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Disentangling the effects of organizational controls on innovation

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ABSTRACT

The strategy and innovation literatures argue that organizational competitiveness is contingent upon firms simultaneously pursuing both process and product innovations. A firm's control system plays a fundamental role in this regard by managing, motivating, and coordinating employees' behaviors for the development of its innovative capabilities. Research suggests that in order to develop successful innovation, management must use controls that align employees' interests with those of the organization while simultaneously allowing employee autonomy to encourage creativity. These disparate functions lead to the control–autonomy dilemma. We argue that managers can address this dilemma by recognizing that the effect of controls on innovation outcomes depends, in part, on the controls' enabling features and the type of commitment they inspire. Our findings show that employee development, which is the focus of input controls, has a direct effect on process innovation-related behaviors while specified goals, the emphasis of output controls, have a direct effect on product innovation-related behaviors. It is only through employees' perceptions of managerial support that input controls increase product innovation-related behaviors and output controls increase process innovation-related behaviors.

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1. Introduction

In many industries, and particularly those that are technology-intensive, sustainable competitive advantage is contingent upon firms simultaneously managing organizational activities to create *process* innovations that improve internal operations and innovations for new or enhanced *products* that meet external market needs (Brown & Eisenhardt, 1995; Damanpour Walker, & Avellaneda, 2009; Lichtenthaler, 2016; Utterback & Abernathy, 1975). Consequently, it is important to understand how managers can supervise subordinates and organizational activities to create these two distinct types of innovations in parallel. A long tradition of research argues that the development of a firm's innovation capabilities is dependent upon the design of its administrative mechanisms (Burns & Stalker, 1961; Henderson & Cockburn, 1994; Kusunoki, Nonaka, & Nagata, 1998). Administrative mechanisms, such as organizational controls, determine the organizational context or climate in which employees and innovation-related activities are coordinated (Gibson & Birkinshaw, 2004; Turner & Makhija, 2006, 2012; Tushman & Nadler, 1978). Organizational design research demonstrates that employee autonomy, [1] which *enables* subordinates to make decisions about their work and unforeseen incidents, is an important feature of administrative mechanisms that promotes innovation in firms (Adler & Borys, 1996; Ecker, van Triest, & Williams, 2013).

While research examining the benefits of employee autonomy has provided significant insights into how administrative mechanisms can facilitate innovation at the individual, unit, and organizational levels, the literature has also highlighted a misunderstood theoretical tension in this line of inquiry. As innovation scholars have noted, successful innovation requires both employee discretion *and* managerial support to allocate resources and align employees' interests with those of the organization (Eisenhardt & Tabrizi, 1995; Khazanchi, Lewis, & Boyer, 2007). However, the mechanisms favoring employee autonomy often diminish the role of management (Hackman, 1987), leading to the "control–autonomy" dilemma (Criscuolo, Gal, & Menon, 2014; Van de Ven, 1986). A similar paradox has been discussed in organizational design studies arguing that administrative mechanisms—which facilitate coordination among different units and individuals to achieve organizational goals—may also diminish innovation because of management's constraints on their behaviors (Adler & Borys, 1996; Puranam, Singh, & Zollo, 2006). The ambidexterity literature highlights a conflict analogous to the "control–autonomy" dilemma, arguing that management systems need control to support the "alignment" of objectives and activities while encouraging "adaptability" to give organization members the autonomy necessary to respond to changing external demands (Ahammad, Lee, Malul, & Shoham, 2015; Carmeli & Halevi, 2009; Gibson & Birkinshaw, 2004). In addition to

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[1] We use the term *autonomy* to refer to the decision-making authority of subordinates. Other studies refer to this as decentralization, decision rights, or employee discretion.

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the role of management systems, the ambidexterity literature also stresses how management characteristics can provide the appropriate organizational environment to enable innovation (Eisenhardt, Furr, & Bingham, 2010; Jansen, George, Van Den Bosch, & Volberda, 2008; Kassotaki, 2019).

While prior literature has increased our understanding of the significant role administrative mechanisms and management attributes play in addressing the control–autonomy dilemma to foster innovation, we still lack a theoretical and empirical understanding of how these mechanisms can be used to simultaneously shape both process and product innovation. We assert that the missing link that mediates the relationship between administrative mechanisms and innovation is employees' perceptions of management, a fundamental consequence of controls (Inkpen & Currall, 2004). To address this gap in the literature, we focus on self-managing teams. This structural arrangement allows team members to have latitude and decision-making authority over their tasks, while management uses controls to align team members' goals with those of the organization (Manz & Sims, 1987; Morgeson, DeRue, & Karam, 2010). For this reason, we did not consider behavioral controls that involve management using centralized decision-making (with no or limited employee autonomy) and regulations to actively monitor subordinates' behaviors while they perform their tasks (Cardinal, 2001). Instead, our model examines two forms of formal control (i.e., input and output) focusing on how the enabling attributes and bases of commitment associated with each allows management to control employees when subordinates have autonomy over their work processes. The enabling approach emphasizes employees' ability to master their tasks, address contingencies, and be innovative (Adler & Borys, 1996; Cardinal, Kreutzer, & Miller, 2017).

Prior research suggests organizational members' perceptions of managerial support are a potential mediator in the relationship between controls and innovation. Researchers have found that the extent to which subordinates believe they receive support from management affects their motivation to engage in innovation-related behaviors (Atuahene-Gima & Ko, 2001; Elenkov & Manev, 2005; Zirger & Maidique, 1990). While innovation research has shown managerial support to be a key antecedent to employees' innovation-related behaviors (Kuratko, Montagno, & Hornsby, 1990; Leonard-Barton & Deschamps, 1988), organizational theorists have given limited attention to the role perceptions of managerial support play in the effectiveness of administrative mechanisms on innovation. Yet, recent organizational control studies suggest that control mechanisms influence subordinates' perceptions of trust in management and management's commitment to them which, in turn, affects organizational outcomes (Inkpen & Currall, 2004; Kownatzki, Walter, Floyd, & Lechner, 2013). In line with this view, Adler and Borys (1996) noted the importance of understanding the consequences of organizational mechanisms as experienced by employees. In addition, the inconsistent findings from prior research on control and innovation (e.g., see Bisbe & Otley, 2004; Cardinal, 2001; Goodale, Kuratko, Hornsby, & Covin, 2011; Huergo, 2006; Ogbonna & Wilkinson, 2003) appear to suggest that we may not have an adequate grasp of when and how controls influence innovation-related behaviors. A focus on the mediating role of perceived managerial support may offer additional insight. By developing a more nuanced understanding of the enabling features of controls and examining the role these features play on employees' perception of management support for innovation, we advance our knowledge of the control–autonomy conflict and the antecedents to both process and product innovation.

2. Theory development and hypotheses

2.1. Enabling features of organizational controls

Scholars have noted that autonomy benefits team performance when there are additional administrative mechanisms in place to provide direction and accountability (Gonzalez-Mulè, Courtright, DeGeest, Seong, & Hong, 2016). In addition, as technological advancements and globalization have increased the complexity, knowledge, and uncertainty of organizations' capabilities (Beltran-Martin, Roca-Puig, Escrig-Tena, & Bou-Llusar, 2008), managers have increased the use of team-based controls to facilitate the development and integration of multifaceted knowledge from multiple and diverse individuals (Child & McGrath, 2001; Kirsch, Ko, & Hanley, 2010). Researchers suggest that in a team environment formal controls, which emphasize hierarchy, prescribed rules, and objectives, may not be as effective as other forms of control that promote socialization and responsibility to individuals (Kirsch, Ko, & Haney, 2010). We argue, however, that formal controls that are enabling (Adler & Borys, 1996) and emphasize management's commitment can be highly effective in the team context.

Prior research has contrasted the coercive and enabling properties of controls (Adler & Borys, 1996). The coercive features of controls emphasize hierarchy, rules, and discipline for deviation from what management prescribes (Cardinal et al., 2017). Decision-making lies with management and employee autonomy is diminished. Furthermore, the coercive approach largely relies on organizational members' commitment to organizational goals through compliance (Adler & Borys, 1996). On the other hand, the enabling approach "encourages a reduction in the disparities of power, knowledge, skills, and rewards between managers and subordinates" (Adler & Borys, 1996, p. 81). Enabling controls facilitate employees' understanding of the processes and purposes associated with their tasks so they can be more effective at their job and respond to contingencies (O'Mahony & Ferraro, 2007; Stansbury & Barry, 2007). A key aspect of enabling controls encourages commitment based upon employees' *internalization*, i.e., adopting behaviors due to congruence with values (Becker, Billings, Eveleth, & Gilbert, 1996) and goals (Adler & Borys, 1996). We contend that control mechanisms that enable employees to develop their knowledge and skills so they can master their tasks will lead to commitment based upon internalization and influence organizational members' perceptions of managerial support which, in turn, determines whether they engage in innovation-related behaviors.

Input controls involve management's monitoring of the resources, knowledge, skills, and expertise required before tasks are performed (Cardinal, 2001; Snell & Youndt, 1995). Cardinal notes that, in the case of R&D professionals, input control "can be used to create a type of 'knowledge environment' desired by firms by manipulating the degree and variety of core knowledge, skills, experience, and attitudes displayed on the job" (pg. 22, 2001). The enabling features of input controls, representing a subset known as capability control (Challagalla & Shervani, 1996; Evans, Landry, Li, & Zou, 2007), emphasize skill and value training to facilitate commitment to the firm's objectives (Ouchi, 1978) and manage organizational members' behaviors through intrinsic motivation. This results in commitment through *identification,* i.e., adopting behaviors due to a self-defining relationship (Becker et al., 1996), i.e., a desire for affiliation with the organizational unit (O'Reilly & Chatman, 1986) and, over time, internalization of its goals. Training and appraisal of employees' skills enables their learning and development (Snell & Youndt, 1995). The emphasis on training for input controls is similar to Gibson and Birkinshaw's (2004) notion of social context, which evokes trust and support as a result of developing subordinates and providing them with decision-making authority. Thus, input administrative mechanisms con-

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trol by specifying the appropriate training while simultaneously allowing subordinates enough autonomy to make decisions. Research suggests that when competitiveness is based on a firm's idiosyncratic knowledge, it is particularly important for management to use mechanisms that emphasize internal development of human capital and long-term employee commitment (Lepak & Snell, 1999).

In autonomous work environments, training can be designed to help employees build mental models that facilitate their understanding the system of work processes, allowing them to address problems more effectively. An emphasis on skills and expertise can support individuals learning from other organizational members' prior experiences and best practices. Skill appraisals are beneficial because they provide metrics for improvement and continuous learning (Adler & Borys, 1996). When employees have discretion over work processes, development assessments are a valuable mechanism that management employs to control the knowledge used to complete tasks. Furthermore, employee development reduces uncertainties regarding the proficiencies that are best suited for the unit's goals. In this regard, the search for knowledge will be limited to a specific domain that is aligned with management-sanctioned skills. Consequently, individuals develop a proficiency in a particular competency, thereby, increasing their depth of knowledge.

In contrast to input controls, which cultivate intrinsic motivations for commitment to the organization and its goals with identification and internalization, output controls utilize outcome specificity to foster both the internalization of goals (Cardinal, 2001; Kreutzer, Walter, & Cardinal, 2015; Snell, 1992) and *compliance*, i.e., adoption of behaviors to achieve rewards and/or mitigate punishments (Becker et al., 1996). In the context of self-managing teams, goals largely pertain to the collective. The enabling properties of output controls focus on management readily sharing information about goals and allowing individuals to stretch their capabilities by managing performance with challenging goals (Gibson & Birkinshaw, 2004). When employees have discretion over their work, goal clarity can be used to align employees' goals with those of management. Having set goals facilitates employees engaging in the necessary behaviors to perform at or beyond management's expectations. Thus, the enabling features of output administrative mechanisms allows for autonomy over the methods while controlling through management specifying goals.

Output controls that encourage innovation with stretch goals allow organizational members to be creative (Gibson & Birkinshaw, 2004). Encouraging subordinates to meet ambitious goals is akin to Ghoshal and Bartlett (1994) ,) organizational context attributes: discipline (i.e., subordinates attempting to meet performance objectives due to a sense of commitment) and stretch (i.e., members trying to achieve bolder goals). Striving to meet challenging goals can legitimize a member's search for alternative methods and broaden the search for relevant knowledge. In fact, researchers argue that environments with autonomy and high goal clarity provide control and give organizational members freedom to improvise their methods (Vera, Nemanich, Velez-Castrillon, & Werner 2016). For knowledge-intensive industries, in particular, performance expectations motivate organizational members to demonstrate their knowledge and capabilities (Crown & Rosse, 1995; Gardner, 2012) and encourage team members to utilize knowledge and skills from multiple organizational members (Argote, Gruenfeld, & Naquin, 2001).

2.2. Controls and perceived managerial support

Previous research indicates that perceptions of management, an important antecedent to organizational outcomes, are influenced by a firm's administrative mechanisms (Kownatzki et al., 2013). In general, perceptions of managerial support reflect organizational members' beliefs about the extent to which management is committed to their well-being, values their contributions, and encourages their efforts (Eisenberger, Armeli, Rexwinkel, Lynch, & Rhoades, 2001). Perceived managerial support for innovation signals management's commitment to innovation by providing organizational members with access to the necessary resources, championing change in the organization (Zirger & Maidique, 1990), and involvement in innovation activities (Atuahene-Gima & Ko, 2001).

Research examining job enrichment and satisfaction suggests that when organizational members have access to training, they perceive higher levels of support (Shore & Shore, 1995, pp. 149–164; Wayne, Liden, & Sparrowe, 1994). Prior work has shown that training and development signals to employees that the organization and management cares about their well-being and that, in turn, employees are more committed to the organization and their supervisors (Costa, Duarte, & Palermo, 2014; Oliver & Anderson, 1994). Furthermore, evaluating subordinates' skill development to promote continued education may indicate management's desire for change and innovative ideas. Because the enabling features of input controls emphasize mastering tasks, identification with the organization, and internalization of its goals, we expect individuals who experience input controls to perceive managers as supportive. Formally, we hypothesize:

Hypothesis 1a : Perceptions of the use of input control will positively affect perceptions of managerial support.

The enabling features of output controls also influence organizational members' perceptions of managerial support. Output controls utilize goal specification to provide employees with information regarding a benchmark for success (Adler & Borys, 1996). Furthermore, challenging or stretch goals suggest management has a high regard for organizational members' capabilities, thereby enhancing subordinates' beliefs of managerial support. Challenging goals may also indicate management's desire for improvement and change. Because challenging goals can be disruptive to current ways of thinking, they may be used to put the organization in crisis mode for the purpose of delivering change (Sitkin, See, Miller, Lawless, & Carton, 2011). In this regard, output controls' enabling features focusing on challenging goals may signal management's commitment to individuals and innovation. Thus, we hypothesize the following:

Hypothesis 1b : Perceptions of the use of output control will positively affect perceptions of managerial support.

Nevertheless, we argue that output controls are likely to have less influence on perceived managerial support than input control for three reasons. First, commitment research suggests that identification, the motivating force behind the effectiveness of input controls (Snell & Youndt, 1995), is associated with greater attachment to managers than commitment due to compliance (Becker et al., 1996), a major feature of output controls. Consequently, we argue that attachment due to a desire for affiliation is likely to be associated with higher perceptions of managerial support. Second, management's emphasis on goals can lead to a short-term orientation (Seijts, Latham, Tasa, & Latham, 2004) in which employees are given limited time for development activities or building relationships. This, in turn, may lessen organizational members' attachment to management and perceptions of their support. Furthermore, since innovation requires a long-term orientation (Flammer & Bansal, 2017) with a focus on developing the necessary competences to compete in the future, employees may view management as more supportive of innovation when they promote employees' training and development than when they display confidence in employees' abilities to meet challenging goals. Third, the findings from the few studies examining the effect of controls on perceptions of support have consistently found that input controls have a positive effect. However, evidence for the effect of output control have been equivocal (Costa et al., 2014; Evans et al., 2007). Thus, we argue:

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Hypothesis 1c : Input controls are associated with more perceived managerial support than output controls.

The accepted view is that perceptions of managerial support for innovation and change are a significant antecedent to employees' innovative behaviors (see Atuahene-Gima & Ko, 2001; Brown & Eishenhardt, 1995; Goodale et al., 2011; Leonard-Barton & Deschamps, 1988). For example, Zirger and Maidique (1990) found that management support has a positive effect on the successful development of new products. Kuratko et al. (1990) also reported that management support was an important precursor to subordinates’ entrepreneurial behaviors. Thus, perceived managerial support may offer additional insight into how controls predict innovation-related behaviors.

2.3. Controls, perceived managerial support, and innovation

In Damanpour’s (1991) meta-analysis, he found that formalization was positively related to innovation for both product and process innovations. Managers and scholars recognize that even in autonomous work environments, formal administrative mechanisms are useful for developing innovations that are valued in the market and that increase organizational effectiveness (Eisenhardt & Tabrizi, 1995). Prior work has had a strong focus on the coercive aspects of formal control, thereby limiting our understanding of the enabling effect of organizational controls as experienced by employees (Cardinal et al., 2017). Yet, scholars have noted that the enabling features may be essential in motivating organizational members to engage in innovation-related behaviors (Adler & Borys, 1996; Cardinal, 2001; Cardinal et al., 2017).

The enabling features of input controls are beneficial for innovation-related activities for several reasons. First, researchers have noted that knowledge is valuable for less than five years, especially in knowledge-intensive industries (Katila & Ahuja, 2002). Thus, it is important to acquire and augment skills allowing knowledge and competencies to remain current (Cardinal, 2001). Organizations that do not stay up to date with emerging technologies and expertise will quickly lose their competitiveness. Second, incentivizing skill acquisition leads to improved skills and enhanced understanding that facilitates the assimilation of new knowledge (Lenox & King, 2004). Finally, recognition of an individual's or team's expertise builds employees' confidence in their problem-solving abilities, which in turn allows for greater creativity and innovation.

Like input controls, the enabling features of output controls benefit innovation-related activities in multiple ways. First, well-defined objectives direct organizational members' efforts to ensure innovations add value (Khazanchi et al., 2007). By focusing on management's goals, employees do not waste time and effort generating ideas that are infeasible or unable to be commercialized. Second, research has shown that specific and challenging goals are associated with individual and team creativity (Shalley, 1991). Managers can use such goals to challenge current thought paradigms and be a catalytic force for experimentation (Hamel & Prahalad, 1993). Furthermore, organizational members are motivated to continue their innovative efforts when they know they are making progress towards a goal (Kramer & Amabile, 2011). Finally, achieving challenging goals leads to confidence in the team's ability (de Jong, de Ruyter, & Wetzels, 2005). Research demonstrates that employees are more innovative when they believe in their ability to complete tasks and achieve goals (Redmond, Mumford, & Teach, 1993). In sum, control research suggests that organizational controls effectively influence employees' innovation-related behaviors through skill assessment and goal definition (Cardinal, 2001; Li, Lee, Li, & Liu, 2010).

We noted earlier that a firm's ability to successfully compete long-term is dependent upon its process and product innovation capabilities (Damanpour, Walker, & Avellaneda, 2009). Process innovations involve learning and refining the production techniques that a firm uses to deliver its product or service (Damanpour, 1991; Utterback & Abernathy, 1975; Zmud, 1982). In this case, practices that improve organizational efficiency, effectiveness, flexibility, and/or responsiveness are emphasized (Damanpour & Gopalakrishnan, 2001; Khazanchi et al., 2007). Process innovations are fundamental to sustained competitiveness because continuous improvements in operations support a firm's ability to develop new and improved products for the market (Ettlie & Reza, 1992; Kotabe & Murray, 1990). As processes tend to become standardized within an industry (Bertrand & Mol, 2013), competitive advantage increasingly becomes contingent upon learning and improving existing processes rather than creating new ones (Roberts & Amit, 2003). Developing path-dependent knowledge concerning methods and operations determines a firm's ability to learn and improve its processes (Terjesen & Patel, 2017).

Since process innovations involve cumulative learning within specific capabilities and technology domains (Thrane, Blaabjerg, & Møller, 2010; Zmud, 1982), the use of input controls is particularly advantageous. The emphasis on regularly improving a firm's internal processes requires organizational members to be equipped with particular skills and expertise that facilitate continuous learning. To improve the effectiveness of organizational processes management will strive for consistency in the procedures. For this reason, the tasks to be performed and skills needed will be formalized (Zmud, 1982) and there will be ongoing evaluations of employees' competences. Input controls allow for more uniformity because management's specifications of the appropriate type and level of proficiency reduce the uncertainty faced by organizational members. Furthermore, the emphasis on specific skills leads to greater efficiency as individuals learn and become more adept in the capabilities that management endorses (Goodale et al., 2011). Regular training provides knowledge that facilitates adaptability and continuous improvement (Adler & Borys, 1996). Hence, we propose:

Hypothesis 2a : Input controls have a positive direct effect on process innovation-related behaviors.

While we assert that input controls and the emphasis on specific competencies have a direct effect on process innovation-related behaviors, we expect perceived managerial support to mediate the relationship between output controls and process innovation-related behaviors. We expect mediation for three reasons. First, the effectiveness of output controls for innovation is contingent upon the ability of organizational members to improvise the means to carry out their tasks to achieve goals. Second, research indicates that managerial support fosters a safe climate where subordinates are able to reflect on existing work practices, experiment, and make changes that lead to process improvements (Tucker, Nembhard, & Edmondson, 2007). Third, as we noted above, output controls that entail challenging goals suggest endorsement of organizational members’ capabilities and influence perceptions of managerial support for innovation. Given this logic, we hypothesize that output controls will indirectly influence process innovation through their effect on perceptions of managerial support:

Hypothesis 2b : Perceived managerial support mediates the relationship between output controls and process innovation-related behaviors.

Unlike the internal focus associated with process innovation, product innovation is driven by an emphasis on the needs of the external market (Henderson & Clark, 1990; Lichtenthaler, 2016). Product innovation involves introducing novel technologies and/or new functionality to a firm's products or service offerings (Atuahene-Gima, 2005). A firm's continued success and organizational survival depends upon its consistent ability to develop new or enhanced products

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that appeal to changing customer demands (Brown & Eisenhardt, 1995). Product innovations require management to translate market preferences and expectations into organizational goals (Brown & Eisenhardt, 1995).

Since output controls emphasize goals rather than work processes, skills, or specific knowledge, they are especially relevant for product innovations. Researchers have argued that product innovation improves when management exercises control over employees and the innovation process by establishing goals and targets (Eisenhardt & Tabrizi, 1995). With output control, successful product innovations result from management's specifying goals that meet market demands and take advantage of the firm's competences (Brown & Eisenhardt, 1995). In an autonomous work environment, output controls make employees accountable for meeting defined objectives yet gives them freedom to explore a broader range of knowledge, along a different trajectory (Thrane et al., 2010), or combine such knowledge in unique ways (Bertrand & Mol, 2013). By incorporating varied and original knowledge employees can generate ideas that benefit product innovations (Argyres & Silverman, 2004; Carnabuci & Operti, 2013). Thus, we hypothesize:

Hypothesis 3a : Output controls have a positive direct effect on product innovation-related behaviors.

We argued above that experience with a particular type of knowledge can improve efficiency and benefit process innovations; however, path-dependent knowledge may be constraining if a firm is unable to use this knowledge to address changes in the environment and consumer preferences. Yeoh and Roth (1999) noted that the "skills and knowledge embedded in individuals" could lead to core rigidities for a firm if "they are less amenable to change" (pg. 642). Research suggests that successful product innovation requires management impetus to show support for change (Zirger & Maidique, 1990) that reverses organizational inertia and requires management to encourage subordinates to use their knowledge for "orthogonal thinking" (Brown & Eishenhardt, 1995). In this regard, we propose that input controls influence product innovation through their effect on perceived managerial support. Given this, we argue:

Hypothesis 3b : Perceived managerial support mediates the relationship between input control and product innovation-related behaviors.

3. Methodology

3.1. Research setting

In this study, we investigate the influence of organizational controls on employees' innovation-related behaviors and the mediating effect of perceived managerial support. Since the nature of tasks, resource allocations for innovation, and training varies across firms, it is important to control for these factors as they could potentially affect the results. We addressed this issue by testing the hypothesized relationships within a large multinational telecommunications company with 51 teams across three R&D units. These teams were involved in the feasibility, implementation, and testing phases of product and process innovations. Approximately 18 months prior to data collection, the firm implemented the software development methodology known as Agile,[2] which resulted in a large-scale reorganization with the entire workforce restructured into self-managing teams. This led to a migration from a more traditional and bureaucratic structure toward a flatter organizational form using input and output controls. A line manager was responsible for setting the goals for three to four teams and evaluating the training and competence development for individuals within the teams. Additionally, a scrum master in each team coached team members on the implementation of Agile practices, resolved conflicts, and determined which issues that impeded team workflow should be escalated to the line managers. The transformation was launched with the aim of promoting efficiency, learning, product innovations, and collaboration within each self-managing team. Teams were cross-functional and, on average, comprised of eight people. All the R&D units began the transition to the new software development methods at the same time with comparable resources. There was no variation in the implementation of the Agile methods in the organization.

The application of Agile practices resulted in a division of work that was collectively determined by team members rather than by management monitoring prescribed behaviors. All team members were considered to be peers and responsibilities for specific tasks were periodically rotated (about every two to three weeks) so no team member had exclusive control over any task. Decision-making authority concerning how work was to be completed took place at the team level and the entire team was responsible for meeting the goals specified by the line manager. Each team was tasked with developing ideas for product innovations and for improving the processes used in carrying out their work. For example, a team could have a goal of increasing their efficiency and speed in writing code or developing new product functionality (or new technology for the same product functionality). Line management gave the R&D teams product requirements based upon the market needs. Product upgrades may have been new to the market, copied from a competitor, or necessary to meet industry standards.

A line manager in one of the three R&D units facilitated our data collection by providing access to the organization and maintaining high organizational commitment throughout data collection. A survey was distributed as a web questionnaire to all members of the 51 teams across the three units. The target population consisted of 406 respondents. As suggested by Dillman (2000), we adopted a five-step data collection strategy involving telephone calls checking for data accuracy and soliciting non-responders, as well as letters for pre-notice of the study, link to the web questionnaire, and follow-up. At the time of data collection, the person most experienced with Agile had worked with the software development method for more than two years, while the person with the least familiarity had less than six months' experience.[3] The average response rate across the three units was 64 percent.

3.2. Variables

We used an approach similar to that of Chuang, Jackson, & Jang (2016) to develop our constructs. We drew from previous theoretical and empirical research that examined administrative mechanisms (e.g., Kreutzer et al., 2015; Snell, 1992; Snell & Youndt, 1995; Turner & Makhija, 2006), perceived organizational/managerial support (e.g., Anderson & West, 1998; de Jong et al., 2005), and innovation (e.g., Cardinal, 2001; Damanpour et al., 2009; Goodale et al., 2011). We also incorporated information obtained from interviews with line managers, product owners, and team members. The items were adapted to reflect self-managing teams and were finalized after evaluations from four control and HR scholars, an innovation director, and several team members for face validity and survey timing. All items were rated using a five-point scale ranging from 1 (fully dis-

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[2] The Agile software development methodology involves principles aimed at responding to changes in user requirements with minimal formal processes (see Cockburn, 2006). All participants were aware that the survey referred to the Agile software technique.

[3] Each R&D unit included team members who had been trained for four months and worked on the transition for two months before Agile was implemented.

agree) to 5 (completely agree). Please see Table 1 for a complete list of the survey items.

3.2.1. Dependent variables

3.2.1.1. Process and product innovation-related behaviors Drawing on prior work about process innovation (e.g., Ballot, Fakhfakh, Galia, & Salter, 2015; Damanpour et al., 2009; He & Wong, 2004; Terjesen & Patel, 2017; Thrane et al., 2010; Zmud, 1982), we conceptualized process innovation-related behavior in a way that reflects learning and improvements in the process. Our items were adapted from Damanpour and colleagues' (2009) administrative process innovations construct (e.g., "In my team, we take the time to discuss ideas on practices and methods"). The following quotes provide an illustration:Now we have the environment and the culture to improve the way of working … There is much freedom to do things. [team member].Team members should be better in improving their way of working. [line manager].Similarly, we built upon prior literature for our measure of product innovation which captures the development of new or improved product/technologies (e.g., Bertrand & Mol, 2013; He & Wong, 2004). We used four items adapted from Goodale et al. (2011) to assess product innovation within the team. Our measure captures innovation focused on development of products/technologies (e.g., "My team is innovative in terms of the products and technologies it develops"). The Cronbach alphas for process and product innovation-related behaviors were 0.71 and 0.86, respectively, which suggest internally consistent constructs (Nunnally, 1978).

3.3. Independent variables

3.3.1. Input controls and output controls

We conceptualized input controls as the emphasis placed on individuals' training and capability development (Eisenhardt, 1985; Kreutzer et al., 2015; Snell, 1992; Snell & Youndt, 1995). We used two items adapted from Hamilton and Kashlak (1999), Kohli, Shervani, and Challagalla (1998) and Snell (1992) to capture the construct. Team members were asked to rate their response to "I'm evaluated for development of expertise, skills and competencies in practices/methods" and "I'm evaluated for development of expertise, skills and competencies in product and technology." Our measure of output controls was based on the extent to which management establishes goals for the team (Cardinal, 2001; Ouchi, 1978; Snell, 1992; Turner & Makhija, 2006). We used two items adapted from Govindarajan and Fisher (1990), "My team has challenging learning goals in product/technological domains" and "My team has challenging performance goals."[4] The Cronbach alphas for input and output control were 0.79 and 0.80, respectively. The following quote provides an illustration:

We have formal talks with our manager during Individual Performance Management meetings in which we are evaluated … by looking at the (*individual*) competency development and the achievement of team goals. [team member].

3.3.2. Perceived managerial support

To measure perceived managerial support, we adapted prior measures of organizational/management support (e.g.,Anderson & West, 1998; Atuahene-Gima & Ko, 2001; de Jong et al., 2005; Kuratko et al., 1990; Leonard-Barton & Deschamps, 1988) and used items consistent with the idea of perceived managerial support for innovation. Our items reflected management's encouragement, recognition, and support (e.g., "My manager energizes my team to work to meet product/technology innovation goals with recognition and encouragement"). The Cronbach alpha was 0.79.

Table 1
Construct measurement.

Construct	Estimates	CR	AVE
PROCESS INNOVATION		0.82	0.54
1. I continuously learn and improve regarding practices and methods	0.70		
2. In my team we have, time to learn and boost our competence in practices/methods	0.81		
3. In my team, we take the time to discuss ideas on practices and methods	0.80		
4. In my team, learning activities are mostly devoted to boost our competence in practice/methods	0.61		
PRODUCT INNOVATION		**0.71**	**0.39**
5. My team is innovative in terms of the product and technologies it develops	0.55		
6. Many relevant new product ideas circulate within my team	0.70		
7. In my team, we have the commitment to innovate in product/technological domains as basic value for future survival	0.50		
8. My team is sometimes involved in technology/ new product exploration	0.64		
PERCEIVED MANAGERIAL SUPPORT		**0.80**	**0.50**
9. My manager inspires people of my team with plans for the future of the groups	0.73		
10. In my team, we know that individual support for product/technology innovation is available to anyone who wants to be facilitated in idea generation and development.	0.59		
11. My manager is used to participate in product innovation projects/initiatives.	0.69		
12. My manager energizes my team to work to meet product/technology innovation goals with recognition and encouragement	0.79		
INPUT CONTROLS		**0.79**	**0.65**
13. I'm evaluated for development of expertise, skills and competencies in practices/methods.	0.87		
14. I'm evaluated for development of expertise, skills and competencies in product and technology domains	0.74		
OUTPUT CONTROLS		**0.80**	**0.67**
15. My team has challenging learning goals on product/technological domains	0.94		
16. My team has challenging performance goals	0.67		

Table 1 **(continue)**
Construct Measurement

Standardized loadings. All loadings are significant at least at $p < 0.05$

3.3.3. Control variables

To strengthen the validity of our structural equation model approach, we used Preacher and Hayes's (2004) approach (as suggested by Zhao, Lynch, & Chen, 2010) to test our model using mediation analysis with bootstrap resampling (N = 10,000). We also used PROCESS software, which controls for covariates that may affect our results. We controlled for differences in business units using a set of dummy variables that represented the three *unit types*. While team size was constant in all three units, we controlled for individual *tenure*, measured as years of experience with the software development practices (Ancona & Caldwell, 1992; Bantel & Jackson, 1989; Katz, 1982). Past research has demonstrated that personnel turnover within a group negatively affects the influence of team experience on task im-

[4] All respondents understood that the goals referenced in the survey were those imposed by management.

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provement (Argote, Insko, Yovetich, & Romero, 1995). The extant research also points to personnel turnover as a way to produce variability in the organization (e.g., March, 1991). We therefore controlled for any possible effect of differences in personnel turnover across the teams by including a single-item measure of *team turnover* (i.e., "In my team, people are regularly replaced, which provides my team with new or different skills and competences"). A five-point Likert scale was used.

4. Analytic strategy and results

We assessed our measurement model and hypotheses via structural equation modeling (SEM) with confirmatory factor analysis (CFA) using AMOS 21. Measurement model quality was determined through indicator loadings, factor correlations, and composite latent-variable reliability for each construct. The goodness-of-fit of the models was assessed using chi-squared tests, a root-mean-square-error of approximation (RMSEA) no greater than 0.05 (PCLOSE), the normed-fit index (NFI), and the comparative fit index (CFI) (see Bentler, 1990; Marsh & Hocevar, 1985 for a discussion of these indices). Satisfactory model fits are indicated by non-significant chi-squared tests, RMSEA $\leq$0.08, NFI and CFI $\geq$0.90 (Bagozzi & Heatherton, 1994), and PCLOSE $>$ 0.05 (Browne & Cudeck, 1993). All analyses were performed on covariance matrices (Cudeck, 1989). After verifying the acceptability of the measurement model, we examined the hypothesized structural relationships among latent variables. Rival models were analyzed to provide further support for the structure of the constructs, while tests of mediation and path analysis were employed to strengthen the nomological validity of our predictions.

4.1. Measurement model assessment

Internal consistency and discriminant validity. We analyzed factor loadings and used composite reliability (CR) and average variance extracted (AVE) to evaluate the internal consistency of the constructs (see Fornell & Larcker, 1981, equations (10) and (11), respectively). Estimates of CR above 0.60 and AVE above 0.50 are considered to be supportive of internal consistency (Bagozzi & Yi, 1988). The CR and AVE values for all constructs in the models (provided in Table 1), with the exception of one, are in line with the stipulated criteria (Hair, Black, Babin, Anderson, & Tatham, 2010), indicating good internal consistency. Specifically, the AVE for the Product Innovation construct did not reach the 0.50 threshold. Fornell and Larcker (1981) suggest that if the AVE is less than 0.5 but CR is higher than 0.6, the convergent validity of the construct is still adequate (p. 46). Prior studies (e.g., Lam, 2012; Wang, Law, Hackett, Wang, & Chen, 2005) have also used an AVE less than 0.5, with a CR greater than 0.6.

Confirmatory factor analysis was used to evaluate the discriminant validity of the model constructs. We built a CFA model with five latent constructs and 16 measures. The results showed that the model fit the data well (see Table 2). The goodness-of-fit statistics for the model were as follows: N = 207, $\chi 2$ (93) = 134.45, $p < 0.001$, $\chi 2$/df = 1.45 RMSEA = 0.05, PCLOSE = 0.62, NFI = 0.89, and CFI = 0.96. The p-values for all items were significant, suggesting a correspondence with each of the respective underlying constructs. The model's discriminant validity was further confirmed by the fact that the maximum shared variance and average shared variance were larger than the average extracted variance for each construct (Hair et al., 2010). We also tested two alternative models (Table 2) against our baseline five-factor model. Model 3 was a four-factor model with input and output control merged to form a single factor. Model 4 merged process innovation with product innovation to form a single factor.

As Table 2 shows, the fit indexes support the hypothesized five-factor model. For model-comparison purposes, we supplemented the aforementioned fit indexes with the Browne-Cudeck Criterion (BCC), which imposes a slightly greater penalty for model complexity than other measures (Browne & Cudeck, 1993). Given two models, the model with the lower BCC is preferred. The five-factor hypothesized model had a lower BCC (228.18) than the model with output and input controls (Model 3, BCC = 234.42) or the four-factor model with process and product innovation (Model 4, BCC = 260.45). As a final step, we controlled for common method bias using a common latent factor to capture the common variance among all observed variables in the model (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). The results of this analysis show that only two of 16 parameters changed significantly, which increases our confidence in the results. Finally, the correlations among latent constructs (see Table 3) are significantly less than one. As none of the confidence intervals contained the value of 1 (Bagozzi & Yi, 1988), this test provides additional evidence for the model's discriminant validity. Hence, we proceed to the examination of the hypothesized model.

5. Results

Descriptive statistics, including means, standard deviations, and reliability coefficients for the variables, are presented in Table 3, along with the constructs' inter-correlations. We tested the hypotheses by applying structural equation models to the sample (N = 207). Fig. 1 presents the standardized betas of the hypothesized relationships and the r-squared of the endogenous and dependent variables. We allowed error variances for exogenous latent variables to correlate. The goodness-of-fit statistics for the model were as follows: χ^2 (96) = 135.75, $p < 0.001$ significant, χ^2/df = 1.41, RMSEA = 0.05, PCLOSE = 0.68, NFI = 0.89, and CFI = 0.96. These statistics indicate a good fit with the data.

The first set of hypotheses examine the effect of control on employees' perceived managerial support. The results show significant, positive effects for both input controls ($\gamma = 0.34$ $p < 0.001$) and output controls ($\gamma = 0.22$ $p < 0.001$) confirming Hypotheses 1a and 1b. Hypothesis 1c proposes a stronger relationship between input controls and perceived managerial support for innovation. To test Hypothesis 1c, we ran a regression analysis using bootstrap (1000) and robust standard errors with perceived managerial support as the dependent variable, and then used the built-in t-test procedure in Stata 16. We controlled for respondents' business unit affiliations, tenure with the Agile process, and the team's turnover rate. The results were consistent with those ob-

Table 2
Comparison of measurement models.

Model	χ^2	*Df*	$\Delta\chi^2$	χ^2/df	NFI	CFI	RMSEA	PCLOSE	BCC
1. Independent	1211.87	120		10.10					
2. Baseline hypothesized five-factor model	134.45	93		1.45	0.89	0.96	0.05	0.62	228.18
3. Four-factor model with output and input controls collapsed into one factor	142.87	94	$\chi^2(1) = 8.417$***	1.52	0.88	0.96	0.05	0.47	234.42
4. Four-factor model with process and product innovation collapsed into one factor	153.63	87	$\chi^2(9) = 19.185$*	1.76	0.87	0.94	0.06	0.13	260.45

N = 207* $p < 0.05$.***$p < 0.001$.

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Table 3
Means, standard deviations, correlations, and reliability coefficients.

	Mean	St. Dev.	1	2	3	4	5	6	7	8	9
1. Process Innovation	3.15	0.66	(0.82)								
2. Product Innovation	3.25	0.64	.403**	(0.71)							
3. Perceived Managerial Support	3.32	0.66	.446**	.442**	(0.8)						
4. Input Controls	3.56	0.75	.387**	.305**	.335**	(0.79)					
5. Output Controls	3.63	0.83	.366**	.351**	.302**	.426**	(0.8)				
6. Team Turnover	3.03	1.01	.111	.065	.062	.135	.094				
7. Tenure in Agile	3.81	1.17	.01	-.111	−0.01	.079	-.03	.058			
8. Dummy Unit 1	0.88	0.32	.182**	-.007	.038	.220**	.085	.130	.147*		
9. Dummy Unit 2	0.06	0.24	-.237**	.086	-.065	-.286**	-.114	-.166*	-.214**	-.715**	
10. Dummy Unit 3	0.05	0.22	-.003	-.083	.016	-.005	.002	-.007	.021	-.654**	−0.061

N = 207***p* < .01 reliability coefficients in parentheses along the diagonal.

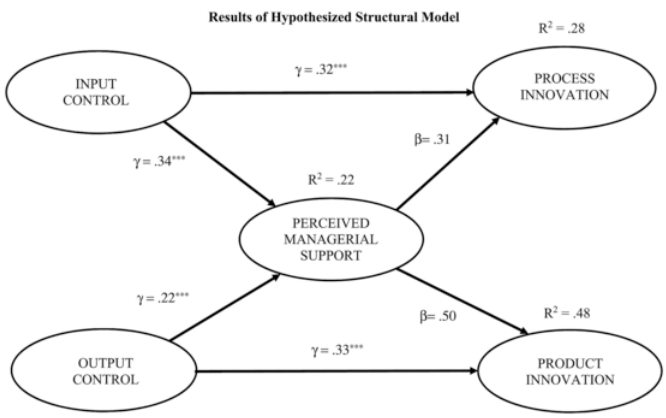

Fig. 1. Results of hypothesized structural model.

tained with the SEM analysis. The standardized coefficients were 0.19 and 0.25 for output and input controls, respectively. The equality test was insignificant with F(1, 201) = 0.47 (p = 0.4945), therefore, we reject the null hypothesis confirming a statistical difference between the two coefficients.

We further tested the robustness of our results by running two stepwise regression analyses entering input and output controls separately to more closely examine their predictive power on perceived managerial support. In the first step of the regression analysis, we added input controls to the control covariates and in the second step added output controls. The incremental effect of output controls accounted for an additional 3 percent of the variance on perceived managerial support. We then ran the regression analysis with the order of entry reversed, controlling for output control with input controls explaining an additional 5 percent. These analyses confirm Hypothesis 1c. Overall, input and output controls explained 22 percent of the variance in perceived managerial support.

Hypotheses 2a and 3a propose differential relationships between control and type of innovation. Specifically, Hypothesis 2a states that input controls have a positive, direct effect on process innovation. The coefficient for this relationship (γ = 0.32 $p < 0.001$) is positive and significant, confirming our hypothesis. The results also show a positive, direct relationship between output controls and product innovation (γ = 0.33 $p < 0.001$), thus supporting Hypothesis 3a. We also hypothesized that perceived managerial support would mediate the relationships between organizational controls and innovation (Hypotheses 2b and 3b). To test for the presence of significant indirect effects, we used a bootstrapping estimation procedure (N = 10,000) with a bias-corrected interval of confidence. We found significant, indirect effects for the relationship between output controls and process innovation (point estimate of 0.068, β = 0.31, $p < 0.001$), which support Hypothesis 2b. We also found a mediation effect between input controls and product innovation (point estimate of 0.15, β = 0.50, $p < 0.001$), which supports Hypothesis 3 b. Overall, organizational controls and perceived managerial support explained 28 percent and 48 percent of the variance in process- and product innovation-related behaviors, respectively.

5.1. Robustness checks

We ran robustness checks on our results by fitting several parameter-nested models of the data and comparing them with our hypothesized model. Because these models are nested, an χ^2-difference test can be used to determine whether the alternative models represent a significant improvement over our hypothesized model. In addition, we looked at different fit parameters to gain further insights into the comparison of these models and their overall goodness-of-fit (see Table 4).

First, we examined the Hypothesis of a full mediation model with no direct effects from input and output controls on innovation types (Model 2). The model fit the data well (χ^2 (97) = 147.28, p < 0.001 significant, χ^2/df = 1.52, RMSEA = 0.05, PCLOSE = .48, NFI = 0.88, CFI = 0.95). Nevertheless, a comparison between Model 2 and our hypothesized model indicates the superiority of the latter. Second, we tested a model that included a direct path from output controls to process innovation (Model 3). The results showed a non-significant ef-

Table 4
Comparison of structural equation models.

Model	χ^2	*df*	$\Delta\chi^2$	χ^2/df	NFI	CFI	RMSEA	PCLOSE	Path Analysis
1. Baseline hypothesized model	135.75	96	χ^2(1) = 11.52***	1.41	0.89	0.96	0.05	0.68	
2. Full mediation model	147.28	97		1.52	0.88	0.95	0.05	0.48	
3. Path from output controls to process innovation	135.69	95	χ^2(1) = 0.07 (p = 0.79)	1.43	0.89	0.96	0.05	0.65	γ = −0.27 (.103) p = 0.792
4. Path from input controls to product innovation	135.50	95	χ^2(1) = 0.25 (p = 0.62)	1.43	0.89	0.96	0.05	0.65	γ = 0.055 (.108) p = 0.611

N = 207*** $p < .001$

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fect for this new relationship ($\gamma = -0.27$; SD = 0.10; p = 0.792) as well as a non-significant chi-squared difference between the two models ($\Delta\chi^2 = 0.07$; p = 0.791). Similar results were obtained when we added a path from input controls to product innovation to our model (Model 4; $\gamma = -0.055$; SD = 0.11; p = 0.611). Overall, these tests further corroborated the validity of our hypothesized relationships.

We also tested alternative models. Since Chuang, Jackson, and Jiang (2016) showed that leadership support moderates the relationship between incentives and individual behaviors, we ran a model with perceived managerial support as a moderator of the relationship between organizational controls and process and product innovation. The overall goodness-of-fit of this structural model was inferior to that of our original model (χ^2/df = 3.09, $p < 0.01$, RMSEA = 0.10, PCLOSE = .05, NFI = 0.95, CFI = 0.96). We also considered the potential substitution/complementarity effect of the different control mechanisms. In this regard, we added an interaction between the effect of output and input controls on our mediator (i.e., perceived managerial support) and our dependent variables. This model was inferior to our hypothesized model (RMSEA = 0.05, PCLOSE = .32, NFI = 0.96, CFI = 0.98). Overall, these additional robustness checks and the analysis of alternative models confirm the validity of our hypothesized results.

6. Discussion and conclusions

The purpose of this study was to increase our understanding of the control–autonomy paradox and the implications this has on two critical activities necessary for long-term competitive advantage: process and product innovation. Drawing on the notion of enabling controls and the literature on perceptions of managerial support for innovation, we argued that in autonomous work environments, the enabling features of controls would positively influence the type of innovative behaviors that subordinates exhibit by shaping their perceptions of managerial support. We hypothesized that organizational members' view of management's support is more important for input controls when developing product innovation and necessary for output controls when creating process innovation. Our results confirm that an emphasis on skill acquisition is directly related to process innovation-related behavior and, due to the mediating role of perceptions of managerial support, indirectly related to product innovation-related behavior. The opposite is true when challenging goals are stressed, i.e., there is a direct relationship with product innovation-related behavior and an indirect relationship with process innovation-related behavior. These results are robust for different estimation techniques and controls for alternative explanations. Below we discuss the implications for theory and practice.

6.1. Implications for theory

Our study extends the control and innovation literature and research on the relationship between administrative mechanisms and organizational outcomes, in general. Prior research concerning the control domain traditionally assumed a coercive point of view that propagates the control–autonomy dilemma by limiting employees' autonomy and coercing them into compliance. This, in turn, diminishes innovation (Adler & Borys, 1996). However, the emerging trend in control studies suggests that the enabling features of controls are the solution to the control–autonomy dilemma for innovation (Cardinal, Sitkin, & Long, 2004; Schroeder, Linderman, Liedtke, & Choo, 2008). Researchers also note the importance of managers' concern for employees in order to achieve organizational competitiveness (Cardinal et al., 2017). An emphasis on the enabling aspects of controls and the role they play on perceptions of management support may help explain why the findings from prior control-innovation research have been inconsistent.

By linking controls' emphasis on skill acquisition and specifying challenging goals to perceptions of support, we provide a more nuanced understanding of the control–autonomy dilemma and enhance the theoretical arguments found in the ambidexterity and organizational design literatures. Specifically, we offer greater theoretical insight into how Ghoshal and Bartlett (1994) ,) notion of organizational contextual features—stretch, discipline, support and trust—enables organizational members and, in turn, lead to perceptions of managerial support. In this regard, our results extend Gibson and Birkinshaw's findings (2004) by showing how different aspects of organizational context (i.e., administrative controls and perceptions of management) are uniquely related to different forms of innovation.

In addition, we show that administrative mechanisms need not be designed with a zero-sum gain between control and autonomy, which potentially results in a lack of innovation or innovations that do not add value. Management's monitoring the development of specific skills and having stretch goals results in both process and product innovative-related behaviors when subordinates believe they have support from management. Thus, cultivating organizational members' perceptions of managerial support is a fundamental aim for the design of administrative mechanisms to encourage innovation and facilitate autonomy, adaptability, and goal alignment. Further, our examination of the relationship between different forms of control and multiple innovation-related behaviors suggests the control features to consider when emphasizing process and product innovations.

Another implication of our study is the importance of understanding the perceptual effects of organizational control mechanisms. Our results show that input controls are associated with significantly higher perceptions of managerial support than output controls. Specifically, organizational members perceive more support when management provides for skill development and training that encourages internalization of the firm's objectives and identification with its values than when management stipulates goals that facilitate internalization and compliance. Studies that do not consider the effects of controls as experienced by organizational members only offer a partial understanding of the relationship between control and organizational outcomes, as they do not explain the motivative consequences of controls.

This study also contributes to the scant literature on the management of process and product innovation within a firm (Damanpour, 1991; Damanpour & Gopalakrishnan, 2001; Lichtenthaler, 2016). Previous literature emphasized the patterns of adoption between periods of process and product innovation (Damanpour & Gopalakrishnan, 2001; Utterback & Abernathy, 1975). Yet, organizational competitiveness is contingent upon simultaneously pursuing both forms of innovation (Brown & Eisenhardt, 1995; Terjesen & Patel, 2017). However, the mechanisms and management characteristics necessary to concurrently deliver both forms of innovations are under-researched (Damanpour, 1991). Our results are compatible with those of Terjesen and Patel (2017), who argued that knowledge search activities for process and product innovation would differ and found that process innovations are negatively associated with search breadth and positively associated with search depth. Their results are congruent with our argument that input controls that focus on similar knowledge will have a direct relationship to employees' engagement in process innovation-related behaviors, while output controls that allow for a broader knowledge search require a mediator, i.e., support from management, to facilitate process innovation-related behaviors. Although prior research has argued that managerial support is a necessary condition for employees to engage in such behaviors due to the inherent risks of innovative activities (Atuahene-Gima & Ko, 2001; Zirger & Maidique, 1990), this study shows that the need for managerial support is contingent upon the controls in place and the type of innovation.

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6.2. Managerial implications

The most apparent practical implications of our findings concern the nature of formal control in autonomous team environments. First, managers should be aware that by employing specific formal controls, the innovation process in self-managing team environments can be managed to deliver multiple types of innovation. Second, managers should bear in mind that the effectiveness of controls on employees' innovation-related behaviors is contingent upon how controls influence subordinates' perceptions of their support. Our study provides evidence that managers can use evaluations based on skill acquisition and/or stretch targets for team performance to show their support for organizational members' efforts. Third, our results have implications for how organizational members can be motivated to achieve performance objectives. Our study instructs managers to consider the type of commitment (e.g., internalization, identification, or compliance) resulting from the design of the control system. Our findings suggest that differences in perceived support may be due to the nature of employee commitment, a byproduct of organizational controls. In sum, this study recommends that management consider the effect of controls on the nature of organizational members' commitment and carefully take note of the perceptual effects of the administrative mechanisms used to motivate organizational members' behaviors. At the very least, in addition to monitoring employees' skills and performance, management may consider monitoring subordinates' beliefs regarding management's concern for their well-being, their access to the necessary resources (e.g., training, decision-making authority), and challenging or stretch goals.

As high-profile firms such as Zappos garner attention for adopting management techniques centered around autonomous decision-making, there is continued interest in how firms can balance autonomy and management control to achieve performance goals. In the case of Zappos, the implementation of the self-management practice—holacracy—resulted in some employees leaving the company and was credited with Zappos falling off of *Fortune* magazine's annual list of the "100 Best Companies to Work For" for the first time in eight years (Reingold, 2016). According to the *Fortune* article, one employee noted that there had been a decline in the "approval of managers" since the implementation of holacracy. Along this line, a Harvard Business study cited "lack of clarity" and "no definitive answers" as the primary complaints of employees leaving Zappos (Bernstein, Bunch, Canner, & Lee, 2016, pp. 38–49). Zappos employees' experiences are consistent with the implications of our results, pointing to the need for management input in autonomous work environments and the importance of perceptions of managerial support.

6.3. Limitations and directions for future research

This paper has some limitations that might spur future research. First, we cannot claim causality for our hypothesized relationships because we collected data using a cross-sectional design. But concerns regarding reverse causality and the superiority of different possible models are lessened by our analytical approach, which uses SEM and the analysis of alternative models' structure, together with our strong theoretical arguments. One promising approach for assessing causality would be a longitudinal design using supervisors' reported measures of subordinates' innovative behaviors. Another useful method for assessing the causality of the hypothesized relationships would be a quasi-field experiment that measures organizational members' perceptions of managerial support and innovative behaviors before and after the introduction of control mechanisms.

A second limitation pertains to our investigation's focus on a single organization with multiple R&D teams. While this context was well suited for our goals and allowed us to control for various exogenous factors (e.g., controls, technology, training, and goals) that might have influenced the results, it also might have affected the generalizability of our findings. In addition, knowledge and innovation are increasingly important for firms across a variety of industries with more traditional and hierarchical structures. Therefore, future studies should try to determine the generalizability of our results by replicating our model in different contexts and analyzing possible contingences.

A third limitation of our study is that the measurement of input controls only captures one aspect of the construct: skill development. This feature of input controls—emphasizing capability development (Challagalla & Shervani, 1996)—facilitates creating a desirable "knowledge environment" (Cardinal, 2001). However, this measure does not completely operationalize some ex-ante aspects of input control discussed by control researchers, i.e., rigorous selection procedures (Snell & Youndt, 1995), nor does it capture ex-post features such as socialization mechanisms (Ouchi, 1979). Future research may examine the effect that selection procedures and socialization have on perceptions of managerial support. Although, as Snell and Youndt (1995) noted, it is important to understand and investigate the correct type of processes required rather than merely examining their presence.

Another limitation of this study is the operationalization of output controls captured solely as having challenging goals. In addition to specifying goals, formal output controls traditionally have been defined to entail evaluations based upon achieving goals and performance-related rewards (Ouchi, 1978; Snell, 1992). It is conceivable that these elements of output controls may have a differential effect on perceived managerial support and thus explain the lack of consensus in prior studies (see Costa et al., 2014; Evans et al., 2007). Our results will hopefully spur future research to consider examining output control with a more comprehensive measure as well as examining individual features separately.

Finally, an additional area for future research is an examination of other intervening variables that may affect the relationship between organizational controls and different innovation types. For example, individuals' degree of identification with the team and the organization might strengthen or weaken the relationships among the organizational controls, perceived managerial support, and innovation types. Therefore, an investigation of how controls influence other variables would most likely be fruitful.

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