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Determinants of Mindful Adoption of Green Innovation

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Abstract

Green innovation adoption is usually believed to be able to confer strategic and competitive benefits to the adopting firms. This paper aims to develop a model that analyzes factors influencing mindful adoption of green innovation. Organizational mindfulness is an organizational attitude that allows firms to be preoccupation with failure, reluctance to simplify interpretations, sensitivity to operations, commitment to resilience, and deference to expertise. Firms require mindfulness thinking in green innovation adoption. Although studies on green innovation adoption can be found in the literature, less is known about organizational mindfulness in green innovation adoption. A conceptual model regarding determinants affecting mindfulness thinking in green innovation adoption is proposed in this paper. The determinant factors are grouped into technological, organizational and environmental dimensions, and the corresponding influence of each factor on mindful adoption of green innovation is discussed. This study can broaden the scope of research on environmental management and organizational mindfulness theory, and contribute to an insight into mindful adoption of green innovation.

Key words: *Green Innovation Adoption; Organizational Green Mindfulness; Technological Factors; Organizational Factors; Environmental Factors*

JEL classification: *M10, M11, M14, O32*

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Introduction

While environmental consideration has become a fundamental part of business strategies, there is a challenge for managers and academicians to explore the integration of environmental concepts and business operations. Applying environmental criteria into corporate operations requires exploring new resource combinations and deploying existing resources in new ways (Hart, 1995). Green practice adoption involves implementing new or modified processes, techniques and systems to reduce environmental harms. As innovation is the use of new technical and administrative knowledge, the adoption of green practices can be regarded as an innovation process. Several researchers (Henriques & Sadorsky, 2007; Rothenberg & Zyglidopoulos, 2007) analyze environmental issues from the perspective of innovation. For example, Del Brio and Junquera (2003) have summarized some factors that influence green innovation management in small and medium-sized enterprises, including financial resources, management style, human resources, manufacturing activity, technological approach, innovative capacity, and external cooperation. Rothenberg & Zyglidopoulos (2007), in a study of the printing industry, found that the adoption of green innovations was positively associated with the dynamism of the company's task environment. Henriques and Sadorsky (2007) found that total quality management and external stakeholder pressure would increase the likelihood that Canadian manufacturing companies implement cleaner technical innovations.

Most of them provide an insight into the influences of certain organizational and environmental factors on green innovation. However, little empirical study analyzes how technological, organizational and environmental factors simultaneously influence mindful adoption of green innovation. In addition to stakeholder pressure, organizational and external environmental factors are two factors commonly considered in the studies of green innovation (Etzion, 2007; Gonzalez-Benito & Gonzalez-Benito, 2006). Scarce attention has been paid to the influences of technological characteristics on green innovation. Although a number of studies on environmental management can be found in the literature, none of them applied the mindfulness concept to environmental management. Mindfulness is a way of working marked by a focus on the present, attention to operational detail, willingness to consider alternative perspectives and an interest in investigating and understanding failures. We argue that firms require mindfulness thinking in environmental management implementation. The main purpose of this paper is to explore the application of the mindfulness concept to environmental management. We will build a conceptual framework exploring the determinants of mindful adoption of green innovation.

Green innovation adoption is usually believed to be able to confer strategic and competitive benefits to the adopting firms. Firms are able to achieve considerable environmental performance by successfully implementation green innovation into their work systems. However, they may fail to achieve deep usage beyond initial adoption because green practice implementation often constitutes complex technologies and processes and calls for significant investment of organizational resources (Fussel & Georg, 2000). Successful adoption of green innovation requires significant involvement in developing operational responses to environmental issues.

Adoption of green innovation constitutes a complex information processing and decision making scenario that involves making sense of a new green practice that the firm is unfamiliar with and is typically characterized by uncertainty and ambiguity over the outcomes of the implementation process (Aragon-Correa & Sharma, 2003; Christmann & Taylor, 2006; Winn & Angell, 2000). Thus, managers are faced with the task of analyzing the ramifications of the green practices on their firms. Under such circumstances, deciding on whether a particular green practice is a good thing for the firm, whether the timing of the implementation is appropriate, and how the implementation is best carried out, requires firms to be mindful of green practice implementation with reasoning grounded in their own facts and specifics. Firms require mindfulness thinking in green practice implementation. In organizational decision-making, mindfulness is a state of being alert and aware. It is a characteristic that is believed to aid in making contextually differentiated interpretations of situations and information scenarios (Hoy, 2003; Weick & Sutcliffe, 2006).

In organizational decision-making, mindfulness is a state of being alert and aware. It is a characteristic that is believed to aid in making contextually differentiated interpretations of situations and information scenarios (Ndubisi, 2012; Weick & Sutcliffe, 2006). The mindfulness approach recognizes the value of managerial

flexibility in structuring and timing investment decisions on the face of uncertain conditions, varying levels of risks at different stages of an investment project and irreversible investments (Fiol & O'Connor, 2003; Ndubisi, 2012). Accordingly, mindfulness theory is deemed suitable for application to the investigation of a firm's implementation of environmental management, more specifically when a green concept or practice is relatively new and uncertain in terms of its likely outcomes and managers have the flexibility of timing the implementation decision depending on factors such as prevailing market conditions and availability of information (Fichman, 2004; Weick & Sutcliffe, 2006). Firms need to keep green mindfulness when engaging in environmental management. As a result, it is necessary to understand the issues about green mindfulness in environmental management. Although mindfulness has been considered by researchers across different disciplines and subjects, the concept of mindfulness has been scarcely employed in research on environmental management in the literature (Ho & Lin, 2014).

Implementing environmental management can be regarded as an organizational innovation process (Hellstrom, 2007; Henriques & Sadosky, 2007; Lin & Ho, 2011). In an attempt to understand how organizations decide on implement new technologies or processes, researchers have started using several psychological constructs and cognitive theories in innovation and strategic decision-making research to explain the cognitive processes involved in innovation implementation decisions in organizations. One such construct is *mindfulness*. In the context of organizational implementation of innovations, mindfulness corresponds to an engagement with an innovation based on facts and details which are unique to the organization itself (Swanson & Ramiller, 2004; Weick & Sutcliffe, 2001). It is suggested that mindfulness can reduce the possibility of failure when implementing an innovation because mindfulness will result in a decision which is based on richer and more contextually relevant interpretation of a given situation (Fichman, 2004; Swanson & Ramiller, 2004). Organizational mindfulness is a desirable property in the process of implementation of innovations in organizations. To fill the research gap, this paper aims to propose a conceptual model exploring the determinant factors influencing organizational mindfulness in green innovation adoption.

In summary, the main purpose of this study is to propose a theoretical framework analyzing the factors influencing mindful adoption of green innovation. As to the structure of the paper, the next section addresses literature review related to organizational mindfulness in green innovation adoption. The third section introduces the conceptual model of determinant factors and their corresponding influences on mindful adoption of green innovation. The final section gives discussions and conclusions.

Literature Review

Innovation consists of any practice that is new to organizations, including equipments, products, processes, policies and projects. Technical innovation pertains to products, services, and production technologies; it is related to basic activities and concerned with either product or process (Kimberly & Evanisko, 1981; Damanpour, 1991). Adopting green practices can be seen as a technical innovation process.

Applying environmental criteria into corporate operations requires exploring new resource combinations and deploying existing resources in new ways (Hart, 1995). Green practice implementation involves using new or modified processes and techniques to reduce environmental harms. The implementation of a new green practice does not guarantee that there is a widespread usage of the new practice within the firm to fulfill the full potentials of the green practice (Winn & Angel, 2000). No matter implementing green practices reactively or proactively, a new green practice may be introduced with a great enthusiasm and widespread initial acquisition; nevertheless it may fail to be thoroughly deployed among many firms (Fussel & George, 2000).

Mindfulness, at its roots, is a psychological notion that reflects upon an individual's cognitive qualities (Langer, 1989; Langer & Moldoveanu, 2000). It is a state of alertness and lively awareness that characterizes active information processing, creation and refinement of different categories, and awareness of multiple perspectives. Mindfulness denotes that the ability of individuals and organizations to achieve reliable performance in a changing environment depends on how individuals and organizations think, gather information and perceive the world around them, and on whether they are able to change their perspective to reflect the situation. At the organization level, mindfulness is defined as an organizational capability that

allows firms to operate under conditions that are characterized by high risk of functional complexity and with little scope to learn from trial and error. Firms make mindful decisions based on reasoning grounded in their own organizational facts and specifics (Swanson & Ramiller, 2004).

Weick and Sutcliffe (2001), in a study of high reliability organizations, addressed that the mindfulness approach reflects the fact that many disasters are caused not by the presence of a large, catastrophic error but rather by the unfortunate combination of small ones. Mindfulness requires a desire to update situational awareness on a continuing basis, to cast doubt, and to probe further to resolve doubtfulness. Although normal business operations are carried out by firms under significantly less stringent conditions than high reliability organizations, inculcating the five characteristics in their organizational operations can reduce chances of failure by avoiding errors in the first place (Weick & Sutcliffe 2001). Thus, mindfulness can be thought of as a desirable property or state that all firms, irrespective of their line of operation should strive to achieve, since it will make them more adept in managing unexpected circumstances (Ndubisi, 2012; Ray, Baker & Plowman, 2011).

Weick and his colleagues (Weick & Sutcliffe, 2001; Weick, Sutcliffe & Obstfeld, 1999) identify five dimensions that underlie organizational mindfulness including (1) preoccupation with failure, (2) reluctance to simplify interpretations, (3) sensitivity to operations, (4) commitment to resilience, and (5) deference to expertise. They found that, following the five dimensions, high reliability organizations can successfully operate under risky and complicated conditions and avoid failures and accidents. Preoccupation with failure refers to a perspective that assumes that errors, problems and unusual events, no matter how small, are potentially important indicators of potential problems with the health of the organization and potentially unexpected aspects of the situation. Reluctance to simplify interpretations involves taking clear steps to avoid making things easier or over simplifying the daily operations. Sensitivity to operations denotes that mindful organizations have a precise understanding of all aspects of the business, both operationally and strategically. Commitment to resilience is to be mindful of errors and correct them before they get worse. Deference to expertise implies finding the most qualified individual to make a decision or complete a job (Weick & Sutcliffe, 2001). Together these five dimensions contribute organizational mindfulness.

This study argues that the mindfulness concept is also suitable for green innovation adoption. According to above discussions on the mindfulness concept, we hold that mindfulness in green innovation adoption, is a way of working during environmental management marked by a focus on the present, attention to operational detail, willingness to consider alternative perspectives and an interest in investigating and understanding failures (Langer, 1989; Weick & Sutcliffe, 2001). Firms need to keep organizational mindfulness when engaging in green innovation adoption.

The notion of mindfulness has been used to study organizational engagement with innovations (Fichman, 2004; Fiol & O'Connor, 2003; Swanson & Ramiller, 2004; Valorinta, 2009; Wolf, Beck & Pahlke, 2012). Environmental management implemented in firms is often characterized by new and complex technical knowledge and process changes, resulting in unexpected or uncertain outcomes. Applying environmental criteria into corporate operations requires exploring new resource combinations and deploying existing resources in new ways. Undertaking environmental management sometimes involves using new or modified processes and techniques to reduce environmental harms, and can be regarded as an organizational innovation process (Hellstrom, 2007; Henriques & Sadorsky, 2007; Lin & Ho, 2011). When engaging with an innovation, mindfulness pertains to attending to the innovation with a contextually differentiated reasoning based on the firm's own facts and specifics (Swanson & Ramiller, 2004). Therefore, mindfulness in the context of environmental management refers to not only being knowledgeable about the green concept or practice and its implications, but also being able to contextualize this understanding regarding the concept or practice based on the specific circumstances prevailing in the firm and their implications on the implementation. Mindfulness is likely to have implication in environmental management because the decision of evaluating and adopting green concepts or practices underlines a firm's attempt to make sense of something that is uncertain and can result in unexpected outcomes.

Mindful firms encourage people to report all errors, near misses, and improvement opportunities and to treat them as systemic issues rather than individual events. With regard to environmental management, mindful

firms who are preoccupied with failure, sensitivity to operations, and deference to expertise will pay more attention to the potential pitfalls associated with implementing new green concepts or practices as they appear. Mindful firms are more likely to empower knowledgeable team members allowing them to deal with an incipient problem and act on emerging opportunities. Also, they will be more likely to recognize problems not as isolated events that must be dealt with simply to maintain current operations, but rather as indicative of system issues that provide opportunities for further engagement in environmental management (Schultze & Orlikowski, 2004). Taking together these aspects of organizational mindfulness prepare a firm to be better able to manage both the initial introduction and subsequent implementation of environmental management practices. Likewise successful environmental management is often the result of not a single large project or decision, but the outgrowth of a fortuitous combination of many small ones (Aragon-Correa & Sharma, 2003; Henriques & Sadosky, 1999). Small disruptions, errors, and opportunities are most likely to be noticed first on the front lines of the firm where individuals involved with a firm's day-to-day operations reside. If these unexpected situations are dealt with swiftly, there is an opportunity to avoid their escalation into larger problems or to leverage them to facilitate change.

A Conceptual Model: Technological, Organizational and Environmental Framework in Innovation Implementation

A number of explanations as to what factors influence technical innovation can be found in the literature. Their findings are relevant for modeling green practice adoption from the perspective of technical innovation. Kimberly and Evanisko (1981) indicate that organizational and contextual factors influence the adoption of innovations. The determinants influencing organizational adoption of innovations include perceived innovation characteristics, adopter's organizational characteristics, and environmental influences. The availability and quality of internal resources and external knowledge, the knowledge transfer activities, and the political and legal environment are relevant for the adoption of technical innovations. While a variety of determinants of innovation implementation have been proposed in the literature, these factors can be grouped into technological, organizational and environmental context (Jeyaraj, Rottman & Lacity, 2006; Scupola, 2003; Tornatzky & Fleischer, 1990; Tornatzky & Klein, 1982). The technological, organizational, and environmental (TOE) framework is widely used in studying innovation implementation (Lin & Ho, 2011). Therefore, based on the TOE framework, this paper attempts to explore the technological, organizational, and environmental factors that can affect organizational mindfulness in green innovation adoption.

Technological Factors

Technological characteristics can be considered as cognitive beliefs reflected in an attitude towards the innovation, and may affect innovation implementation (Jeyaraj et al., 2006; Rogers, 2003; Tornatzky & Klein, 1982). Therefore, technological characteristics should be taken into account when analyzing organizational mindfulness in green innovation adoption. Several technological characteristics of an innovation can affect its implementation, including implementation cost, complexity, and compatibility (Frambach & Schillewaert, 2002; Jeyaraj et al., 2006; Tornatzky & Klein, 1982).

Implementation costs include the required financial and human resources in implementing and using green innovation. Costs have been long posited as a barrier for the adoption of innovation (Rogers, 2003; Tornatzky & Klein, 1982). However, some researchers argue that high implementation costs may motivate innovation adopters to treat the innovation more seriously and implement it more actively in order to make the innovation more cost-effective (Rogers, 2003). Higher implementation cost of green innovation may cause the firms to be more reluctant to simplify interpretations and more mindful of errors and unusual events, no matter how small, in adopting green innovation. Therefore, the following proposition is suggested:

P1: Implementation cost has a positive effect on mindful adoption of green innovation.

Complexity is the degree to which innovation is perceived to be relatively difficult to understand. It will increase the difficulty in knowledge transfer and innovation implementation (Rogers, 2003), and is usually hypothesized to be negatively related to innovation adoption (Tornatzky & Klein, 1982). Green practices incorporate both tacit and explicit knowledge. The tacit knowledge may be inherent in identifying sources of

pollution, reacting quickly to accidental spills, and proposing preventive solutions (Boiral, 2002). It leads to the ambiguity of the practices. Ambiguity is a major barrier to the transfer of best practice within a firm. A green practice with high complexity contains a lot of tacit knowledge that requires laborious efforts to learn and diffuse. The difficulty in learning and sharing tacit knowledge makes it relatively difficult to adopt green innovation, and consequently the firm may be apt to be deference to expertise and reluctant to simplify interpretations. Therefore, the following proposition is suggested:

P2: *Complexity of green innovation has a positive effect on mindful adoption of green innovation.*

Compatibility is the degree to which innovation is perceived as being consistent with the existing values, experiences, and needs of the firms (Rogers, 2003). Compatibility is relevant to green innovation adoption. Because several green practices are additions to firms' current technologies and processes, adopting green innovation is not a single event but can be described as a process of knowledge accumulation and integration. Green practices that are more compatible to a firm's current technologies and processes will be more easily to be implemented within the firm (Etzion, 2007). However, the greater the difference between the innovation and the current technological setup within the firm, the more likely that firms will be tempted to dismiss their present circumstances as irrelevant or out-dated when considering the implementation of the innovation (Swanson & Ramiller, 2004). Under such circumstances, the general tendency within the firm will be to gloss over the firm's own facts and specifics, rather than scrutinizing them vis-à-vis the requirements of the innovation. Therefore, the following proposition is suggested:

P3: *Compatibility of green innovation has a negative effect on Mindful adoption of green innovation.*

Organizational Factors

The organizational context implies the processes and attributes that constrain or facilitate innovation. Several studies have discussed the influences of a variety of organizational characteristics such as quality of human resources, organizational culture, and organizational size on environmental strategy (Etzion, 2007).

The quality of human resources is an essential factor influencing innovation implementation. Qualified human resources are helpful to implement innovations because of their competent learning capabilities. Adopting green innovation is a complex process requiring cross-disciplinary coordination and significant changes in the existing operation process (Russo & Fouts, 1997). It is intensive in human resources and depends on the development and training of tacit skills through the employees' involvement (Hart, 1995; Del Brio & Junquera, 2003). Mindfulness calls for an awareness of sensitivity to operations and reluctance to simplify interpretations (Weick & Sutcliffe, 2001). In the context of green innovation adoption, this translates into consideration towards the different ramifications of the green practice on the firm's operational and strategic advantages. Qualified employees with the ability to consider a variety of approaches to a problem simultaneously and elaborate on the details of an idea and carry it out will make a firm aware of the multiple perspectives of green innovation adoption. Therefore, the following proposition is suggested:

P4: *Quality of human resources has a positive effect on mindful adoption of green innovation.*

Organizational culture is a broad term that essentially refers to a shared understanding of the reality by the members of the organization. Organizational culture governs the ways in which an organization deals with failure and mishaps, and how rewards systems are defined within the organization. Differences in organizational culture give rise to variations in the styles of innovation implementation (Damanpour, 1991). Organizational culture is also associated with mindfulness behavior. Based on an analysis of high reliability organizations, Weick and Sutcliffe (2001) argue that informed organizational culture can foster mindfulness among organizations. When implementing green practices, firms are faced with a situation that can lead to unexpected outcomes. They are faced with information pertaining to a technology which is new to the organizational context and can bring about radical changes in the functioning of the firm, but at the same time, the cost of failure in the environmental initiative may be high. Under such circumstances, organizational culture that does not shy away from reporting about and analyzing unfavorable information will make employees more open towards considering both the favorable and unfavorable aspects of the green practice in the justification process involved in green innovation adoption. Therefore, the following proposition is suggested:

P5: *Informed organizational culture has a positive effect on mindful adoption of green innovation.*

Firm size has been repeatedly taken as a relevant organizational characteristic influencing firms' innovation adoption (Frambach & Schillewaert, 2002; Rogers, 2003) as well as environmental activities (Del Brio & Junquera, 2003; Etzion, 2007). In general, large firms tend to implement innovation and green practices more easily than small ones because they have sufficient resources and strong infrastructures. Small firms, in contrast, may suffer from the lack of financial resources and professionals, which results in difficulties in adopting green innovation. Due to less flexible structure, lower ability to adapt and more difficulty in assimilating change, larger firms may be more difficult than smaller firms in keeping mindfulness in the adoption of green innovation. Therefore, the following proposition is suggested:

P6: *Mindful adoption of green innovation is negatively associated with the firm size.*

Environmental Factors

The environmental factors refer to the standard conceptualization of external environment in the organizational behavior literature. The external environment in which a firm conducts its business is an important factor affecting environmental strategy. Certain environmental variables such as environmental uncertainty, and stakeholder pressure are often discussed in the literature of environmental management (Etzion, 2007).

Environmental uncertainty refers to frequent and unpredictable changes in customer preferences, technological development, and competitive behavior perceived by the managers. It has been viewed as a relevant environmental characteristic that affects a firm's decision making (Li & Atuahene-Gima, 2002). Managers facing uncertain business environments tend to be more proactive and use more innovative strategies than managers in less turbulent environments. Under high environmental uncertainty, firms attempt to gather and process information frequently to address environmental changes (Gupta & Govindraj, 1991), and also tend to pay more efforts on innovation and increase the rate of innovation to maintain a competitive advantage (Damanpour, 1991). When adopting green innovation under high environmental uncertainty, firms are faced with a situation that can lead to significantly unexpected outcomes. Under such circumstances, firms are likely to be preoccupation with failure and sensitive to operations. Therefore, the following proposition is suggested:

P7: *Environmental uncertainty has a positive effect on mindful adoption of green innovation.*

Stakeholders are individuals or groups who affect a firm's activities and are also affected by the firm's activities. Stakeholder pressure is regarded as the most prominent factor influencing a firm's environmental strategy (Buysse & Verbeke, 2003; Sharma & Henriques, 2005). Among various groups of stakeholders, customers and regulators are arguably viewed as a firm's most important stakeholders (Christmann, 2004; Etzion, 2007). According to the stakeholder theory, firms carry out activities to satisfy their main stakeholders. Under the circumstance of high stakeholder pressure, firms are apt to be reluctance to simplify interpretations of stakeholders' varied environmental requirements, and to keep commitment to resilience. Therefore, the following proposition is suggested:

P8: *Stakeholder pressure has a positive effect on mindful adoption of green innovation.*

Conclusions

For the purpose of sustainable development, an increasing number of companies all over the world are constantly under pressure to develop environmentally responsible and friendly operations, and regard commitment to the natural environment as an important variable within the current competitive scenarios. They are attentive to the concept of enhancing their competitiveness through improvements in the environmental performance, addressing the environmental concerns of their customers, and mitigating the environmental impact of their production and service activities. Many researchers have proposed various explanations as to what factors influence firms' adoption of green practices. Stakeholder pressure, environmental regulation, company size, managers' characteristics, human resources and industry sector are relevant variables frequently appeared in related research. The main purpose of this paper is to study

the factors that affect mindful adoption of green innovation from the perspectives of technical innovation and stakeholder pressure.

Mindfulness can be thought of as a desirable property or state that all firms, irrespective of their line of operation should strive to achieve, since it will make them more adept in managing unexpected circumstances. Organizational mindfulness approach is also suitable for green innovation adoption. Although normal business operations are carried out by firms under significantly less stringent conditions than high reliability organizations, inculcating the above five characteristics in their organizational operations can reduce chances of failure by avoiding errors in the first place (Weick & Sutcliffe 2001). Thus, green practices that are implemented in firms are often characterized by new and complex technical knowledge and process changes, resulting in unexpected or uncertain outcomes. Organizational mindfulness in the context of green innovation adoption refers to not only being knowledgeable about the green practice and its implications, but also being able to contextualize this understanding regarding the practice based on the specific circumstances prevailing in the firm and their implications on the implementation. Organizational mindfulness is likely to have implication in green innovation adoption because the decision of evaluating and adopting green practices underlines a firm's attempt to make sense of something that is uncertain and can result in unexpected outcomes.

This study investigated organizational mindfulness behaviors in environmental management, and analyzing the effects of technological, organizational and environmental factors on green innovation adoption. Due to the lack of research on organizational mindfulness in green innovation adoption, this study can broaden the scope of research on environmental management by clarifying the meanings of mindful adoption of green innovation as well as providing some explanations as to the factors affecting organizational mindfulness behavior in adopting green innovation. The organizational mindfulness approach recognizes the value of managerial flexibility in structuring and timing investment decisions on the face of uncertain conditions, varying levels of risks at different stages of an investment project and irreversible investments. Accordingly, organizational mindfulness theory is deemed suitable for application to the investigation of green innovation adoption. Understanding determinants of mindful adoption of green innovation is essential for practitioners to best implement environmental management as well as for researchers to best understand the issues that need to be addressed.

The present study only considers the determinant factors that have been widely used in the literature of technical innovation and environmental management. The influences of other possible environmental, organizational and technological factors on organizational mindfulness in green innovation adoption can also be taken into consideration in future studies. In addition, empirical studies based on the proposed conceptual model can be conducted.

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