

**Explaining Management Innovation Pervasiveness: The Role of
Internal Antecedents**

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ABSTRACT

Management innovation is the introduction of new management practices, processes, techniques or organizational structures that significantly alter the way the work of management is performed. This paper examines a particular characteristic of management innovation: i.e. pervasiveness. Based on the behavioral theory of the firm, the determinants of firms' adoption of pervasive management innovations are explored. I find that performance shortfalls have a direct positive effect on the pervasiveness of adopted innovations. Likewise, I find a direct effect of education level, richness of internal communication and CEO novelty on pervasiveness.

INTRODUCTION AND BACKGROUND

Recently, the phenomenon of management innovation has attracted increasing interest among scholars and practitioners (e.g. Birkinshaw et al., 2008; Damanpour et al., 2009; Lazonick & Teece, 2010; Mol & Birkinshaw, 2009). While innovation in general and technological innovation in particular have been subject to intense research scrutiny over at least the last half century, management innovation is still an emerging field struggling with unclear definitions, weak empirical measurements and limited knowledge of the basic generative mechanisms and performance consequences.

Systematic discussions about innovation characteristics or properties have been surprisingly absent in the management innovation literature. In studies of other types of innovation, it is widely recognized that an understanding of innovation characteristics is a prerequisite for building cumulative and generalizable knowledge (Wolfe, 1994). Numerous studies of technological innovation have shown that innovation characteristics influence innovation adoption (Damanpour & Schneider, 2009; Wolfe, 1994; Zaltman et al., 1973). For example, a review of 75 studies identified three innovation characteristics (compatibility, relative advantage and complexity) that have a consistent and significant effect on innovation adoption (Tornatzky & Klein, 1982). Pelz and Munson (1982) also found that innovation attributes such as the originality and the complexity of an innovation influenced the sequence of innovation stages. The more complex or uncertain an innovation, the more disorderly the observed innovation process in firms. Hitherto, no publications have applied or measured any of these innovation attributes in empirical studies of management innovations.

Overall, management innovation refers to the introduction of new management practices, processes, techniques or structures¹ (Birkinshaw et al., 2008; Mol & Birkinshaw, 2007b). Examples of well known management innovation include Motorola's six sigma methodology, the multidivisional form at General Motors and Oticon's spaghetti organization (Chandler, 1962; Foss, 2003; Mol & Birkinshaw, 2007a), but

¹ For the benefit of readability, the term management practices is used to refer both to practices, processes techniques and structures throughout the paper.

management innovations may also be changes of a smaller scale and hence less observable. Since management innovations involve changes in the internal functioning of a firm, e.g. its task design, reward structures, management philosophies and distribution of decision making authority, they are often more tacit, systemic and difficult to imitate than technological innovations. For that reason, it can be argued that management innovations are an important potential source of sustainable competitive advantage in firms (Barney, 1991; Barney, 1996; Penrose, 1959; Teece & Pisano, 1994).

Nevertheless, little systematic knowledge about management innovation has been gathered. Detailed accounts of the emergence and spread of specific innovations exist (e.g. Chandler, 1962; Fligstein, 1985; Guler et al., 2002; Kossek, 1987; Teece, 1980). Also, a stream of diffusion literature has focused on the general patterns of diffusion of organizational practices (e.g. Ansari et al., 2010; Massini et al., 2005). But few studies have addressed the antecedents or the performance consequences of management innovation from a firm-level perspective. Noteworthy exceptions include the recent contributions from particularly Michael Mol, Julian Birkinshaw and Gary Hamel (e.g. Birkinshaw et al., 2008; Hamel, 2006; Mol & Birkinshaw, 2009; Mol & Birkinshaw, 2007a; Mol & Birkinshaw, 2007b). Nevertheless, research on management innovation is still characterized by lack of consensus on definitions and theoretical frameworks and there is no shortage of methodologies and theoretical lenses proposed in the various recent publications.

This paper defines management innovation as the implementation of management practices, processes, techniques or structures that are new to the firm. The main purpose of the paper is to contribute to the growing literature on management innovation by addressing the gap in our understanding of innovation characteristics. Particularly, this article addresses pervasiveness as a characteristic of management innovation and attempts to explain what leads firms to adopt management innovations with higher levels of pervasiveness. Arguably, innovations with different levels of pervasiveness are likely to be affected differently by different organizational and contextual factors (Wolfe, 1994). As

mentioned, the literature on technological innovation has paid a great deal of attention to innovation characteristics. For example, innovations have been subdivided into product vs. process innovation (e.g. Abernathy & Utterback, 1978; Damanpour & Aravind, 2006; Edquist et al., 2001), radical vs. incremental innovations (e.g. Afuah, 1998; Dewar & Dutton, 1986; Ettlie et al., 1984; Greenwood & Hinings, 1996) and complex vs. simple innovations (e.g. Damanpour & Schneider, 2009; Pelz, 1985; Wolfe, 1994).

Pervasiveness in this paper refers to the number of units or employees affected by an innovation and is similar to what has been labeled “scope” (Wilson, 1966; Wolfe, 1994) or “breadth” (Pelz & Munson, 1982) in studies of technological innovation. It is widely acknowledged in innovation studies that complex innovations involve higher levels of uncertainty and higher implementation costs for adopting organizations (Damanpour & Schneider, 2009). However, complexity has been defined in a number of ways. For example, complexity can refer to the intellectual difficulty associated with understanding an innovation (Drucker, 1985) or to the trialability of an innovation, i.e. the extent to which an innovation may be experimented with on a limited basis (Damanpour & Schneider, 2009; Rogers, 2003). Complexity is defined by Rogers and Shoemaker (1971, p. 154) as “the degree to which an innovation is perceived as relatively difficult to understand and use”. Pervasiveness in this paper is used in a meaning similar to the notion of organizational complexity proposed by Pelz (1985). Pelz (1985) distinguishes between technical and organizational complexity of an innovation, where the first refers to the divisibility of the new technology and the latter to the number of units or groups involved in its adoption. Since innovations that involve multiple units require more coordination and entail higher implementation costs than innovations that are only adopted by a few units, pervasiveness is central for understanding innovation adoption (Damanpour & Schneider, 2009; Pelz, 1985). The definition of pervasiveness employed in this study, furthermore, reflects the way complexity as a term is used to describe the structure of a firm. As a characteristic of a firm, complexity typically refers to how differentiated the structure of the organization is (Blau & McKinley, 1979; Damanpour, 1996; Hall, 1977). The degree of complexity, then, is implied by the extent of

differentiation along a number of dimensions, e.g. number of occupational types, hierarchical levels functions (Aiken et al., 1980; Blau, 1970).

The main purpose of the paper is to explain what leads some firms to adopt more pervasive management innovations than others. Based on survey and archival data, two main questions are addressed. First, how does external stimuli in the form of a performance shortfall influence the pervasiveness of adopted management innovations? Second, how do internal antecedents influence the pervasiveness of adopted innovations? Specifically, the paper explores three internal antecedents: workforce education levels, richness of internal communication and CEO novelty.

In the following section, a set of hypotheses are developed based on behavioral theory and findings from previous management innovation studies. Then data and methodologies employed in the study are described. Finally, the paper discusses the findings, limitations and implications for future research.

THEORETICAL DEVELOPMENT

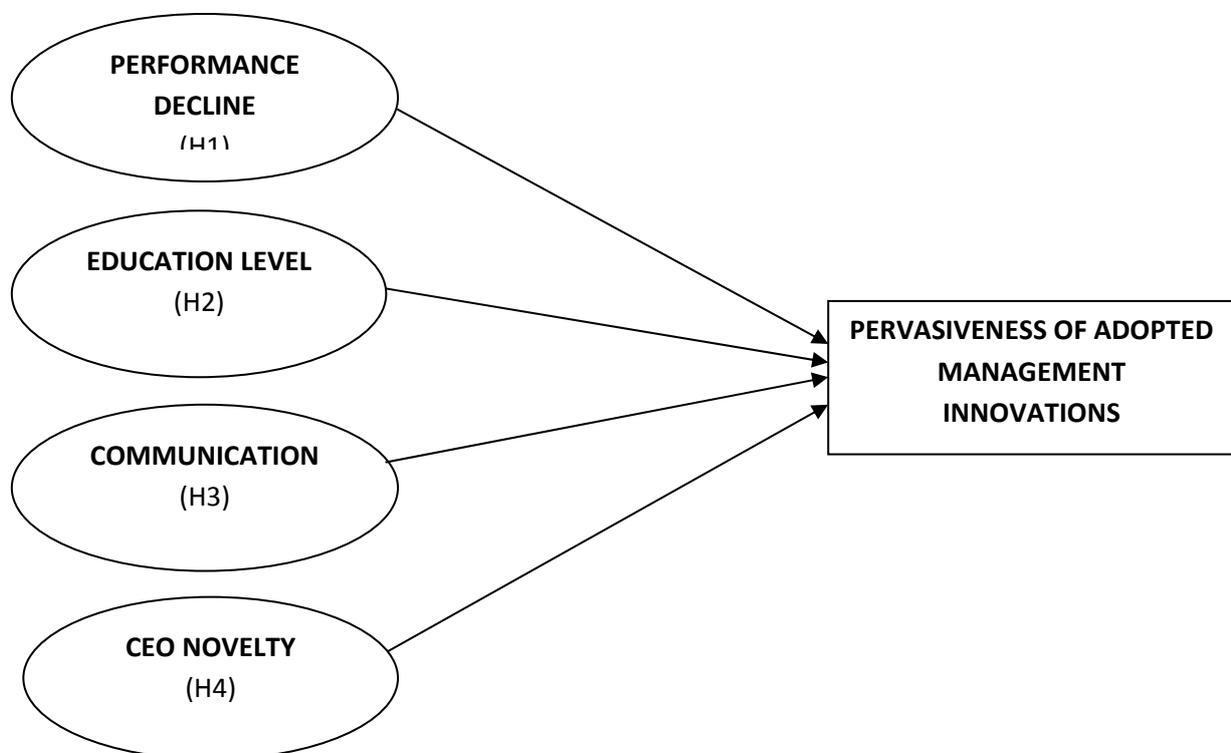
The theoretical lenses applied in this paper is derived from the behavioral theory of the firm (Cyert & March, 1963; March & Simon, 1958; Simon, 1947; Simon, 1955). The behavioral theory of the firm (BTF) pioneered the understanding of the internal organization of firms and has contributed importantly to the foundation for most modern theories of strategy and firm behavior (Pierce et al., 2008). BTF incorporates sociological and social psychology perspectives into economics and thereby provides a more realistic theory of decision making in firms. The original contribution by Cyert and March (1963) provided a deep understanding of how firms make decisions in a context of bounded rationality, conflicting goals, problem driven search and imperfect environmental matching. However, they provide few guidelines for managers actually seeking to change firm behavior.

Subsequent contributions in the field of strategic management have remedied this weakness in Cyert and March' framework. Most notably the resource based view (Barney , 1991; Barney, 1996; Penrose,

1959; Wernerfelt, 1984) and the dynamic capabilities perspective (Pierce et al., 2008; Teece et al., 1997; Teece, 2007; Winter, 2003) have formulated theories of firm behavior with stronger prescriptive implications. These perspectives are highly compatible with the assumptions and perspectives of BTF and I will regard them as part of a broader BTF tradition (for a discussion of the relation between BTF, resource based theory and dynamic capabilities see e.g. Pierce et al., 2008). The resource based view and the dynamic capabilities perspective emphasize how heterogeneous internal resources, routines and capabilities underlie the sustainable competitive advantage of firms.

The broad BTF perspectives discussed above provide a nuanced and realistic starting point for understanding the decision to adopt management innovations in firms. In the following section, these theories are used to argue for four hypotheses related to the pervasiveness of adopted management innovations. The hypotheses are summarized in the model presented in figure 1.

Figure 1. Overall conceptual model



HYPOTHESES

Performance shortfall

It is a fairly straightforward assumption that an important driver of changes in firms are changes in their external environments. Chandler (1962) in a series of historical case studies illustrated how organizational structures are greatly influenced by the external strategies and contingencies facing a firm. For example, the diversification strategies of large American corporations led to the need for structural and administrative reorganization to meet the needs of the quite different markets. This pressure eventually spurred the development of the multidivisional form of organization. Likewise, as different geographical markets became more similar with the spread of urbanization, regionally defined divisions in large firms tended to merge into single units for each line of products (Chandler, 1962).

Likewise, institutional theory has formulated the idea that firms due to inertia and path dependencies are most likely to implement radical changes and innovations only when confronted with severe pressures or exogenous changes such as performance crises or CEO succession (Drazin et al., 2004; Romanelli, 1991; Romanelli & Tushman, 1994; Scott, 1995).

The BTF acknowledges the influence of external stimuli but contests the typical neo-classic assumption of perfect environmental matching. I.e. the idea that firms are able to continuously scan all possible decision alternatives and chose the value maximizing response to any problem or opportunity. Due to bounded rationality of decision makers and the presence of internal goal conflicts, BTF suggests that firms make satisficing rather than optimizing decisions (Cyert & March, 1963). According to the BTF, firms set satisficing aspiration levels based on previous performance and the performance of relevant reference groups. Search is problem-driven and biased in the sense that alternatives are scanned in order of proximity to the present organizational setup or to the problem area. The search process ends once an alternative that meets the aspiration level is found.

Failure to meet aspiration levels and identification of an action alternative that brings the organization back to satisfactory performance, respectively, triggers and ends the search process. Therefore, it is reasonable to assume that the complexity or severity of the initial problem influences the nature of the chosen solution. Birkinshaw et al (2008) argue that a novel problem is a prerequisite for a novel solution to be implemented. In the context of management innovation, Birkinshaw and colleagues claim that firms will exhaust the consultancy market for off-the-shelve management solutions before experimenting with their own development of something truly novel. Nickerson and Zenger (Nickerson & Zenger, 2004), similarly, argue that more complex problems are likely to lead firms to broader search processes, since the most simple and routine based solutions will not suffice.

Pervasive management innovations are likely to entail higher implementation costs and require more coordination between subunits, since more employees are affected. Hence, the risk of failure and the uncertainty involved with the innovation process is larger for the adopting organization (Damanpour & Schneider, 2009; Pelz & Munson, 1982; Pelz, 1985). It is well established in the literature on technological innovation that innovation complexity (across varying definitions and measurements) is negatively related to innovation adoption (Damanpour, 1996; Pelz, 1985; Zaltman et al., 1973). This could indicate that a higher sense of urgency is needed for firms to adopt risky innovations. I.e. a stronger sense of necessity is needed in order to compensate for the perceived risk involved. Due to the risk and costs associated with more pervasive management innovations, I will argue that the same will be the case for this type of innovation. In other words, the larger a performance shortfall experienced, the more likely a firm is to adopt more pervasive management innovations.

In accordance with the principle of simple minded search and satisficing as the decision criteria, firms are likely to implement simple and less pervasive innovations if such innovations could resolve the perceived problem (Cyert & March, 1963; Pitelis, 2007). According to this principle, organizational members will initially search for solutions to perceived problems in the neighborhood of the problem area. If a firm

for example experiences problems with the reward structures in the sales department, it is likely to look for a solution that requires only minor changes to the reward system for this department before initiating a wider search. Conversely, firms are more likely to experiment with more risky and pervasive innovations, when the problems facing the organization are so severe that simpler solutions are inadequate (Birkinshaw et al., 2008; Cyert & March, 1963; Wiseman & Bromiley, 1996).

Hypothesis 1. Perceived performance declines positively influence the pervasiveness of adopted management innovations.

Education

For a number of reasons, the education of the workforce is thought to influence the innovativeness of a firm. Highly educated employees will generally possess more knowledge of strategic and managerial issues. This knowledge may in itself be valuable in developing qualified ideas and solutions to the critical problems or opportunities facing an organization. Employees who from their educational background have skills and understanding of strategic management, are more likely to contribute to the development and implementation of management innovations (Barney, 1991; Barney & Wright, 1998; Mol & Birkinshaw, 2009). It is reasonable to assume that these skills and competences of the workforce will have a particular strong effect on the likelihood of adopting more pervasive management innovations.

Furthermore, the knowledge that employees possess may be important for the ability of firms to recognize, assimilate and apply new valuable external information. This ability has been labeled absorptive capacity and essentially depends on the level of prior related knowledge already available in an organization (Cohen & Levinthal, 1990; Lane & Lubatkin, 1998; Szulanski, 1996). New management practices will typically involve new information of a rather academic nature. This information may, for example, relate to task coordination, knowledge sharing, distribution of decision making authority and organizational efficiency. Employees with a degree level education are more likely to be able to absorb this type of information, assess its usefulness for the organization and actually apply it in developing and

implementing managerial solutions to the problems or opportunities facing the organization. This ability to comprehend and use knowledge of an academic, strategic and managerial nature is likely to be exceptionally important when the desired management innovations are more pervasive.

Finally, highly educated employees are more likely to have a resourceful personal and professional network, which potentially exposes them to valuable new information and ideas (Hansen, 2002; Mol & Birkinshaw, 2009). The cross-fertilization of ideas that occurs in these types of networks may be a potential source of management solutions available to firms and increases the likelihood of a firm adopting pervasive management innovations.

In accordance with the behavioral theory perspective adopted in this article, educational backgrounds of employees may also be important because it influences the search behavior of an organization (Cyert & March, 1963; Pierce et al., 2008). Firms are not able to scan all available information in their environments, but rather they filter the information based on prior experience and extant knowledge. Employees with a degree level education are more likely to search for solutions that relate to management practices since they have a richer understanding of these issues than other employees. Likewise, they are more likely to grasp the implications, consequences and coordination challenges involved in more pervasive management innovations and, hence, are more likely to search for solutions of this nature.

Hypothesis 2. A highly educated workforce positively influences the pervasiveness of adopted management innovations.

Communication

The richness and frequency of communication between employees and units in an organization is generally found to be important for the innovativeness of firms. New knowledge is created when information and ideas are diffused and combined across an organization (Gupta & Govindarajan, 2000;

Jassawalla & Sashittal, 2000; Nonaka & Takeuchi, 1995), and the ability to continuously create information and knowledge is an important driver of organizational self-renewal and innovation (Allen et al., 1980; Argyris, 1977; Nonaka & Yamanouchi, 1989; Rothwell & Robertson, 1973). When interunit relations are strong and plentiful, the effectiveness of organizational members' search behavior is increased, since individuals are more likely to be exposed to information about new opportunities and relevant knowledge residing in other business units or departments (Hansen, 2002). Similarly, studies have found that the absence of effective internal communication is a major barrier to the development of new technology based products (e.g. Gupta & Wilemon, 1990). As such, rich communication flows are likely to increase the diagnostic capacity of a firm by exposing employees to new ideas, giving them access to valuable knowledge in other parts of the organization and fostering cross-fertilization of ideas (Jassawalla & Sashittal, 2000). This paper, thus, posits that firms with rich and plentiful communication are more likely to develop novel and pervasive management solutions to the problems or opportunities facing the organization.

Internal communication serves a number of purposes in the innovation process. For example, a study of innovation in the financial services industries (Lievens et al., 1999) finds that internal communication is the prime vehicle for realizing a positive team climate and foster adequate cross-functional cooperation. Lievens et al (1999) argue that internal communication, therefore, is a critical success factor in innovation projects. Also, a number of studies have found that the frequency of communication between organizational members and units positively affects the level of trust in an organization (e.g. Becerra & Gupta, 2003; Johnson & Lederer, 2005), and in a recent study, Bartels et al (2007) find that internal communication is a strong predictor of organizational identification. Both trust and identification may be important for the successful implementation of large organizational changes (Giangreco & Peccei, 2005; Meyer et al., 2007; Meyer et al., 2007; Reger et al., 1994). In this respect, rich and plentiful communication flow are also likely to support the implementation processes related to management innovation. This is particularly the case for pervasive management innovations, since these innovations are likely to require a

higher degree of coordination and collaboration across organizational units and departments than less pervasive innovations.

Hypothesis 3. Rich and plentiful communication flows in a firm positively influences the pervasiveness of adopted management innovations.

CEO novelty

The chief executive officer (CEO) is in a special position to exercise influence on the strategies, search behaviors, aspiration levels, attention structures and standard operating procedures of a firm (Hambrick & Mason, 1984; Ocasio, 1997; Pitelis, 2007). Therefore, CEO succession may be an important driver of organizational changes.

Firms are by nature adaptive and path dependent (Cyert & March, 1963). Hence, when a CEO has been in office for a long time, the routines and operating procedures of the organization tend to stabilize and large structural or strategic changes become less likely. CEO tenure is associated with a higher degree of strategic myopia, internal resistance, vested interests and, hence, organizational inertia (Hannan & Freeman, 1984; Romanelli & Tushman, 1994; Tushman & Rosenkopf, 1996). Similarly, Miller (1991) found that CEO tenure is inversely related to the degree of match between an organization and its environment. Therefore, CEO succession may constitute an opportunity to overcome organizational inertia and a number of studies have documented that CEO succession indeed increases the likelihood of strategic and structural changes (Carlson, 1961; Denis & Denis, 1995; Helmich & Brown, 1972; Meyer, 1975; Romanelli & Tushman, 1994).

CEO succession may also lead to a shift in the distribution of power in an organization, which may facilitate necessary strategic and structural changes. Over time, groups and individuals gain power based on their ability to deal with the strategic contingencies facing an organization. However, with time the prevailing power distribution also tends to become institutionalized, since power holders resist changes

that undermine their influence (Pfeffer & Salancik, 1978; Pfeffer, 1981; 1992; Salancik & Pfeffer, 1977). CEO succession offers an opportunity for existing power distributions to be altered and new strategic perspectives to be introduced (Pfeffer & Salancik, 1978; Shen & Cannella, 2002).

Finally, CEO succession may be a mechanism for organizational learning, since it often brings with it a shift in the core assumptions and theories-in-use in an organization (Tushman & Rosenkopf, 1996; Virany et al., 1992). The shift of top executive, hence, may facilitate so called second order or double-loop learning (Argyris, 1977; Weick, 1979), which under normal circumstances may be hampered by inertia and path dependency. According to Virany et al (1992, p. 72), “[..]executive succession can fundamentally alter the knowledge, skills and interaction processes of the senior management team. These revised skills and communication processes improve the team's ability to recognize and act on changing environmental conditions”. Tushman and Rosenkopf (1996) also used this type of learning perspective to explain an observed correlation between CEO succession and the introduction of discontinuous organizational changes.

In summary, recent CEO succession is likely to be associated with large organizational changes because it assists an organization in overcoming inertia, political resistance and institutionalized power dependencies. Furthermore, it brings new managerial perspectives and facilitates double-loop learning, which increases the likelihood of developing and implementing new, pervasive management innovations. Conversely, as CEO tenure increases, inertial forces and path dependency grow and make management innovations less likely. Since more pervasive management innovations affect more employees, they are likely to be associated with higher degrees of resistance and, therefore, the inertia associated with CEO tenure is likely to be especially important for this type of innovation.

Hypothesis 4. CEO novelty positively influences the pervasiveness of adopted management innovations.

DATA AND METHODS

This study is based on the Management Innovation Survey developed at the Center for Strategic Management and Globalization at Copenhagen Business School. The overall structure of the survey has been adapted from the Community Innovation Survey (CIS), which is a European wide survey measuring product and process innovation. The CIS was developed on initiative of the European Union and has been executed by national statistical offices throughout the EU six times since 1992. The survey has been incrementally improved and refined during the years and a large number of papers have been published using CIS data (e.g. Battisti & Stoneman, 2010; Evangelista et al., 1997; Frenz & Ietto-Gillies, 2009; Laursen & Salter, 2006). The CIS includes measures on changes in business practices and structures, which have been used as a measure of management innovation by e.g. Mol and Birkinshaw (2009). However, the CIS does not measure the pervasiveness of changes and also lacks a number of the firm level variables of interest to this study. Compared to the CIS, the Management Innovation Survey employed in this study has refined the innovation measures allowing for a more nuanced understanding of the phenomenon.

The sample of firms was taken from the Danish CD-direct database, which contains detailed public information on all Danish enterprises. The survey was sent to CEOs of the 1,051 largest Danish firms and the data was collected during the fall of 2009. The selection was done based on number of full-time employees and include all firms with more than 150 employees in 2008. 314 firms responded corresponding to a response rate of 29.9%. The survey was conducted online and respondents received a postal invitation with a unique login and password for the website. All non-respondents received a postal reminder and were subsequently contacted via telephone. When it was not possible to reach the respondent, interviewers asked for a direct e-mail address and follow up e-mails with a link to the survey were sent. The survey was sent to CEOs but other members of the top management team were also allowed to answer.

In order to minimize the risk of common method bias, data regarding the performance decline variable was collected using archival data from the CD-direct database. This ensured that all measures in the survey were not collected from the same source. Two of the other variables, education levels and CEO tenure, are also of a fairly factual nature and could in principle be confirmed from other sources. This reduces the risk of bias in the sample compared to e.g. self-reported items based on the respondent's perception or attitudes (Podsakoff & Organ, 1986). Finally, a factor analysis, the Harman's one-factor test, did not indicate common method variance (Podsakoff & Organ, 1986). Two-group mean comparison tests were used to test for non-response bias and indicated no significant differences between respondents and non-respondents when comparing relevant variables such as industry affiliations and company size.

Ordinary Least Square regression (OLS) is employed to assess how much variance in the pervasiveness of adopted management innovations can be explained by the set of independent variables (IVs) and to analyze the relative contribution of each of the IVs.

Measures

Pervasiveness. The pervasiveness of adopted management innovations is measured as the percentage of employees directly affected by the management innovations implemented by the firm. First, respondents were asked whether they during the years 2006-2009 implemented any new or significantly altered organizational structures or management practices, processes or techniques. Management innovation in this study is defined as practices that are new to the adopting organization. Respondents who reported having implemented management innovations were asked to indicate the approximate percentage of employees who had been directly affected. Non-innovators are coded as '0'. Since they have not implemented new management practices or structures, no employees are affected.

Performance decline. Performance decline is measured as the percentage change in a firm's return on equity (net profit divided by equity) from the financial year 2004 compared to 2006 based on data from the Danish CD-Direct database. The measure is calculated so that a larger measure indicates a larger

performance decline, i.e. $(ROE_{2006} - ROE_{2004}) / ROE_{2004} * (-1)$. The years 2004 and 2006 are chosen to reflect the time period prior to the main period of interest in the study, namely the years 2006-2009. This reflects an expected time lag between the perceived performance shortfall and a change in the outcome variable; i.e. pervasiveness of adopted management innovations. A firm's financial performance obviously does not fully reflect the strategic aspirations of an organization. Nevertheless, since a range of factors influence the extent to which performance is perceived to meet aspirations, a financial measure is chosen as a crude proxy for performance shortfall. Another option could have been to ask for CEOs' perception of previous firm performance. However, the ability of respondents to accurately report their perception and performance 3-5 years ago is questionable. Also, this approach would raise serious issues of both social desirability and common method bias, since that would make CEOs the source of information for the dependent as well as independent variables (Furnham, 1986; Moorman & Podsakoff, 1992; Podsakoff & Organ, 1986; Spector, 2006).

Workforce education. This measure reflects the education level of employees. Respondents were asked to indicate approximately what percentage of employees have a degree level education (M.Sc., MBA, PhD or equivalent).

Communication. The measure of communication flows indicates the top manager's perception of the richness of communication and collaboration in the firm. The measure is a multi-item scale and respondents were asked to indicate based on their personal experience to what extent the following statements accurately describe the communication climate in the organization: (1) The communication across departments is rich and plentiful, (2) Departments are often skeptical about information received from other departments (reverse-coded), (3) The communication across levels of the organization is rich and plentiful, (4) Inter-disciplinary and cross-departmental collaboration on tasks and activities is widespread, and (5) Formal channels of communication, e.g. company blogs, newsletters, intranet and

databases, are plentiful and widely used. Responses were recorded on a scale from 1 (not accurate at all) to 7 (very accurate). The scale has an alpha coefficient of 0.73.

CEO novelty. CEO novelty indicates the number of years the current CEO has been in office. The measure is reverse-coded so that a higher number indicates a more recent CEO succession, i.e. a higher degree of novelty.

Controls. Four control variables are included in order to test for possible alternative explanations: (1) Larger firms may have more resources enabling them to invest more in innovation activities. On the other hand, larger firms may be more characterized by inertia. Also, the mere size of a firm in itself, may influence the costs and risk involved in implementing more pervasive innovations. Therefore, firm size measured as the logarithm of the number of employees in 2009 was included. (2) An industry dummy distinguishing between service and manufacturing industries was included to control for industry effects. (3) Firms that are member of enterprise groups may have access to knowledge and resources from corporate headquarters or other members of the group. Hence, a group dummy measuring whether a firm is part of an enterprise group or not is included. Finally, (4) the extent of organizational differentiation, e.g. number of functions or departments reporting directly to top management, may influence the likelihood of adopting pervasive innovations. Therefore, span of authority measuring the number of units or departments reporting directly to the CEO is included as a control.

RESULTS

Table 1 shows the means, standard deviations and correlation coefficients of the dependent and independent variables. Firms in the sample adopted management innovations in the period 2006-2009 that on average affected 59% of their employees. On average firms experienced a decline in return on equity from 2004 to 2006, which is used as the measure for performance decline below. However, substantial variance existed between firms.

Table 1. Means, standard deviations, skewness and correlations among variables

| | Mean | S.D. | Skewness | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|-------|-------|----------|------|------|------|------|------|------|------|------|---|
| 1. Pervasiveness of management innovations | 59.38 | 33.63 | -0.23 | 1 | | | | | | | | |
| 2. Performance decline | .77 | 21.40 | -0.94 | .13 | 1 | | | | | | | |
| 3. Education level | 15.52 | 20.56 | 2.04 | .19 | .11 | 1 | | | | | | |
| 4. Communication climate | 4.48 | .95 | -0.18 | .24 | .07 | .12 | 1 | | | | | |
| 5. CEO Novelty | 43.52 | 8.42 | -2.32 | .20 | -.18 | .04 | -.03 | 1 | | | | |
| 6. Size | 5.89 | 1.31 | 0.72 | .02 | .07 | .19 | .03 | -.00 | 1 | | | |
| 7. Span of authority | 8.43 | 7.43 | 4.08 | -.01 | -.01 | .12 | -.02 | -.02 | .39 | 1 | | |
| 8. Industry dummy | .34 | .46 | 0.52 | -.06 | -.03 | .22 | .05 | -.11 | -.04 | .16 | 1 | |
| 9. Enterprise group dummy | .71 | .45 | -0.87 | .00 | -.05 | -.05 | -.03 | .26 | .01 | -.06 | -.12 | 1 |
| <i>N = 201</i> | | | | | | | | | | | | |

The antecedents of management innovation pervasiveness are analyzed using standard OLS regression and table 2 contains the regression results. The model in itself is highly significant and explains roughly 15% of the variance in the dependent variable, which is a reasonable level of R-squared for this type of study.

The first column in table 2 shows the standardized regression coefficients (betas) of each of the variables. As expected, all four variables of interest have a positive relationship with pervasiveness of adopted management innovations. Furthermore, all of the betas are significant, which indicates that each of the variables make a unique contribution to the prediction of pervasiveness when the variance explained by all the other variables is accounted for. Standardizing the beta coefficients allows for a comparison of the unique contribution made by each independent variable. From table 2 it can be seen that CEO novelty (beta=0.23, $p < 0.01$) and communication (beta=0.22, $p < 0.001$) make the strongest unique contribution to explaining pervasiveness. None of the control variables significantly explain the dependent variable.

In summary, there is strong support in the data for all four hypotheses. This indicates that the proposed behavioral model explaining pervasiveness of adopted management innovation is useful and relevant. It is confirmed that the introduction of management innovations with higher levels of pervasiveness is related to a performance shortfall in the years prior to innovating (hypothesis 1). Normally, OLS regression does not lend itself to any conclusions on the direction of causality. However, since the performance decline variable specifically measures a time period prior to the occurrence of the dependent

variable, the data indicates that the direction of causation runs from performance shortfall to the innovation outcome. Also, the data confirms that the three internal antecedents studied, namely higher workforce education levels (hypothesis 2), richness of communication (hypothesis 3) and recent CEO succession (hypothesis 4), increase the pervasiveness of adopted management innovations.

Table 2. OLS regression results predicting the pervasiveness of adopted management innovations

| | Standardized beta | t-value |
|-------------------------------|--------------------------|----------------|
| Performance decline | .14*** | 4.63 |
| Education level | .16* | 2.29 |
| Communication | .22*** | 3.25 |
| CEO novelty | .23** | 2.94 |
| Size | -.03 | -.24 |
| Span of authority | .00 | .02 |
| Industry dummy | -.08 | -1.11 |
| Enterprise group dummy | -.05 | -.76 |
| Constant | -.05 | -.38 |
| Observations | 201 | |
| F-value | 7.79*** | |
| R-squared | .154 | |
| Adjusted R-squared | .148 | |

*** p<0.001, ** p<0.01, * p<0.05

CONCLUDING DISCUSSION

The strong support for all hypotheses in this paper suggest that the behavioral framework is a useful lens for studying and understanding management innovation pervasiveness. Overall, this study supports the idea of firms as path dependent and adaptive organizations that are most likely to implement fundamental changes when confronted with a performance shortfall or a CEO succession (Cyert & March, 1963; Drazin et al., 2004; Hannan & Freeman, 1984; Romanelli & Tushman, 1994). Also, the study indicates the importance of internal dynamics in understanding firm behaviors. Specifically, the paper makes at least two important contribution to the management innovation literature.

First, the paper contributes to our understanding of the concept of management innovation by initiating a discussion of innovation attributes. Management innovations are not all alike. They are likely to differ along a number of dimensions such as their origins, contents, complexity, pace and sequence of implementation and their pervasiveness. This paper constitutes a first step toward a richer understanding of management innovation by specifically addressing the pervasiveness of adopted innovations. The paper shows that pervasiveness of management innovations vary across firms and, hence, that pervasiveness as an innovation attribute is relevant for empirical analysis. Furthermore, the paper has found that a significant part of the observed variance in pervasiveness of adopted innovations can be explained by a number of behavioral variables.

Second, the paper applies the behavioral notion that firms perceive their environments through organizational filters to management innovation. Three variables involving these internal organizational filters are investigated, namely CEO novelty, communication and education levels. These three variables all have to do with what resources and competencies are present in a firm and how these assets are leveraged and put to use across the organization.

A new CEO brings new perspectives and knowledge into the organization which is potentially valuable for the development and implementation of new and more complex management practices in response to problems or opportunities facing the organization (Denis & Denis, 1995; Helmich & Brown, 1972; Meyer, 1975; Shen & Cannella, 2002). Also, this study indicates that CEO succession may spur valuable learning processes and assist in overcoming inertia and other organizational barriers to implementing structurally complex management innovations (Tushman & Rosenkopf, 1996; Virany et al., 1992). The knowledge and competences employees have as a result of higher education levels are likely to improve their ability to absorb new knowledge and information of a strategic nature (Cohen & Levinthal, 1990), to recognize problems and opportunities and to develop managerial solutions in response. Finally, the richness of communication flows within an organization is likely to make firms better able to identify, cross-fertilize,

distribute and utilize extant knowledge and resources for management innovation purposes (Bartels et al., 2007; Jassawalla & Sashittal, 2000).

Previously, Harder (2011a, 2011b) has introduced the notion of diagnostic capability to explain how internal antecedents influence the likelihood of adopting management innovations. Diagnostic capability refers to the ability of an organization to recognize the locus of a perceived problem or an opportunity for improved performance and to develop management solutions that solve the problem or exploit the opportunity. The concept of diagnostic capability, therefore, is based on the behavioral assumptions of bounded rationality, imperfect environmental matching and internal goal conflicts. Since firms do not have access to perfect information, continuous environmental scanning and infinite cognitive abilities, organizational filters become hugely important in understanding why some firms are more likely to innovate than others (Cyert & March, 1963; Pierce et al., 2008; Pitelis, 2007).

Diagnostic capability share commonalities with e.g. the notions of sensing and seizing of opportunities introduced by Teece (2007) and with March' (1991; 1996; 2006) concept of exploitation and exploration. However, diagnostic capability is thought of as a more limited concept directly related to firms' management innovation behavior. Due to the broad nature of the diagnostic capability concept, a number of factors may be involved and made subject to studies in relation to management innovation. Overall, Harder (2011a) suggest that diagnostic capability may relate to either institutionalized elements of organizational design, resources or routines or to the perceptiveness and cognitive abilities of to managers. The importance of top managers as internal change agents and the effect of organizational design variables are also discussed in the conceptual model introduced by Birkinshaw et al (2008).

While this paper does not directly test or measure the notion of diagnostic capability, the three internal antecedents studied may be perceived as relating to a firm's diagnostic capability. The empirical findings in this study, hence, indicate that varying degrees of diagnostic capability of firms may be an important explanation of the observed differences in management innovation behavior. Specifically, this

paper gives some indication that diagnostic capability may be a determining factor in explaining the pervasiveness of adopted management innovations. As such, developing more pervasive innovations is likely to place higher demands on the perceptiveness and cognitive abilities available in a firm. Therefore, firms with higher levels of diagnostic capability are more likely to implement management innovations with higher levels of pervasiveness.

Implications for theory and practice

The paper indicates that the behavioral lenses and the concept of diagnostic capability may be useful for understanding and studying management innovation. Also, the paper has opened a discussion of the innovation attributes that may be subject to analysis in relation to management innovation. However, in so doing, it is also stressed that our understanding of the core concept of management innovation is still in many ways imperfect. If we disregard the management fashion literature and studies of diffusion patterns of specific innovations, there exist very few empirical studies of firm-level management innovation. Even fewer studies actually distinguish between types or attributes of management innovation and investigate how causal drivers and performance outcomes may differ depending on innovation characteristics. Obviously, a richer understanding of the types and attributes of management innovation is necessary in order to build generalizable and cumulative knowledge of management innovation. This study has made a small contribution to this understanding of management innovation attributes, but much research still needs to be done. A potentially valuable direction for future research, therefore, lies in developing a deeper understanding of management innovation attributes. For example, scholars should attempt to answer the following questions: What are the most meaningful attributes of management innovation? What causes some firms to adopt certain types of innovations? And how do innovation attributes influence adoption rates, implementation sequence, implementation pace and performance outcomes?

This study reveals a number of important implications for managers. The study confirms that managerial actions and decisions matter. Innovation outcomes are not purely a result of performance

shortfall or external pressures. Specifically, three recommendations can be made for managers wishing to increase the likelihood of adopting pervasive management innovations. First, managers can attempt to design hiring and promotion policies that favor highly educated employees. Second, managers can ensure that internal communication channels are plentiful and easily accessible for employees. Furthermore, they should focus on encouraging communication and collaboration across units, departments and levels in the organization in order to boost idea cross-fertilization and learning. Finally, top executives and firm owners should be aware of the inertial pressures associated with high CEO tenure. CEO succession is associated with costs and should, of course, not be interpreted as a general recommendation. Nevertheless, executives could think of other ways to compensate for the inertia associated with high CEO tenure. For example, ensuring diversity in the top management team could be one way to bring in different perspectives and to combat inertia (Bantel & Jackson, 1989; Boeker, 1997; Hambrick & Mason, 1984; Santos & Garcia, 2006; Stjernberg & Philips, 1993).

Limitations

A number of limitations apply to this research. A range of innovation characteristics could be investigated, but this research only observes pervasiveness. A more complete understanding of management innovation, of course, entails including more nuanced measures of the core concept. Also, this paper has taken the firm as unit of analysis. In reality, management innovation is more likely to be a multilevel phenomenon with drivers at both individual, organizational and contextual levels. Future research, therefore, may attempt to include multilevel methodologies in the study of management innovation.

Since this study employs cross-sectional data, it should also be noted, that the results represent a specific point in time. The time-order dynamics of management innovation are not studied. Future research may attempt to grasp the actual process of idea generation, testing and implementation in order to further our understanding of how management innovation actually occur in firms. Likewise, it is a weakness of this

study, that it is predominantly based on a single-respondent survey. Especially the measure of communication climate may be subject to social desirability biases. Also, it is a limitation of this study that the positive performance effect of management innovation is assumed and not measured. The relationship between the pervasiveness of adopted management innovations and future firm performance is not addressed. Future research should attempt to measure the actual performance effects.

Finally, this paper does not attempt to actually measure diagnostic capability, nor does it include all imaginable variables related to the diagnostic capability concept. The notion of diagnostic capability is still conceptually vague and future research should attempt to clarify the boundaries and definitions associated with diagnostic capability. Future research may attempt to develop and measure diagnostic capability as an empirically observable construct and discover what underlying factors drive a firm's diagnostic capability. While this is undoubtedly an interesting research prospect, it lies outside the ambitions of the current study.

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