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The sources of green management innovation: Does internal efficiency demand pull or external knowledge supply push?

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ABSTRACT

Compared with the abundant achievements of technological innovation, management innovation is still under-researched in academia. Putting management innovation in the context of environmental issues, this paper seeks to answer two key questions: (1) what factors stimulate green management innovation and (2) how can green management innovation affect firm performance. On the basis of literature review an operational definition of green management innovation is given. Then the relationships between green management innovation, its antecedents and consequences are hypothesized. A total of 267 valid questionnaires from mining industry in China are used. Different from the market pull and technology push of technological innovation, green management innovation is mainly pushed by external knowledge supply, while the internal efficiency demand does not play a significant role in our findings. Moreover, green management innovation has a positive effect on firm economic performance and internal efficiency demand moderates the effect. Our findings provide complementary insights to green management innovation.

1. Introduction

With the continuous deterioration of global environmental issues, dealing with environmental challenges has become an important issue in business operations. Firm's environmental awareness continues to grow (Cainelli et al., 2015). “Going green” has been an important measure that most firms adopt (Christmann, 2000). The green practices of firms have aroused academic attention and discussion during the past two decades.

The majority literature focuses on green product innovation and green process innovation, analyzing their drivers and consequences (e.g. Shrivastava, 1995; Rennings, 2000; Sharma and Henriques, 2005; Stefan and Paul, 2008; Qi et al., 2010; Horbach et al., 2012; Berrone et al., 2013; Amores-Salvadó et al., 2014; Ma et al., 2017; Dangelico et al., 2017). But green management innovation is not the case. Only little literature (generally qualitative and anecdotic) analyzes the role of certain management practices (Melnyk et al., 2003; Dahlmann et al., 2008; Inoue et al., 2013). Little effort has been devoted to investigate green management innovation comprehensively so for (Haden et al., 2009; Damanpour, 2014; Llach et al., 2012).

The paper addresses the deficiencies in existing researches by considering two questions. First, under what conditions do firms introduce green management innovation? Second, how does green management innovation affect firm performance? Extant literature mainly focuses on green technological innovation, overlooking the effect of technological innovation on firm performance. Our findings refresh the research on green innovation and are conducive to firms' sustainable development.

The contributions of this article are mainly as follows:

(1) It makes a practical definition of green management innovation. There are a lot of existing literature on green innovation, mainly focusing on product and process, but as far as we know, there is no specific definition of green management innovation. (2) It studies the power source of green management innovation. Traditional innovation theory believes that the motivations of innovation come from market pull, technology push, government startup and so on. Combined with these theories, some researchers have done empirical studies from the perspective of technological innovation, however there is still lack of research on management innovation. Combining with environmental issues, we study the

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power source of green management innovation, and find that efficiency demand is not the reason for firms to carry out management innovation, the supply of innovative knowledge directly promotes firms' management innovation. Based on this conclusion, we can derive some practical suggestions for firm's management innovation. (3) It studies the relationship between green management innovation and firm performance. Although academia has confirmed the relationship between green technological innovation and firm performance, green management innovation is not the case, it is regarded as the burden of firms. The results show that green management innovation is helpful to the improvement of firm performance, and the effect is more obvious when there is a strong demand for innovation. This conclusion provides a strong support for encouraging managers to carry out green management innovation.

This study is organized as follows. The definition of green management innovation and hypotheses in this paper are introduced in Section 2. Samples, questionnaires, and variables are explained in Section 3, and the results are presented in Section 4. The implications of our findings are discussed in Section 5 and the limitations and future research are discussed in the last section.

2. Background literature and hypotheses

2.1. Background literature

Green management innovation is a peculiar subset of both green innovation and management innovation and then a combination of these two areas.

2.1.1. Green innovation and management innovation

Green innovation is postulated as a promising means to achieve both economic growth and environmental protection (Christmann, 2000). It is referred to as "the production, application or exploitation of a good, service, process, organizational structure or management or business method that is novel to the firm and which results in a reduction of environmental risk" (Arundel and Kemp, 2009; Horbach et al., 2012; De Marchi and Grandinetti, 2013). According to this widespread definition we can see there are many forms of green innovation, including technological innovation, i.e., product and process, and non-technological innovation, i.e., organizational structure, management or business model (Shrivastava, 1995; Berrone et al., 2013; Shu et al., 2016; Ma et al., 2017; Brehmer et al., 2018). In order to reduce environmental impact, firms have carried out a lot of new practices in non-technological field. Such practices include environmental management, quality management, energy management, green marketing, green supply chain etc (Theyel, 2000; Watson et al., 2004; Wagner, 2008; Vachon and Klassen, 2008; Fiore et al., 2017; May et al., 2017; Li et al., 2018; Montobbio and Solito, 2018). Compared with the favor of technological innovation, non-technological innovation has not received much attention in this domain yet. Only a few researches have studied the influence of some single non-technological practice to firms (May et al., 2017; Li et al., 2018; Montobbio and Solito, 2018). To the best of our knowledge, there is still a lack of research on the drivers of green non-technological innovation.

Management innovation is also termed as administrative innovation (Naveh et al., 2006) or organizational innovation (Alänge et al., 1998; Armbruster et al., 2008) in literature. Although management innovation occurs in almost all firms (Evangelista and Vezzani, 2010), only less than 10% of the research articles in the field of innovation focuses on it (Damanpour, 2014). It is an under-researched form of innovation (Llach et al., 2012; Birkinshaw et al., 2008). Some researchers define management innovation as the application of management practice or structure that is new-to-the-state-of-the art (Chandler, 1990; Hamel, 2006). Others define it as "the invention and implementation of a management practice that is new to the firm" (Birkinshaw et al., 2008; Volberda et al., 2013; Walker et al., 2015). Compared to other innovation forms, it is primarily an organizational-level phenomenon and emphasizes changes in the way managers work (Hamel, 2006; Volberda et al., 2013; Damanpour, 2014). Two dominant perspectives have been identified to explain the antecedents of management innovation, i.e., rational perspective and fashion perspective (some literature uses "social") (Sturdy, 2004; Birkinshaw et al., 2008; Ansari et al., 2010; Volberda et al., 2014; Damanpour, 2014; Walker et al., 2015). The rational perspective rooted in the economic theory assumes the motivation for the introduction of management innovation is to improve firms' efficiency (Sturdy, 2004; Walker et al., 2015). The fashion perspective rooted in the network and behavioral contagion theories argues that management innovation in firms is driven by bandwagon pressures to gain external legitimacy and reputation rather than technical reasons (Birkinshaw et al., 2008; Volberda et al., 2014). Although both perspectives are often mentioned by academics in the field of management innovation, they have not been proved yet.

2.1.2. Green management innovation

In accordance with the widespread definitions in these two fields mentioned above, we define green management innovation as "the introduction or application of new environmental management measures within the firm". 2 questions must be answered to define innovation at the operational level (Birkinshaw et al., 2008), what is being innovated, how new the innovation is. Our definition emphasizes these two key elements. First, what is being innovated? The focus of green management innovation is the green management practices within firms, such as environmental management, energy management, quality management, etc. Second, what is the degree of novelty? Such management practice that is new to the focal firm, whether it is invented by the firm or adopted from other firms, is green management innovation. There are still other non-technological practices in green innovation domain such as green marketing, green supply chain. We exclude these practices in this definition meticulously considering they need to contact stakeholders beyond the focal firm's boundary. As they are inter-organizational level phenomena (Armbruster et al., 2008; Damanpour, 2014), we believe that it's better to use business model innovation theory to study these phenomena (Boons et al., 2013; Brehmer et al., 2018).

2.2. Hypotheses

2.2.1. Green management innovation and internal efficiency demand

From the rational perspective of management innovation, scholars posit that managers drive innovations to deliver improvements in organizational effectiveness (Chandler, 1990). Performance gap theory is often mentioned in this stream to explain the adoption of new management practices (Sturdy, 2004; Walker et al., 2015). When a firm perceives the difference between its actual accomplishment and potential accomplishment, the need for change to bridge the gap is created. Since firms are adaptive systems and change in response to internal aspirations, the focal firm may adapt or introduce new management methods to improve the organizational performance. For instance, the scarcity of materials induced the development of lean management system in Toyota (Grant, 2008).

With the improvement of environmental requirements, firms need to work hard to minimize the environmental hazards caused by products and production processes. When there is a gap