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What drives successful implementation of pollution prevention and cleaner technology strategy? The role of innovative capability

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ABSTRACT

Firms that are dynamic and prepared to implement environmental strategies have a potential competitive advantage over their industry counterparts. Therefore, it is important to understand, what capabilities are required to implement proactive environmental strategies. The paper discusses the attributes of innovative capability required by firms in order to adopt pollution prevention and cleaner technology strategies. Empirical results show that process and behavioral innovativeness are required by firms to implement a pollution prevention strategy. In addition to process and behavioral innovativeness, firms need a top management with high risk-taking ability as well as market, product, and strategic innovativeness to implement a cleaner technology strategy. The paper proposes some important managerial implications on the basis of the above research findings.

1. Introduction

The resource-based view of firms states that a firm's ability to implement strategies successfully depends on its capacity to create and exploit resources better than competitors. Creating a competitive advantage requires a strategic fit between the firm's unique organizational capabilities and the changing external business circumstances (Andrews, 1971; Chandler, 1962; Penrose, 1959). Sustaining this advantage go beyond just acquisition and generation of tangible and intangible resources that are valuable, rare, and inimitable. Firms must possess the ability to integrate and deploy these resources in a manner derived from causally ambiguity, socially complexity, and inimitability (Amit and Schoemaker, 1993; Barney, 1991; Wernerfelt, 1984). Some researchers (e.g. Hart, 1997) and organizations (e.g. Millennium Ecosystem Assessment, 2005) view natural environment as a constraint to the global economy. Researchers (Christmann, 2000; Hart, 1995; Russo and Fouts, 1997) argued that firms can create a competitive advantage in this nature-constrained economy if they proactively develop the capability to manage the natural resources better than their competitors. But the question arises is that what are those capabilities. Dynamic capability is defined as the "firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (Teece et al., 1997). Can dynamic capability help firms in implementing environmental strategies to gain a competitive advantage?

2. Research significance and objectives

Hart (1995) in his seminal work proposed that while implementing short term strategies based on pollution prevention (P2) and product stewardship, and long term strategy based on sustainable development, it is essential for firms to develop resources like continuous improvement, stakeholder integration, and sustainable vision. These organizational resources are valuable, rare, and inimitable and thus have a potential to create a competitive advantage. These resources in combination with organizational capabilities resulting from are a history of development on a unique path, social intricacy, and compounded experiences enable a firm to implement a proactive strategy in gradual and systematic way. Sharma and Vredenburg (1998) identified capabilities as stakeholder integration, continuous higher-order learning, and continuous innovation in order to implement proactive environmental strategies. It is also suggested that organizational capabilities related with P2 strategy leads to cost advantages only if complementary capabilities of process innovation and execution are

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present (Christmann, 2000). Similarly, the capability of developing and deploying natural environment friendly manufacturing technology can improve firm's performance (Klassen and Whybark, 1999).

Most of the existing research on P2 strategy and cleaner technology (CT) implementation involves firms based in developed countries (Aragon-Correa, 1998; Berry and Rondinelli, 1998; Christmann, 2000; Ramus and Steger, 2000; Sharma and Vredenburg, 1998). Aragon-Correa (1998) surveyed firms in Spain and realized that the firms with the most proactive business strategies employed both corrective as well as preventive natural environmental approaches. Berry and Rondinelli (1998) identified elements of successful environmental strategy as support of top management, clearly stated environmental policy, declared and measureable goals, participatory decision making by employee engagement, and stricter monitoring, auditing, reporting and assessment system. Christmann (2000) studied American firms to establish that capabilities related to process innovation and execution are complementary assets that helps in determining environmental performance leading to cost advantages. Ramus and Steger (2000) studied European firms to understand the important environmental policy factors and management support behavior leading to employee's eco-initiatives. Sharma and Vredenburg (1998) found out that Canadian firms having capabilities for stakeholder integration, higher order learning, and continuous innovation were proactive in implementing environmental strategies.

Scholars have also analyzed the influence of characteristics of the business environment like uncertainty, complexity, and munificence in moderating the relationship between proactive environmental strategy and competitive advantages (Aragón-Correa and Sharma, 2003). Organizational capabilities involved in other proactive environmental strategies like industrial ecology have also been discussed (Sangle, 2010). However, very little attention has been paid to understand the dynamic capability or common characteristics of dynamic capability of firms to implement proactive sustainability strategies.

The paper attempts to present detail understanding on essential common characteristics of dynamic capability to implement P2 and CT strategies. Innovative capability has been considered as one of the components or commonalities or common characteristics of dynamic capability and is said to consist of process, behavioral, market, product and strategic innovativeness (Wang and Ahmed, 2007, 2004). The literature suggests that P2 capability can be built in the short term when employee involvement is higher and the firm can continuously improve (Hart, 1995), which is a reflection of its continuous innovative capability (Sharma and Vredenburg, 1998). Similarly, it is also reported that to implement sustainable development in the long term, firms should have the ability to create disruptive innovative technologies that do not exist today (Hart and Milstein, 2003). We analyzed survey data (based on questionnaires) on P2 strategy, CT strategy, and innovative capability of Indian firms from various industry sectors to explore further that which dimensions of innovative capability help firms in implementing both P2 and CT strategies.

3. Linking innovative capability attributes with pollution prevention and cleaner technology strategies

3.1. Innovative capability attributes and pollution prevention strategy

Extant literature suggests that innovative capability covers a range of innovative activities such as design and developing new products or services, new methods of production, discovering new markets, exploring new sources of supply and constructing new organizational forms (Betz, 1993; Schumpeter, 1934; Weerawardena, 2003). Innovation has been defined as the mechanism by which firms create the new set of products, processes and systems to adapt with evolving markets, technologies, and competition (Daft, 1982; D'Aveni, 1994; Utterback, 1994). Recently, Wang and Ahmed (2004) identified five factors that contribute to a firm's overall innovativeness: product, process, strategic, market, and behavioral innovativeness. Innovations have also been classified on the basis of their degree into radical and incremental (Afuah, 1998; Wan et al., 2005). A radical innovation is generally said to mark a distinct and risky departure from existing practices and competences (Dosi, 1982), whereas an incremental change builds on the existing skill set (Afuah, 1998; Myers and Marquis, 1969).

The problems of extensive material consumption, enormous waste, and continuously increasing pollution linked with industrialization present an opportunity to lower cost of product and delink risk of any type with a strategy to enhance pollution prevention and eco-efficiency (DeSimone and Popoff, 1997). Effective P2 requires substantial employee engagement and empowerment along with capabilities in continuous improvement and total quality management (Hart, 1995). P2 strategy defines the transparent and easiest way to increase bottom line for firms hence increasing overall shareholder value. It is evident from literature that firms managed to reduce cost of production and witnessed better profitability due to P2 and waste management strategies with appropriate skills in employee engagement and continuous improvement (Christmann, 2000; Sharma and Vredenburg, 1998).

P2 is defined as “the use of materials, processes, or practices that reduce or eliminate the creation of pollutants or wastes at the source” (Freeman et al., 1992). It can be achieved through production processes redesign, input raw materials substitution of raw material, and recycle and reuse of by products from production processes and incremental technological improvements in processes (Hart, 1995; Porter and van der Linde, 1995). Process innovativeness as an attribute of innovative capability is defined as introduction of new production methods, new management approaches, and new technology that can be used to improve production and management processes (Wang and Ahmed, 2004). As this is a comprehensive definition to include all type of process changes-technological as well as non-technological-this has been renamed as ‘Business Process Innovativeness’ (BPI) in this study. The adoption of cleaner production methods as well as technological advancements to enhance eco-efficiency of processes, introduction of new management approaches to overhaul production methods, and efforts to reduce carbon footprint, wastes, emissions and pollutants can be linked to BPI (Christmann, 2000).

Firm's willingness to innovate can be considered as the first predictor of the firm's innovative behavior (Montalvo, 2003). Firm's willingness to engage in innovative activities which is proxy to innovative behavior can be explained and predicted in terms of its individual employee, managers and team's attitude towards innovation. The ‘Behavioral Innovativeness’ (BVI) can be present at different levels of organization as individual, teams and management. Willingness to change as a person (Hurt et al., 1977), team's ability to absorb and adapt to new requirements and expectations of organization (Lovelace et al., 2001) and management's willingness, commitment and support to new ways of doing the things across all activities (Rainey, 1999) collectively demonstrates BVI of a firm. Team interaction, knowledge sharing and effective communication among team members have a positive effect on efficiency of process innovations (Brown and Eisenhardt, 1995). BVI, a component of innovative capability, is required to engage organizational members willingly in creating marginal improvements required for P2 (Ramus, 2002).