and is recommended as an appropriate methodology to spotlight the actual accounting issues (Keating, 1995; Merchant & Van der Stede, 2006; Cooper & Morgan, 2008; Davila & Oyon, 2008).

Most qualitative studies explore it by analyzing answers from interviews, observing participants or reviewing the documents. So, investigating ICS requires a protocol in which a list of themes on ICS has to be discussed, observed or documented. Table 2 summarizes the themes investigated in the four studies in order to operationalize the construct.

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Insert Table 2 about here
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The following analysis of these indicators proceeds with three sorts of information. For each study, the research question is recalled. Afterwards, an explanation of the instrument construction is pursued. Finally, the instrument and the items of the instrument are discussed.
3.1 Investigations on ICS with references to Simons exclusively

After an explorative qualitative investigation, Simons proposed an overall framework from which hypotheses can be posed and tested. Abernethy & Brownell (1999) are the first to use ICS in an empirical study. At the organizational level, they assume a moderating effect of an ‘interactive use’ of a budget system on the relationship between the extent to which the public hospitals are changing and the organizational performance. The authors concentrate on the quotes of Simons (1990, 1991) to build a unidimensional measure\(^7\) formed by the score of four items (Cronbach alpha of 0.59). Reviewing these items enables to underline one measurement issue. The item entitled ‘the extent to which you agree that the budget process is continuous - it demands regular and frequent attention from managers at all levels’ seems to mix two questions. On the one hand, the authors ask the extent to which the respondent agrees that the budget process is ‘continuous’ in the sense of regularity and frequency of attention. On the other hand, they ask whether this continuous attention occurs at all levels. In fact, it is not sure that the respondent knows what happens at all levels and, even if he is familiar with the attention at all levels, it may be supposed that some managers do not pay the same amount of attention than the respondent. That does not mean that the information used in the budget process is not part of ICS.

At the group level, Davila (2000) hypothesizes that the project uncertainty and the project strategy are both related to the design of management information which, in turn, is related to the project performance. According to the author, the design of management information is characterized, to a certain extent, by the usage pattern of information in the sense of Simons (1995). To measure the ‘interactive use’, Davila (2000) adapts the notion of ICS, initially from an organizational level, to a team level, and, in doing so, proposes a short description of ICS in the questionnaire. Simons (1995:97) admits that an interactive process may occur at a lower organizational level but recalls that this view of an ‘interactive use’ is not the focus of his analyses. In fact, Simons defines ICS as an information-based system that is also “an important and recurring agenda addressed by the highest levels of management”.

This early discussion on the dimensions of an ‘interactive use’ of MCS occurs along an older debate on the dimensions of a ‘tight’ budgetary control. Van der Stede (2001) attempts

\(^7\) Given the lack of instrument in the quantitative literature on this ‘interactive use’, a second alternative measure of the construct has been build. This second instrument is composed of a description for the two styles of use (diagnostic and interactive). Using a different wording between the two alternative measures allows to improve the validation of the convergence. The correlation between the two alternative measures significantly amounts to 0.41.
to build a multi-dimensional instrument measuring the tightness of a budgetary control,
composed of five micro attributes and, in doing so, the author notices that the notion of
‘interactive use’ of budgetary control shows overlap with the concept. Van der Stede (2001)
develops a dimension entitled ‘intensity of budget-related communication’ (Cronbach alpha
of 0.75) representative of this overlap, and composed of six significant items. Out of these
six, the two last items are differently scaled from the others. It is also unclear how the value
of this dimension has been calculated. Despite this technical problem, considering a
management accounting construct like a ‘tight’ budgetary control as multi-dimensional seems
sound due to the fact that several distinct themes compose the construct. Even though the
author does not explicitly recognize that an ‘interactive’ budget control system should be
investigated through different dimensions, a conceptual reasoning on ICS should allow to
bring an answer.

After (and based on) the initial works of Simons (1990, 1991, 1994 & 1995), Marginson
(2002) qualitatively examines the nature of the relationship between MCS and strategy at an
individual level. In particular, the author investigates the interplay between ‘interactive use’
of performance management systems (PMS) and the managers’ strategic activities. With
respect to the data collection, Marginson (2002:1030) creates an interview protocol
encompassing 8 questions about the use of PMS. In these questions, it is not clear how the
notion of ‘interactive use’ of PMS was discussed with interviewees or derived from the
interviews. In addition, the author states (p.1026) that this notion of ICS is supported by the
field while the argument to substantiate this support is restricted to the presence of ‘top
managers involvement’ and a ‘focus on strategic uncertainties’. Therefore, the interaction
between hierarchical levels and the face-to-face challenges and debates within teams are
overlooked or absent in the interviews.

Bruining, Bonnet & Wright (2004) qualitatively investigate why and how does the
management change their style of use of MCS to implement a management buy-out. In order

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8 Simons (1995: 161) writes that “the concept of ‘tightness of controls’ is of little value unless it is differentiated according to
the multiple types of control levers and how they are used”.
9 Van der Stede (2001:130) states that “since no measures of interactive budgeting control are reported in the literature, a
measure was built from scratch, largely based on Simons (1995)” while, in fact, the empirical studies of Davila (2000) and
Abernethy & Brownell (1999) have already elaborated an instrument to measure the ‘interactive use’ and especially adapted
to a ‘budget control system’.
10 In particular, when the outliers are omitted from the database, Van der Stede (2001:131) agrees however on the potential
unsuitable incorporation of the two last items.
to answer to the research questions, the authors build an interview protocol containing semi-structured questions. Solely based on Simons (1995), they operationalize ICS with 6 themes. Although this list of themes seems more indicative of the initial concept of Simons than what Marginson (2002) does, the questions per se are not cited and the mere statement of a theme such as ‘Experiments, knowledge systems, management development, learning’ does not bring enough insights on how the Simons’ interactive notion has been approached with interviewees or derived from interviews.

### 3.2 Investigations on ICS with references to empirical studies

At an organizational level, Bisbe & Otley (2004) are concerned about the ambiguity in the relationship between ICS and product innovation. The authors first investigate the direct relationship between ICS and innovation for low- and high-innovating firms. Secondly, they examine the indirect effect of ICS on the performance acting through product innovation (mediating) and the indirect effect of ICS on the relationship between the product innovation and performance (moderating). Therefore, Bisbe & Otley (2004) do pay attention to the control systems that are theoretically tied to innovation and widely used in practice namely the budget control system, the balanced scorecard control system, and the project management control system. To measure the ‘interactive use’ of these three control systems, the authors build their instrument based on the suggestions of Abernethy & Brownell (1999) and Davila (2000). With the four initial items measuring the ‘interactive use’, three load on one factor for each of the three selected control systems and the Cronbach alphas are 0.77, 0.78, and 0.78 respectively, indicative of a high reliability. The main benefit of their instrument is the extension of the previous instrument for control systems other than the budget. Nevertheless, based on the results of factor analysis, the item entitled ‘the extent to which the information generated by a certain control system deserves attention as a means of regularly questioning and challenging ongoing action plans’ has been excluded from the ‘interactive use’ uni-dimensional construct, while the similar item was not kept out from the ‘interactive use’ construct of Abernethy & Brownell (1999) after their factor analysis.

In a longitudinal qualitative study, Tuomela (2005) elaborates the design of a performance measurement system and, within this project, studies the consequences of an interactive use of PMS in particular. With a reference to studies like Abernethy & Brownell (1999) and Bisbe & Otley (2004), the author observes participants and, based on these observations, is able to

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11 Unavailable in their article. Rather, in their appendix, a questionnaire checklist is posted.
recognize an ‘interactive use’ of PMS. Then, Tuomela (2005:308) declares four observed indicators. These indicators orient the construct of interactive use toward particular themes such as discussion and learning between superiors, peers and subordinates. Consequently, the author restricts the concept of ICS in overlooking other components of ICS such as the intensity of use, although Tuomela (2005:312) acknowledges later that “an interactive use of performance measures increases the time spent in meetings” for the business managers and operating managers.

After the qualitative studies of Marginson (2002) and Tuomela (2005) on the interactive use of PMS, Henri (2006) conducts a quantitative analysis on the relationships between the manner of using the performance management system in particular and the organizational capabilities. To measure the ‘interactive use’, the author adapts the instrument of Vandenbosch (1999), initially built to determine the use of the executive support system. Due to the oriented view of Vandenbosch’s (1999) instrument toward attention-focusing of the executive support system, Henri (2006) adds two items to substantiate the context of management control system. After a confirmatory factor analysis, all seven items load significantly on one factor and the Cronbach alpha of the ‘interactive use’ construct is 0.79. Even though particular instruments to measure the interactive use of PMS have not been developed in the quantitative literature, the author does not explain the reason why other instruments such as the one of Abernethy & Brownell (1999), Davila (2000) or Bisbe & Otley (2004) are not considered. Furthermore the items in use correspond to a restricted view of ICS. Like Tuomela (2005), the author does not assess the theme ’intensity of use’ of MCS.

In the most extensive empirical study of the levers of control framework exploring the antecedents of control systems, the relations between them and their costs and benefits, Widener (2007) conducts also a quantitative research on the style of use of performance management system. The author investigates whether and how the levers of control of Simons influence one another. The interactive control system, one lever of control, is appraised by using the instrument of Henri (2006) and complemented by the books of Simons (2000) and Kaplan & Norton (1996). Initially, Widener (2007) asks 17 questions on the style of use of PMS and, based on an exploratory factor analysis discriminating the diagnostic use from the interactive use, 5 items are revealed significant to form the interactive use of PMS (Cronback alpha of 0.84). The author notices that the items coming from the instrument of Henri (2006) indicate a diagnostic instead of an interactive use. Consequently, it is not clear whether the items assessing the ‘interactive use’ have been empirically validated in previous studies.
Furthermore, the 5 items assessing the interactive use of PMS relate once again to a limited view of ICS. In contrast with Tuomela (2005) and Henri (2006), Widener (2007:773) measures the intensity of use of MCS but does not incorporate other properties of ICS such as face-to-face challenges and debates.

Following the study of Abernethy & Brownell (1999), Naranjo-Gil & Hartmann (2007) explore strategic change in public hospitals. This change is measured along a prospector-defender continuum (Miles & Snow, 1978). Although Abernethy & Brownell (1999) do not pay attention to the direction of change, Naranjo-Gil & Hartmann (2007) argue that the extent and the direction of strategic change are influenced by the ‘interactive use’ of management accounting systems (broadly defined), the broad scope of management information, and the top management team heterogeneity. To extend the study of Abernethy & Brownell (1999), the authors re-use their questionnaire combined with the Bisbe & Otley’s (2004) one. The exploratory factor analysis retains all six items on one factor (Cronbach alpha of 0.82) composing the interactive use of MAS. Even though Naranjo-Gil & Hartmann (2007:745) specify that their questions are “slightly adapted in wording to be understandable in the Spanish hospital setting”, the ties between their instrument and the one used in previous studies are unclear. In fact, the items in use relate to managerial actions described in Simons (1995) instead of using the instrument of others. Nevertheless, this instrument seems to integrate multiple themes characterizing ICS and, at the same time, reflects a high consistency as a uni-dimensional construct.

Finally, Kober, Ng & Paul (2007) explore the idea that combines a traditional strategy contingency influencing the design of MCS with how an ‘interactive use’ of management control mechanisms could facilitate a change in strategy. To seize the notion of ‘interactive use’ through the interviews, the authors first review the literature and present ICS based on the Simons’ statements. However, a list of questions or themes discussed during the interviews is not incorporated. Additionally, no indication on how the concept of ICS is derived from the interviews is mentioned. It seems that Kober et al. (2007:444) vaguely interpret the meaning of ICS and therefore restrictively consider that their case firm uses budgets “in an interactive manner, which encompassed formal and informal face-to-face meetings and discussions of variances and any necessary corrective actions”. Beside this limited view of ICS, the authors make the meaning of ‘interactive’ nebulous when they speak of an ‘interactive meeting’, which is not related to the Simons’ definition of ‘interactive control system’.
3.3 From a uni- to a multi-dimensional construct of the ‘interactive use’

Many different indicators have been introduced in the literature for the measurement of an ‘interactive use’ of control system, implicitly or explicitly seeing the construct as unidimensional. Due to the diverse nature of purposes served in the construction of ICS (learning, communication, manager behaviour), Bisbe, Batista-Foguet & Chenhall (2007) argue that the ICS construct is multidimensional, which is in line with the initial idea of Van der Stede (2001). Although this justification seems substantial, it can be observed that few quantitative and qualitative studies have previously considered that ICS should be decomposed into different non-observable facets, called ‘dimensions’. In fact, these studies have defined ICS using some of the “characteristics as mentioned by Simons, usually quoting some of the non-exhaustive enumerations or attributes […]. As a result, slightly different subsets of the construct domain are tapped in these studies and the extant survey-based literature of ICS represents an examination of partial subsets of the construct’s meaning” (Bisbe et al, 2007:796). As mentioned earlier, Bisbe et al. (2007:797) have identified five non-observable dimensions that constitute the ICS construct according to Simons’ work: (1) an intensive use by top management, (2) an intensive use by operating managers, (3) a pervasiveness of face-to-face challenges and debates, (4) a focus on strategic uncertainties, and (5) a non-invasive, facilitating and inspirational involvement. If one dimension is missing, the ICS construct changes. Each dimension of the construct can be approached by several indicators and if some indicators are not measured, the validity of the dimension is not threatened.

Based on the review of the empirical review briefly discussed in the previous section, an attempt to classify the various indicators used in the reviewed studies into these five dimensions is made in Table 3.12,13

\[\text{Insert Table 3 about here}\]

12 The classification was not operated on the basis of the type of MCS in study. First, as noted by Van der Stede (2001:123) about the budget control system, “it should be noted […] that Simons is largely concerned with the way in which senior managers utilize the various control systems of an organization, which encompass a much broader set than just budgetary controls”. Second, ICS does not refer to a set of technical attributes (see footnote 2).

13 The classification of items between the Bisbe et al.’s (2007) dimensions is not always clear-cut. Thus, a classification into multiple dimensions has been allowed.
This table offers an overview of the different constructs of ICS measured in the empirical literature with respect to a conceptual reference. Some studies seem to concentrate the measure of ICS on a limited number of dimensions while others try to assess a more complete view of ICS. For instance, the concept of ICS developed by Widener (2007) has no overlapping dimension with the concept exploited by Henri (2006). Consequently, one can observe that both authors do not measure the same underlying concept at all.

If the Simons’ ICS concept is, as claimed by Bisbe et al (2007), a concept composed of 5 different dimensions, all studies that have used indicators measuring less than the five dimensions of the construct have not tested the Simons’ ICS construct but a slightly different ICS construct. Therefore, an incomplete measurement of dimensions “would cause serious misspecification of the construct, and eventually the findings and conclusions about the relationships between ICS and other constructs would be flawed” (Bisbe et al., 2007:806).

Unfortunately, there is a large diversity of dimensions considered in the various studies which limit the construction of a solid body of evidence regarding the ICS.

The enumeration and classification of indicators previously employed in quantitative and qualitative studies are useful for researchers in providing a broad picture of what items have been already used so far and in helping them to carefully define the specifications of the ICS construct they will use in order to contribute to the building of empirical evidence by the replication of ICS measurement in the future empirical studies.

Reusing the instruments of previous studies is important to avoid re-interpretation of ICS and to make replication of conclusions easier. To do so, a quasi-exhaustive list of items from empirical literature has been established. For examples, Abernethy & Brownell (1999), Van der Stede (2001), and Bisbe & Otley (2004) construct a set of items to measure the interactive use of budget control systems. Marginson (2002), Tuomela (2005), Henri (2006), and Widener (2007) make an other set to evaluate the interactive use of a performance measurement system. Davila (2000), Bruining et al. (2004), Naranjo-Gil & Hartmann (2007), and Kober et al. (2007) in turn, propose a set of more generic items usable for other MCS. This list may facilitate future management accounting research in the construction or improvement of the instrument measuring the different dimensions of an ‘interactive use’ of management control system as defined by Simons.
DETERMINANTS OF THE INTERACTIVE CONTROL SYSTEMS

The determinants of the use of control systems have not been deeply scrutinized, probably due to a misunderstanding of the ICS features, and a lack of theory\textsuperscript{14} sustaining ICS. Although the former has been detailed in the previous section, the later cannot be solved with a review and discussion of the literature. However, a review of the fundamentals enables to improve the understanding of the question and to propose research avenues.

Two streams of literature are suggested to form the foundations. First, Chenhall & Chapman (2006:35) note the potential of the contingency theory “to identify how MCS are best designed and implemented to ‘fit’ the context, or contingencies, within which MCS are employed”. Traditionally, the contingency theorists (Lawrence & Lorsch, 1967; Hayes, 1977; Waterhouse & Tiessen, 1978; Otley, 1980; Fisher, 1995 & 1998; Chapman, 1997; Hartmann & Moers, 1999 & 2003; Chenhall, 2003; Gerdin & Greve, 2004 & 2008) work on the design of MCS. As far as the use of MCS is concerned, the contingency theory remains underdeveloped. Nevertheless, based on the theory of Adler & Borys (1996) on an ‘enabling’ versus ‘coercive’ formalization of the bureaucracy, Ahrens & Chapman (2004) bring back a contingency perspective to suggest ways in which organic controls\textsuperscript{15} might be determined. They explain that, based on particular contingencies (repair, internal transparency, global transparency, and flexibility), an enabling MCS can be designed. Yet, this stream of literature focuses on the determinants of the design of the use of MCS instead of the use of MCS. Based on this difference, structural and contextual contingencies could explain the variation in the design of the use of MCS but not the use of MCS.

Second, based on field analyses, Simons, in turn, concentrates on the nature of the information-based communication processes to explain the ‘organic controls’ or ‘enabling controls’. Originally, he describes the belief system and ICS as two enabling levers. In particular, the presence of an interactive use of MCS is originated from the senior managers who choose the control systems to be interactive\textsuperscript{16}. Based on a review of the literature, this

\textsuperscript{14} The word ‘theory’ is defined as a “well-developed set of interrelated propositions” (Schoonhoven, 1981:350). Therefore, neither the ‘contingency theory’ nor the principles of Simons are a theory in conventional terms.

\textsuperscript{15} The terms ‘organic control’ are viewed as MCS that “might be used to support rather than constrain operational management” (Ahrens & Chapman, 2004:279).

\textsuperscript{16} Usually, few control systems are used that way due to economic, cognitive and strategic reasons (Simons, 1999:115).
choice depends on the three\textsuperscript{17} determinants: (1) the strategic uncertainty, (2) the organizational life-cycle, and (3) the levers of control.

4.1. Strategic uncertainty

The term ‘uncertainty’ has been widely studied in the literature (Lawrence & Lorsch, 1967; Duncan, 1972; Galbraith, 1973; Lorenzi, Sims & Slocum, 1981; Daft & Weick, 1984; Gordon & Narayanan, 1984; Milliken, 1987; Gerloff, Muir & Bodenheimer, 1991; Chapman, 1997; Chong & Chong, 1997; Van Gelderen, Frese & Thurik, 2000; Chenhall, 2003). In accounting, the uncertainty perceived by a decision-maker comes from the difference between the amount of information required to perform the task and the amount of available information in the organization (Galbraith, 1973:5).

When the word ‘strategic’ is attached to the word ‘uncertainty’, it refers to unforeseen event that could provide threats or opportunities as circumstances change (Simons, 1991:50) whenever if the uncertainty comes from the competitive dynamics (‘external environment of the organization’) or from the internal competencies (‘the technology used by the organization’) that top managers monitor (Widener, 2007:763). Simons (1990) stresses examples such as the emerging new technologies, the changing customer needs, the sociopolitical threats and opportunities, and the competitive threats and opportunities that senior managers perceive.

Based on the contingency theory, it has been evidenced that the ‘perceived environmental uncertainty’ (PEU) determines the design of MCS as more managers perception of uncertain contingencies ask for more information to be processed by decision makers (Gordon & Narayanan, 1984:34). Simultaneously, may it be argued that, based on the contingency theory, the ‘perceived strategic uncertainty’ (PSU) would determine the use of MCS? A first argument in favor of a positive answer is found by Davila (2000:391-392) who, in his multi-methods investigation of ICS, poses that “uncertainty is a driving force in the design and use of management control systems”. Also, as previously mentioned, Ahrens & Chapman (2004), followed next by Wouters & Wilderom (2008), reframe the contingency theory with four new contingencies that would explain the design of the use of MCS. This design is the starting

\textsuperscript{17} In the initial arguments of Simons, two determinants were outlined: the strategic uncertainty and the clarity of the managers’ vision. The latter will not be reviewed in this article due to a lack of literature tying the use of information and the clarity of the vision. In addition, the strategic uncertainty is inherent in the managers’ vision for the future (Simons, 1991:59). Thus, reviewing the strategic uncertainty offers an overall picture of the basic of the managers’ vision.
Based on qualitative investigations (Bruining et al., 2004; Tuomela, 2005; Kober et al., 2007), it comes out that when more uncertainty is perceived by managers, more discussions on these strategic uncertainties are operated, and more information is acquired. First, in the qualitative analysis of the impact of a management buy-out on the style of use of MCS, Bruining et al. (2004:168) note from interviews that the market uncertainty generates better and open interactions in the planning process and a more “intensive briefing between employees and managers about critical factors”. However, the critical factors are related to what the firm already knows how to do well and not on contingencies that could provide threats or opportunities as circumstances change (Simons, 1991:50). An ambiguity in the meaning of ICS is spotlighted.

Second, when Tuomela (2005) studies the implementation of a new PMS, the author observes that “new kinds of information would be needed to further improve the control of strategic uncertainties” and, similarly, when Kober et al. (2007) investigate the facilitating role of ICS on a change in strategy, the authors notice that new meetings focused on discussions of professional issues are organized in a period of major changes. Consequently, from a qualitative perspective, it can be argued that the ‘perceived strategic uncertainty’ determines the interactive use of control systems.

From quantitative studies, it seems less evident that the strategic uncertainty determines ICS. First, when Widener (2007) investigates whether and how the levers of control of Simons influence one another, the author subdivides the strategic uncertainty into an operating (e.g., scale effects, internal product innovation), competitive (e.g., new industry entrants), and technological (e.g., new technology) uncertainty. Even though the results seem to support a relationship between the ‘competitive uncertainty’ only and ICS, the positive correlation remains marginal.

Second, as far as the relationship between ICS and innovation concerns, the studies of Davila (2000) and Bisbe & Otley (2004) are worth mentioning. On the one hand, Davila (2000) investigates the relationship between the project uncertainty, the project strategy, and the design of management information (in which the ‘interactive use’ is one dimension) and finds that the project uncertainty (symbolized by the market-, technology-related uncertainty and the project scope) is correlated with the design of management information. But, on the other hand, in scrutinizing the relationship between ICS and the ‘product innovation’, Bisbe
& Otley (2004) evoke the evident association between the ‘strategic uncertainty’ and ‘product innovation’. The authors do not find support for a direct relationship between ICS and the product innovation except for low-innovating firms.

Third, some scholars investigate the indirect effect of ICS such as the moderating and mediating effect on the relationship between the ‘strategic uncertainty’ and the ‘organizational performance’. In looking at the ‘strategic uncertainty’ associated with ‘strategic changes’, Abernethy & Brownell (1999) find support for a moderating effect of the interactive budget system on the relationship between the strategic changes and the organizational performance. Similar to Abernethy & Brownell (1999), Bisbe & Otley (2004) hold a significant positive moderating effect of ICS on the relationship between the product innovation and the organizational performance. Thus, quantitative investigations illustrate significant but weak direct relationship between the ‘strategic uncertainty’ and ICS. The indirect relationship, in turn, receives higher support.

4.2. Life-cycle of the firm

Greiner (1972:39, 1998:56) wrote that “it is evident that the same organization practices are not maintained throughout a long time span”. Several authors agree on the importance of studying management control practices across life-cycle stages (Moores & Yuen, 2001; Auzair & Langfield-Smith, 2005; Davila, 2005; Davila & Foster, 2005; Granlund & Taipaleenmäki, 2005; Sandino, 2007; Kallunki & Silvola, 2008). They recognize that the control needs vary along the life of the firms. In most cases, “studies do not consider the role of contingencies within each growth stage [of firms], implicitly assuming that all firms in the same growth stage introduce the same types of MCS” (Sandino, 2007:268).

Given ICS is conditioned to meet the information and control needs of the managers and their organizations, Simons (1995, 2000) introduce the idea of when ICS is implemented with respect to the life-cycle of the firm (Fig. 1).

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Insert Figure 1 about here

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Traditional contingency studies are conducted to measure a relationship between the
organizational life-cycle and the design of MCS (Auzair & Langfield-Smith, 2005). Concerning the relationship between the organizational life-cycle and the use of MCS, in turn, many questions remain pending even though quantitative (Moores & Yuen, 2001; Davila & Foster, 2005 & 2007; Davila, 2005; Sandino, 2007; Kallunki & Silvola, 2008) and qualitative studies (Grandlund & Taipaleenmäki, 2005) conduct empirical investigations close to this relationship. Based on a review of the organizational life-cycle literature, five studies are worthwhile to be considered. To do so, the research question, the chosen methodology and the findings related to MCS are presented and discussed.

Based on the ‘gestalt’ concept of Miller (1981), Moores & Yuen (2001) conduct an analysis on the potential difference in the selection and presentation of management information across the organizational life-cycle stages. With 49 usable responses to a mail survey in the clothing and footwear industry, they classify firms into their respective stages (birth, growth, maturity, revival and decline, Miller & Friesen (1983, 1984)) from a cluster analysis. The authors find significant support for the hypothesis that MAS formality is different at each stage, and most predominantly between the growth and maturity stages. Despite the small sample size, the fact that the selection and presentation of information are more formalized across the stages of development is indicative of differences in the design of MCS across the organizational life-cycle.

Concentrated on the life-cycle model of Miller & Friesen (1983, 1984) as well and the results of Moores & Yuen (2001), Kallunki & Silvola (2008) investigate the relationship between the extent of use of ABC system and the organizational life-cycle stages. With 105 Finnish respondents from a survey questionnaire inserted in a multivariate equation, the authors confirm that “characteristics of the firm affecting the use of advanced cost-accounting systems differ across life cycle stage phases” (p.68), what supports the life-cycle principle. More importantly, the authors show evidence that ABC usage “is more common among firms in maturity and revival phases than it is among firms in a growth phase” (p.76). Even the reasons for using MCS vary with the stages of development.

Other studies such as Davila (2005) and Davila & Foster (2005 & 2007) address the emergence of MCS in early-stage companies. All three studies focus on the starting phase of

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18 Auzair & Langfield-Smith (2005) utilize a ‘selection’ contingency approach accordingly to build their theoretical framework.

19 Moores & Yuen (2001:357) conceptualize organizational life-cycle configurations “as distinctive patterns of organizational characteristics including strategy, structure, leadership and decision-making styles at each stage”.

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the life-cycle in which the first formal MCS appear.

From a review of entrepreneurial and life-cycle literature, Davila (2005) explores what drives the emergence of formal MCS. Based on the findings of Moores & Yuen (2001), the author quantitatively measures the relationship between these drivers and the adoption of human resources management system. His results from interviews of 95 technology-oriented firms in California’s Silicon Valley indicate that “the size of the organization, its age, the replacement of the founder as CEO, and the existence of outside investors” (p.223) are associated with the adoption of formal MCS. Interestingly, Bruining et al. (2004:167) notice during their qualitative investigation that the adoption of more ICS takes place through the strategic appointment to the Supervisory Board of the chairman. Therefore, the design of the use of MCS seems to be influenced by the replacement of the founder, and the existence of outside investors like for the design of MCS.

Close to this study, one of the research questions posed by Davila & Foster (2005) concern the determinants of the time-to-adoption of formal MAS, and, in particular, the decision to adopt an operating budget. With a sample of 78 multi-industry start-up companies, the authors answer that, in addition to the significant variables of Davila (2005), CEO experience, CEO style and the hiring of a financial manager are associated with faster adoption of budgets.

With the same sample as Davila & Foster (2005), Davila & Foster (2007) measure the time-to-adoption of formal MCS, the variables influencing this time-to-adoption, and the rate of adoption of MCS. The results indicate that the financial planning system is the first adopted MCS, followed by the human resources management system. Also, number of employees, presence of venture capital, international operations, and time to revenue are associated with the rate of adoption. Finally, the CEO with larger tenure adopt more MCS. The supported rationale of adoption of MCS comes from the need of more formal systems to scale-up the organizations. In fact, the adoption of MCS is correlated with the size of the organization. Based on this thinking, the next question might be what drives the adoption of ICS.

These five recent studies are indicative of the actual interest in the impact of the organizational life-cycle stages on the design of MCS. Yet, the questions of the relationship between the organizational life-cycle and ICS remain unanswered although it is commonly agreed that the needs of management information increase with the developmental stage of the firm. An important avenue for research is situated in the development of understanding of
ICS design across the stages of organizational development.

4.3. Levers of control

Initially, Simons proposes four levers of control. The beliefs system and interactive control system represent two ‘positive’ (‘organic’, ‘enabling’, ‘yang’) forces and the boundary system and diagnostic control system correspond to two ‘negative’ (‘mechanistic’, ‘coercive’, ‘yin’) forces. The interplay of both forces creates a dynamic tension necessary for reconciling the organizational objectives of efficiency and innovation. This dynamic tension entails that each lever can be influenced by the others and, used together, allow to release energy into profitable growth. As far as ICS concerns, three investigations have been conducted to explore the different relationships between the levers.

From a 4-year long case study, Tuomela (2005:309) develops a new performance measurement system within a Finland company and, at the same time, studies the consequences of an interactive use of PMS. The author notices a longitudinal relationship within the positive force of levers (beliefs system and ICS). In practice, the goal of the performance measurement system evolves from support to a beliefs system to an ICS (and also indirectly via a DCS), which is in line with the fact that “the functioning of interactive and diagnostic controls depends on organizational belief and boundary systems” (Ahrens & Chapman, 2004:278). More specifically, Simons (1995:155) notices that the belief system serves as an inspirational tool to implement intended strategy via DCS and to find out emergent strategy via ICS.

Quantitatively, two investigations have been conducted to scrutinize the value of the relationship respectively between (1) a belief system and ICS, and (2) a diagnostic control system and ICS. First, in analyzing the framework of Simons (2000), the results of Widener (2007:779) support the hypothesis that the beliefs system influences the ICS. Second, in the study of the relationship between DCS, ICS and the organizational capabilities, the results of Henri (2006:541) indicate that the interactive control system and diagnostic control system are highly and significantly correlated. Thus, ICS is associated with DCS. But, based on a conceptual reasoning, it is agreed that the parallel use of DCS and ICS creates a dynamic tension that reconciles the search of innovation development and the achievement of strategic targets but the reason why DCS determines ICS (or the reverse) is less evident.

Although some relationships between the levers are not investigated, qualitative and quantitative studies substantiate and evidence the hypothesis that ICS is determined by the
belief system.

5.0 OUTCOMES OF THE INTERACTIVE CONTROL SYSTEMS

This section focuses on the implications of ICS that refer to the effects of ICS rather than to the construct itself. Then, based on the literature, it can be argued that the use of ICS drives the managers’ attention toward the strategic uncertainties. Through debates and dialogues between subordinates, peers and superiors, managers look for new information in order to handle these strategic uncertainties. Potential outputs of these debates and dialogues are the development of a new product, the formulation of a new strategy or the management of crisis. Overall, ICS plays a predominant role in all organizational changes (Kloot, 1997).

With this short description of theoretical effects of ICS, structuring the multiple outcomes of ICS requires a framework of analysis that clusters the effects. The two groups activated by Marginson (2002) cast the level of analysis: (1) the implications of ICS for managers’ strategic activities, and (2) the strategic outcomes at the firm level. This separation is consistent with Chenhall (2003) when the author reviews the outcomes of MCS. The first corresponds to the behavioral outcomes. This cluster gathers the managers’ activities that represent “their involvement in the detection of new ideas and in mobilization of resources around these new ideas” (Marginson, 2002:1022). The second reflects the organizational level. Based on the managers’ strategic behavior, they bring important contributions to a firm’s strategic program and rate of strategic adjustment. This framework suits to the conceptualization of Simons that describes what MCS should comprise in order to direct managers’ strategic activities, thereby leading to desirable outcomes at the firm level.

5.1. Strategic outcomes at the individual level

Few studies give attention to the impact of ICS on the managers’ activities. Three qualitative investigations have been marked as corresponding to this field. Hence, a quantitative support is a potential avenue for research.

Focused on the individual level, the question of the impact of ICS on the strategy implementation process remains vague. Marginson (2002) conducts a longitudinal analysis to explore how and why MCS can influence the managers’ strategic activities. In looking at the interactive use of performance measurement system, the author argues that “there was little evidence that top management’s use of KPIs as interactive controls helped to guide strategic activity within the firm” (1026). But, according to Simons (1995:95), KPI cannot be used as
interactive control because the objective of focusing on the critical performance variables is opposed to the one of concentrating on the strategic uncertainties. In fact, the use of KPI signifies that managers focus on the implementation of intended strategy and search for the ‘correct answer’ but do not concentrate on the formation of emerging strategy and do not search for the ‘correct question’. This ambiguity in the difference between the focus on KPI and on the strategic uncertainties makes Marginson (2002:1026) conclude that using the performance measurement system creates a tension within the process of strategy development. This tension comes from the choice between enhancing creative innovation and achieving predictable goal. On the one hand, the creative innovation and organizational adaptation is facilitated by focusing the manager attention onto the contingencies that could threaten the current strategy of the business. On the other hand, the achievement of predictable goal is facilitated by focusing the manager’s attention on the most important critical performance variable.

A second impact of ICS on the managers’ strategic activities is the search of information. In case of increasing strategic uncertainty, the top managers extend their source of information and try to develop new information-based interactions (through face-to-face dialogues) with lower-level managers in contact with the clients, suppliers, financial investors or other stakeholders (Bruining et al., 2004). This allows to reduce the strategic uncertainty and to make the firm more market responsive. This finding is close to the significant positive association between the environmental uncertainty and the broad scope of information (Chenhall & Morris, 1986).

This search for information causes challenges to the managers’ strategic agendas (Tuomela, 2005). First, as predicted by Simons, interactive use of MCS is costly in terms of time consumption both when collecting the data and when discussing the results. Second, according to the qualitative investigation of Tuomela (2005) on the consequences of an interactive use of PMS, the design of ICS increases the visibility of actions which may initiate resistance to change.

5.2. Strategic outcomes at the firm level

Three main outcomes at the firm level can be enumerated. ICS facilitates (1) learning, (2) strategic change, and (3) innovation. First of all, as far as the organizational learning concerns (Levitt & March, 1988; Huber, 1991; Weick, 1991; Kim, 1993; Hurley & Hult, 1998; Crossan, Lane & White, 1999; Bontis, Crossan & Hulland, 2002; Örtenblad, 2002; Shipton,
Kloot (1997) argues that an interactive use of MCS determines the responses to the organizational change through surveillance, dialogues and debates. When those responses result in organizational change, a ‘generative’ learning occurs. As it seems that people learn before their organization adapts (Ittner & Larcker, 2001:399), facilitating organizational change passes first through facilitating the organizational learning. However, the difference in role between facilitating learning and facilitating strategic change is not always straightforward. Although Simons (1995) suggests that interactive MCS ‘facilitates’ double loop learning, Kloot (1997:53) for example acknowledges that “the definitions of MCS and organizational learning display commonality of purpose: both are concerned with changing or adapting an organization to ensure its fit with its environment”.

Abernethy & Brownell (1999) accordingly define the ‘role’ of ICS as a ‘learning machine’ or ‘idea creation machine’ in the formulation and implementation of a strategic change. Based on 63 usable responses from Australian public hospitals, they find significant support for a moderating effect of an interactive use of budget control system on the relationship between a strategic change and the performance. Given the incapacity to observe the organizational learning, the authors deduce from the results that the learning and adaptation role of ICS is evidenced and especially effective during strategic change. Similarly, Tuomela (2005) claims that ICS facilitates organizational dialogue amongst top managers through which strategic learning can emerge.

In recognizing the organizational learning as a primary organizational capability to reach competitive advantage, Henri (2006:532) investigates the relationship (among others) between the interactive use of PMS and this organizational learning. With 383 usable responses from Canadian manufacturing firms, the author finds strong support for this relationship.

Instead of using the concept of organizational learning, Widener (2007) exploits the concept of ‘orientation to learning’. Like Henri (2006), the author studies the relationship (among others) between the interactive use of PMS and this orientation to learning. With 122 usable responses from variable types of firms, her results, in turn, reveal mixed support for

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20 ‘Generative’ learning (Kloot, 1997) or ‘double loop’ learning (Argyris, 1977) is the process that questions (and tries to understand) any deviations from preset targets. In the case of deviations, organizational learning occurs if managers understand the reasons behind these deviations and, accordingly, adjust their behaviour (now or in the future) to manifest new opportunities. Opposed to this ‘generative’ learning, the ‘adaptive’ learning (Kloot, 1997) or ‘single loop’ learning (Argyris, 1977) occurs if the subordinates adjust their behaviour to reach the preset target in the case of deviations from preset targets.
this relationship. Interestingly, it is noteworthy that inspecting the uni- or bi-variate correlations alters the significance of the results. Moreover, this significance is also modified according to chosen path model. Therefore, these two remarks outline the profound influence of the methodological choice on the significance of the results.

Second of all, a strategic change is viewed here as a change of momentum (Miller & Friesen, 1980a, 1980b, 1982; Drazin & Van de Ven, 1985). Generally, most organizations evolve to a direction led by past trends. In this context, a strategic change means to break down past trends or to build new ones (Miller, 1987). Based on the results of Abernethy & Brownell (1999), the interactive use of budget control system moderates the relationship between strategic change and the performance. To come up with this statement, the authors define the strategic change as the extent to which a firm is moving along the defender/prospector continuum (Miles & Snow, 1978), which corresponds to a change in momentum (Gerdin & Greve, 2004). Naranjo-Gil & Hartmann (2007) reuse this instrument to further the relationship between ICS in a context of strategic change. Regarding the extent of strategic change, the authors suggest a direct effect of ICS on this extent. Concerning the direction of strategic change, they subdivide their sample in two groups: (1) the hospitals changing toward a prospector position, and (2) the hospitals going to a defender position. Derived from their 381 usable responses from Spanish hospitals, Naranjo-Gil & Hartmann (2007) find support for a direct effect of ICS on the extent of strategic change and a significant (insignificant) relationship between ICS and the strategic change toward prospector (defender).

Traditionally, it has been argued that a change in strategy is tied to a change in the design of MCS (Simons, 1987; Dent, 1990; Langfield-Smith, 1997; Chenhall, 2003). In reversing the traditional view, does a particular use of MCS facilitates a change in strategy? Through a qualitative study investigating this case of a change in strategy, Kober et al. (2007) remark that ICS facilitates this change, which is in line with the facilitating role of ICS.

Third of all, as previously noted, the use of formal accounting information was widely deemed as a brake for the development of innovation (Bisbe & Otley, 2004) even though the early study of Hopwood (1974) reveal that the manner of using the formal accounting

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21 First, “momentum is expected to be a dominant factor in organizational evolution; that is, reversals in the direction of change in variables of strategy and structure are expected to be relatively rare”. Second, “momentum is likely to coexist among a great many variables of strategy and structure at the same time; that is, momentum will be pervasive” (Miller & Friesen, 1980a:592-593).
information can be creative and flexible rather than short-termist. In a new product development context, Davila (2000) investigates the relationship between the MCS design (construct in which ICS is one dimension of the design of MCS) and the project performance. With 56 usable responses from 11 firms, he finds evidence that a more intense use of MCS has a positive effect on project performance. Overall, the facilitating role of ICS in the development of innovation is supported (Davila, 2000; Bisbe & Otley, 2004).

6.0 CONCLUSIONS

The literature covering the dimensions, the determinants and the outcomes of an interactive use of management control system has been screened and structured so that the different studies working with the Simons’ construct of ICS are sorted together. It allows to point to the gap in the literature and offers avenue for research.

First of all, a specification issue of ICS has been opened by Bisbe et al. (2007). Based on a priori conceptual reasoning, they call for the measurement of a multidimensional construct instead of a traditional unidimensional one. In reviewing the literature on the indicators used in quantitative and qualitative studies, it comes out that few consider this possibility. Therefore, one avenue for quantitative research is the construction of a measurement instrument of an ‘interactive use’ composed of different dimensions and indicators already utilized in previous studies. This avenue is in line with the endeavour of Van der Stede (2001) about the ‘tight’ budget control system.

Additionally, a call for methodological progress is made for the qualitative studies. In fact, the interview protocols and the manners to derive an ‘interactive use’ from the interviews or observations are poorly described in the qualitative literature. It would facilitate the replication of studies and avoid reinterpreting ICS.

Second of all, researches on what determines the use of MCS are still in its infancy. On the one hand, the contingency theory is emphasized. Based on the theory of Adler & Borys (1996), Ahrens & Chapman (2004) and Wouters & Wilderom (2008) organize a contingency framework to understand what determines the design of the use of MCS. Conceptual developments of the contextual and structural contingencies and quantitative tests of hypothesis would allow to a certain extent to bring an answer. Although the empirical results remain marginal, attempts to measure the strategic uncertainties as a contingency to determine the style of use of MCS has been operated. On the other hand, no investigation has been conducted to understand the relationship between the organizational life-cycle and the style of
use of MCS despite the fact that Simons proposes a framework likely to be tested. For example, what drives the emergence of ICS would be a worthwhile future research question.

Finally, the types of ICS outcomes are split in two groups. In the first group, the impact on the managers’ strategic activities is explored and mainly through qualitative studies. It can be observed that few researches focus on the behavioural impact of ICS and particularly few quantitative investigations. The pervasiveness of using management information through dialogues and debates is supposed to head people for the search of new opportunities of development. Then, to what extent ICS impacts the strategic activities of the operating managers would indicate the scope of ICS within the organization and consequently, to what extent a change in the style of use of MCS from DCS to ICS would have consequence on the resistance of change.

Acknowledgments

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Table 1. Significant indicators to measure the ‘interactive use’ of management control system (post hoc evidences from quantitative studies)

<table>
<thead>
<tr>
<th>Studies</th>
<th>Items</th>
<th>Antecedents</th>
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| Abernethy & Brownell (1999:202)      | 1.1. The extent to which you agree that you often use budgeting information as a means of questioning and debating the ongoing decisions and actions of manager.  
1.2. The extent to which you agree that the budget process is continuous - it demands regular and frequent attention from managers at all levels.  
1.3. The extent to which you agree that there is a lot of interaction between top management and department/unit managers in the budget process.  
1.4. The extent to which you agree that you use the budget process to discuss with my peers and subordinates changes occurring in the hospital. | Simons (1990, 1991)                  |
| Davila (2000:396)                    | 2. The extent you agree that the information was used constantly in the interactions with my team. Frequently it was the main topic of our conversation.                                                                 | Simons                                |
| Van der Stede (2001:127-128)        | 3.1. Corporate superiors call me in to discuss budget deviations in face-to-face meetings.  
3.2. My corporate superiors, myself, and my own subordinates often form a team to discuss and solve budgeting matters.  
3.3. Budget matters are discussed regularly with my corporate superior even if there are no negative budget deviations to report.  
3.4. I consult with my corporate superior on how to achieve my budget.  
3.5. Indicate the typical frequency with which you formally communicate with the corporate parent for budget-related issues (R).  
3.6. Indicate the typical frequency with which you informally communicate with the corporate parent for budget-related issues (R). | Simons (1995)                        |
| Bisbe & Otley (2004:717)            | 4.1. The extent to which the information generated by a certain control system deserves attention as a means of regularly questioning and challenging ongoing action plans.  
4.2. The degree to which information from the control system is discussed face-to-face merely on an exception basis.  
4.3. The extent to which it demands frequent and regular attention from the top manager.  
4.4. The extent to which it demands frequent and regular attention from operating managers at all levels of the organization. | Abernethy & Brownell (1999) and Davila (2000) |
| Henri (2006:551)                    | 5.1. The extent to which your top management team currently uses performance measures to enable discussion in meetings of superiors, subordinates and peers.  
5.2. The extent to which your top management team currently uses performance measures to enable continual challenge and debate underlying data, assumptions and action plans.  
5.3. The extent to which your top management team currently uses performance measures to provide a common view of the organization.  
5.4. The extent to which your top management team currently uses performance measures to tie the organization together.  
5.5. The extent to which your top management team currently uses performance measures to enable the organization to focus on common issues.  
5.6. The extent to which your top management team currently uses performance measures to enable the organization to focus on critical success factors.  
5.7. The extent to which your top management team currently uses performance measures to develop a common vocabulary in the organization. | Vandenbosch (1999)                    |
| Widener (2007:785)                  | 6.1. The extent to which you agree that top management interprets information from the PM system.  
6.2. The extent to which you agree that top management pays little day-to-day attention on the PM system (R).  
6.3. The extent to which you agree that top management pays day-to-day attention to the PM system.  
6.4. The extent to which you agree that operating managers are involved infrequently and on an exception basis with the PM system (R).  
6.5. The extent to which you agree that operating managers are frequently involved with the PM system. | Henri (2006) and Simons (2000)        |
| Naranjo-Gil & Hartmann (2007:752)   | 7.1. The extent I use MAS to set and negotiate goals and targets.  
7.2. The extent I use MAS to debate data assumptions and actions plans.  
7.3. The extent I use MAS to signaling key strategic areas for improvement.  
7.4. The extent I use MAS to challenge new ideas and ways for doing tasks.  
7.5. The extent I use MAS for involvement in a permanent discussion with subordinates.  
Table 2. Indicators to measure the ‘interactive use’ of management control system (post hoc evidences from qualitative studies)

<table>
<thead>
<tr>
<th>Studies</th>
<th>Items</th>
<th>Antecedents</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8.2. What are the critical success factors for your unit/department? Who is responsible for establishing these?</td>
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<td></td>
<td>8.3. To what extent are you involved in ensuring achievement of these targets?</td>
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<td></td>
<td>8.4. Do you pay attention to any in particular? If yes, why?</td>
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<td>8.5. Are any changes made to these at any stage? What is/are the reasons for such change/modification?</td>
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<td>8.6. What are the major meetings or encounters that you have in the course of a normal working week/month?</td>
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<td>8.7. What are the topics of these meetings or encounters and who are the participants?</td>
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<td></td>
<td>8.8. Are the meetings regular or ad hoc?</td>
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<td></td>
<td>9.2. Experiments, knowledge systems, management development, learning.</td>
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<td></td>
<td>9.3. Items from operations on strategic agenda top management.</td>
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<td></td>
<td>9.4. Frequency of attention to management information from all management levels.</td>
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<td>9.5. Frequency of discussion strategic items between management levels.</td>
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<td></td>
<td>9.6. Changes in assumptions of firm’s strategy.</td>
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<td></td>
<td>10.2. Discussing the results within the measurement team and management groups.</td>
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<td>10.3. Focus on particular measures at one point of time.</td>
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<td>10.4. Trying to capture alleged cause-and-effect relationships into the presentation form.</td>
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<td>11.2. Discussions of variances: from rigidity to flexibility.</td>
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<td>11.3. Inter-hierarchical communication and discussion.</td>
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</table>
Table 3. Classification of indicators drawn from quantitative and qualitative studies according to the Bisbe et al. (2007) dimensions of ‘interactive use’

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<th>(5)</th>
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<td>11.3.</td>
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</table>

* Widener (2007:773) mentions that whether the Bisbe et al. (2007) dimensions serve as reference like this table, “interactive control [defined by Widener (2007:785)] corresponds to two of the properties having to do with the involvement of top and operating managers”, dimensions (1) and (2) respectively.
Figure 1. Interactive MCS from a life-cycle perspective (Simons, 2000:310)

<table>
<thead>
<tr>
<th>Life-Cycle</th>
<th>Diagnostic Control Systems</th>
<th>Interactive Control Systems</th>
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<tbody>
<tr>
<td>Small Start-up</td>
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<tr>
<td>Growing</td>
<td>Functional Specialization</td>
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<tr>
<td>Mature</td>
<td>Market-Based Profit Centers</td>
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<tr>
<td></td>
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<td>Product, Regional, Customer</td>
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</tbody>
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