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## Management control systems in high-tech start-ups: An empirical investigation

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### ABSTRACT

The literature on management control systems (MCS) has challenged the traditional belief that their use restrains the entrepreneurial posture of start-ups. This literature relates the adoption of these systems by start-ups to internal and external contingency factors. The aims of this study are twofold: i) to explore how different causal conditions related to these factors combine in explaining the use of MCS, and ii) how these combinations of causal conditions differ when comparing the MCS that relate to planning with those that relate to evaluation.

Based on survey data from a sample of high-tech start-ups, this study seeks to meet these objectives through quantitative and qualitative research methods.

The findings contribute to a better understanding of the adoption of MCS by start-ups. The findings demonstrate the relevance of the configurational analytical technique when simultaneously exploring the internal and external factors that lead to adoption.

### 1. Introduction

The life cycle theory of the firm (Miller & Friesen, 1983, 1984) identifies five successive phases: birth, growth, maturity, revival, and decline. The birth phase is the period in which a new firm tries to become viable. In this stage, the research characterizes firms as being small; having owner-managers; and being simple, centralized, and informal structures. Therefore, firms, called start-ups in the birth stage, mainly use simple control mechanisms and few or even no formal management control systems (MCS) (Churchill & Lewis, 1983; Grainer, 1972; Miller & Friesen, 1983, 1984). In line with Aldrich, Kalleberg, Marsden, and Cassell (1989), this study defines a start-up as an entity that coherently organizes itself for the first time.

Simons (2000, p.4) defines MCS as “formal, information based routines and procedures used by managers to maintain or alter patterns in organizational activities.” The MCS provide financial and non-financial information that managers can use for several purposes, such as decision-making, control, signaling, external learning, education, and communication (Simons, 2000). However, the success of start-ups depends, among other factors (such as human resources practices, Bendickson, Muldoon, Liguori, & Midgett, 2017), on the introduction of MCS that fit the firm's growth phase and its organizational characteristics. According to Grainer (1972), the adoption of MCS allows young

firms with fast growth to cope with the increasing need for information. In Grainer's (1998) opinion, a lack of MCS partly causes the failure of firms because of growth restrictions. In the same vein, Lin, Chen, and Lin (2017) find that operational and strategic control are positively and negatively related, respectively, to a new venture's performance. Therefore, MCS adoption is probably an important event in a startup's life (Davila & Foster, 2005, 2007).

Despite the hypothetical contribution of MCS to the success of start-ups, few studies focus on this phenomenon (Foster & Young, 1997). For instance, Davila and Foster (2005) find that although studies widely examine the budgeting of mature firms, the scientific knowledge about the use of this instrument in start-ups is quite low. The interest in start-ups by researchers of management control is a recent phenomenon (Davila & Foster, 2009), as evidenced by the literature (e.g., Davila & Foster, 2005, 2007; Davila, Foster, & Jia, 2010, 2015; Granlund & Taipaleenmäki, 2005; Lin et al., 2017; Moores & Yuen, 2001; Sandino, 2007).

The contingency theory posits that a firm's performance derives from the alignment between the characteristics of the organization and its contingencies (Donaldson, 2001). Applied to organizational control, this theory posits that none of MCS is universally appropriate for all firms and that MCS should not be equally applied across all firms and in all circumstances (Merchant & Van der Stede, 2007; Otley, 1980). The

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best MCS are those which help managers to achieve their organizational objectives and therefore should adjust to the context in which they are going to operate (Chenhall, 2007). However, the methods that contingency studies usually use (e.g., King, Clarkson, & Wallace, 2010) are linear. These studies seek statistically significant correlations in the interdependencies between contingency factors and organizational controls in improving performance. This analysis becomes reductionist in explaining the behavior of the constituent parts of the organization (Meyer, Tsui, & Hinings, 1993), since it assumes that there is an optimal organizational configuration (Fiss, 2007). In this sense, the analysis cannot uncover the complexity of the configurational arrangements present in organizations (Bedford & Sandelin, 2015).

Traditional contingency studies have neglected the multifaceted nature of controls and how multiple controls combine, which limits advancement in the control theory (Cardinal, Sitkin, & Long, 2010). Organizational control is in practice a complex and dynamic phenomenon (Cardinal et al., 2010) that results from a package of MCS that interacts in a differentiated and complex way with situational factors. Grabner and Moers (2013) define a package of MCS as a complete set of control practices that the firm implements (interdependently or not). This view has recently become the focus of many studies, as exemplified by Bedford and Malmi (2015) and Bedford, Malmi, and Sandelin (2016) who show the need to undertake studies that examine the inter-relationship between the overall MCS that an organization uses and its internal and external contingency factors (Otey, 2016). Two or more organizational configurations could be equally effective in achieving the desired outcomes (Fiss, 2007). This equifinality concept raises interest in the configurational analysis that emphasizes the holistic nature of organizations and their need for coherence among organizational elements (Meyer et al., 1993), including MCS. Gerdin (2005) remarks that an important task for future research is to examine the existence of alternative and functional equivalents of MCS designs.

The purpose of this research is to understand the association between a group of contingency factors that are traditionally found in the contingency-based organizational control research and the adoption of MCS in start-ups. Therefore, this research does not seek to understand how the use of MCS affects the performance of firms, because a great deal of research already exists on that subject (e.g., Davila & Foster, 2005; King & Clarkson, 2015; Lin et al., 2017; Tsamenyi, Sahadev, & Qiao, 2011).

This study simultaneously examines external factors, such as the type of investor and environmental heterogeneity, and internal factors, such as business strategy and structure decentralization. Specifically, the study's objectives are: i) to explore how different causal conditions related to internal and external factors combine in explaining the use of MCS, and ii) how these combinations of causal conditions differ when comparing the MCS that relate to planning with those that relate to evaluation.

Although previous authors (e.g., Davila & Foster, 2005, 2007) do not distinguish between these two types of MCS, planning and evaluation are vital activities for start-ups to become viable and to grow (Karlsson & Honig, 2009; Puhakka, 2007). They both provide the information that managers need to make the right decisions (Silvola, 2008).

This study uses two complementary methods, the cluster analysis and the fuzzy-set qualitative comparative analysis (fsQCA). Although the research uses the cluster analysis more frequently (e.g., Gerdin, 2005; King & Clarkson, 2015; Moores & Yuen, 2001), these two methods show some complementarities that several researchers in different fields have already explored (e.g., Fiss, 2011; Haynes, 2014). Further, both methods are case-based and accept that more than one solution exists to achieve the desired outcome (Haynes, 2014). Nevertheless, this study concludes that the fsQCA presents several advantages over the cluster analysis, and therefore reinforces the arguments of several authors (Fiss, 2011; Haynes, 2014), namely in the management control field (Bedford et al., 2016; Bedford & Sandelin, 2015).

Although the accounting research rarely uses the fsQCA, it is a suitable technique to analyze the conditions for the occurrence of a specific phenomenon (Rihoux & Ragin, 2009), especially to analyze complex causation and nonlinear relationships (Ragin, 2008). Therefore, this research draws on the insights of the configuration or configurational theory, a modern variation of the contingency theory (Donaldson, 2006), by using a cluster analysis and the fsQCA.

Building on a sample of 54 Portuguese high-tech start-ups, the results show the existence of multiple combinations of situational factors and the MCS. These findings offer some support for the idea of a combined effect of internal and external factors in the adoption of MCS by start-ups. This study also contributes to the literature by confirming that organizational control is a complex phenomenon that translates into different organizational configurations.

Following this introductory section, Section 2 provides the literature review. Section 3 presents the research model, the propositions, the measures, and the method. Section 4 presents the empirical results, and Section 5 exhibits the discussion and advances with the conclusions.

## 2. Literature review

The contingency approach in the organizational control field proposes that a large number of external and internal contingency factors determine the design, implementation, and use of the MCS that a firm adopts (Chenhall, 2007; Luft & Shields, 2007). Even so, the studies that traditionally focus on the contingency theory adhere to the reductionist tenet by seeking linear correlations and an optimal organizational configuration, which is contrary to the principles of configurational theory (Meyer et al., 1993). Conversely, this study applies a configurational analysis (Meyer et al., 1993; Snow, Miles, & Miles, 2006) to examine the interrelationship between planning and evaluation MCS and some of the most frequently identified situational factors in the traditional contingency-based organizational control research. Specifically, environmental heterogeneity and type of investor have been considered as external factors and business strategy and structure decentralization as internal factors. This study argues that these situational factors can have different effects on the use of MCS by start-ups in contrast to other factors in the literature (e.g., size) whose effects might be lower in high-tech startups.

### 2.1. External factors

#### 2.1.1. Type of investors

According to the agency theory, the investor takes on the main role of managing his or her relationship with the start-up's management team (Jensen & Meckling, 1976). However, this role might depend largely on (1) the weight of financial resources the investor has in the capital structure of the start-up; and (2) whether the financial resources are in the form of debt or equity. Therefore, the type of investor should affect the type of MCS that the start-up uses.

In a relationship between the investor and the manager, conflicts of interest may emerge due to information asymmetry. Bergemann and Hege (1998) mention that a conflict exists between the entrepreneur/manager (agent) and venture capitalist (principal), because the former controls the allocation of funds and investments as well as the flow of information about a project. The manager usually possesses more detailed information and before the investors. According to Baiman (1982), MCS are important in reducing agency costs. The studies by Reid and Smith (2000) and Smith (2005) find that venture capital firms seek to reduce risk and agency problems through MCS, and the improvement of the MCS is sometimes a requirement for the venture capitalists to invest in the start-up (Mitchell, Reid, & Terry, 1997). The professionalization of management, which includes the introduction of MCS, is a part of a package of benefits venture capital firms grant to start-ups (Hellmann & Puri, 2002). This package often includes the evaluations of the quality of the staff and the recruitment of people

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