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Formulating problems for commercializing new technologies: The case of environmental innovation



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Summary Prior research on environmental innovation has highlighted the importance for the firm of a shared environmental vision but has not empirically explored why or what are its effects. The purpose of this paper is to analyze the effect of an environmental sustainability vision for the development and commercialization of environmental innovations. We conduct an in-depth, multilevel investigation of the development of green product lines in a multinational manufacturing firm, based primarily on interview data collected over five years. By analyzing the interaction between environmental vision and the product development process as an interaction between problem formulation and the search for problem solutions, we explain how and why a shared environmental vision can accelerate environmental innovation. Specifically, we show that a shared environmental vision can lead to an increase in the number of application areas, and increased sales of previously customized solutions but that the efficacy of the shared vision is dependent on a good match between the environmental problems being focused on, and the core competencies of the firm.

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Introduction

The interest of firms in environmental considerations is growing (Haanaes et al., 2011; Keeble, Lyon, Vassallo, Hedstrom, & Sanchez, 2005). The drivers for companies to become greener and develop environmental or green offer-

ings include a range of factors. First, as population and economic growth increase the pressure on, e.g., waste, water, and consumption of fossil fuels and raw materials, the economics of scarce resources is calling for new solutions effective with respect to the environment. Thus, green initiatives often are directly related to the opportunity to decrease resource consumption and increase efficiency (Florida, 1996). Second, employee morale and a socially responsible firm image are important drivers of firms' corporate sustainability initiatives (Keeble et al., 2005), and many firms are incorporating energy savings and carbon dioxide (CO₂) reduction into their corporate social responsibility policies. Third, regulation is an important aspect of corporate green

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initiatives (Porter & Van der Linde, 1995) and includes regulation aimed at internalizing negative externalities, plus subsidies for certain technologies and deregulation of certain markets. Fourth, arguably, there will be increased demand from both consumers and firms for environmentally friendly products, services, and production processes (Keeble et al., 2005). Fifth, and partly as a result of the first four drivers, many firms see major opportunities from involvement in environmentally friendly innovations for differentiation (Mont, 2004; Porter & Van der Linde, 1995) and other types of competitive advantage (e.g. Sharma & Vredenburg, 1998).

To date, research on environmental initiatives has focused largely on demarcation (what is or is not green) and the drivers of corporate sustainability initiatives (why firms should care). Although there is some research that looks at the 'how' of creating environmental innovations (e.g. Carrillo-Hermosilla, del Rio Gonzalez, & Könnölä, 2009; Epstein, 2008; Esty & Winston, 2006; Hoffman, 2000; Hutchinson, 1996; Lankoski, 2008; Mont, 2004; Porter & Van der Linde, 1995; Roome, 1992; Sharma & Vredenburg, 1998; Stead & Stead, 1995; Steger, 2004), there is still much we do not know.

It has been argued that the development of environmental innovations requires a shared environmental vision and explicit goal-setting by top-management (e.g. Figge, Hahn, Schaltegger, & Wagner, 2002; Hart, 1997; Larson, 2000). However, we know comparatively little about how these aspects affect the development of new, environmentally differentiated offerings in established firms. Since there is no reason to assume that a specific environmental vision will lead to profitable environmental innovation in all firms, we need to investigate in depth the relationship between an environmental vision and the commercialization of environmental innovations. The purpose of this paper is to *analyze the effect of an environmental sustainability vision for the development and commercialization of environmental innovations by an established firm*.

To achieve this, we apply a problem-solving perspective (Nickerson & Zenger, 2004) to analyze the process by which an explicit environmental vision leads to the commercialization of environmental offers. We study a Swedish multinational corporation (MNC), referred to here as Bearing Co.,² and several of the products in one of its business areas – automotives. We contribute to the literature on environmental innovation by highlighting the importance of matching the firm's environmental vision with its core competencies. We also provide a theoretical explanation for how, under the right conditions, the process can be accelerated.

Theoretical framework

We begin this section with a brief review of the relevant prior research on environmental innovation. Environmental innovation is generally seen as embracing all those technologies, products, solutions, processes, services, and new management and business methods that are more environmentally friendly than relevant alternatives, and which at the same

time add economic value via lower costs and/or improved profitability (Foxon & Andersen, 2009). Environmental innovation has been studied fairly thoroughly from a profitability and business model perspective but we need to know more about the practical implementation of environmental innovations in established firms. This re-emphasizes the topic of corporate environmental visions as relevant for further study. The problem-solving perspective of the firm (Hsieh, Nickerson, & Zenger, 2007; Pounds, 1969) is adopted to analyze the role of problem formulation for innovation activity. We summarize some key points and provide a conceptualization of environmental vision, innovation, and value proposition, utilizing problem terminology.

Environmental innovation

Academic researchers have studied the phenomenon of environmental innovation for several decades (e.g. Ashford, Heaton, & Priest, 1979; Hart, 1995; Horbach, 2008; Runge, 1987). The literature focuses on two main areas: (1) the role of policy and other institutions in the development of environmental innovations (e.g. Jaffe, Newell, & Stavins, 2002; Kivimaa, 2008; Porter & Van der Linde, 1995; Wallace, 1995), and (2) the study of competitive advantage in relation to environmental innovations (e.g. Hart, 1995; Hoffman, 2000; Sharma & Vredenburg, 1998; Steger, 2004). While the first of these literature streams could be understood as focusing on *potential* implications for firm strategy, the second is more aligned to the topic of this paper.

Some of the literature on competitive advantage related to environmental innovations focuses on the average profitability of the environmental innovation and appropriation of its economic value. In terms of the profitability of environmental innovations, the empirical studies so far have been inconclusive – or at least not convergent. Some studies find a positive relation (e.g. Hart & Ahuja, 1996; Klassen & McLaughlin, 1996; Russo & Fouts, 1997), no relation (e.g. Johnson, 1995; Lanoie, Laplante, & Roy, 1998; Repetto, 1995), or a negative relation (e.g. Cordeiro & Sarkis, 1997). Ultimately, it seems that under some circumstances there are green business opportunities for some firms (e.g. Carrillo-Hermosilla et al., 2009; Dunphy, Griffiths, & Benn, 2002; Esty & Winston, 2006; Hoffman, 2000; Porter & Van der Linde, 1995). This leads to the question of under which circumstances is environmental innovation profitable?

Part of the answer is related to the appropriation of economic value from environmentally differentiated offers. This is a fairly wide and dispersed research area. Product-service systems research (e.g. Mont, 2004), for example, focuses on business models (i.e. the conceptual logic related to how a firm creates and appropriates economic value – Björkdahl, 2007, 2009; Osterwalder & Pigneur, 2010) that are conducive to exploiting environmental innovation, while other studies focus on the role of branding, institutions, and lobbying to identify strategies suitable for exploiting environmental innovations (e.g. Borchers, Duke, & Parsons, 2007; Linder, 2012; Ozaki, 2011; Pacheco, Dean, & Payne, 2010; Roe, Teisl, Levy, & Russell, 2001). However, arguably of more practical concern is how managers of established firms can create processes and routines for the effective development of profitable environmental innovations. It is often

² The name of the corporation has been disguised for confidentiality reasons.

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