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CORPORATE ECOLOGICAL RESPONSIVENESS, ENVIRONMENTAL AMBIDEXTERITY AND IT-ENABLED ENVIRONMENTAL SUSTAINABILITY STRATEGY

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Research-in-Progress

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Abstract

An increased focus on creating a sustainable society has thrust environmental sustainability issues to societal and governmental forefront. Organizations can seize this opportunity to use environmental sustainability initiatives to set themselves apart from competitors. Achieving sustainability requires organizations to incorporate sustainability as part of their corporate strategy. A review of extant Information Systems (IS) literature on environmental sustainability revealed that the strategic role of Information Technology (IT) in enabling environmental sustainability strategy is one perspective that has not been explored in depth. Our paper addresses this gap in research. In this research paper, we propose that firms that use IT strategically to enable their environmental sustainability strategies and are able to demonstrate environmental ambidexterity are set to achieve competitive advantage, legitimacy, and reputation from their corporate ecological responsiveness initiatives. We present preliminary results from interviews that were part of our in-depth case study approach.

Keywords: IT Strategic Role, IT-Enabled Environmental Sustainability Strategy, Environmental Ambidexterity, Corporate Ecological Responsiveness, Firm Motivations, Corporate Payoffs

Introduction

The future of our ecosystem and society depends on our ability to reverse or limit the effects of global climate change. Sustainability issues have come to societal and governmental forefront. The focus is on how to create a sustainable society. Sustainability can be defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987, p. 43). It is a complex term that can encompass environmental, economic, and social issues (Porter & Kramer 2006). In essence, sustainability is the conservation, deployment, and reuse of resources in responsible ways to impact the people, planet, and profit. Achieving sustainability will require stabilizing or reducing the environmental burden (Hart 1997).

Bansal & Roth (2000) define corporate ecological responsiveness as "a set of corporate initiatives aimed at mitigating a firm's impact on the natural environment" (p. 717). Organizations engage in corporate ecological responsiveness for different reasons such as to gain competitive advantage, to demonstrate compliance with norms and regulations, and to do something good for the society. Bansal & Roth (2000) term these firm motivations for corporate ecological responsiveness as competitiveness, legitimation, and ecological responsibility respectively. Environmental sustainability has often been thought of as reporting to stakeholders and regulators how an organization engages in environmentally and socially responsible initiatives to benefit the society. Examples of this include organizations publishing annual reports on corporate social responsibility. However there are tremendous opportunities for organizations to use environmental sustainability initiatives to gain competitive advantage, legitimacy, and reputation both in the short- and long-term. Hart (1997) states that "Rarely is greening linked to strategy or technology development, and as a result, most companies fail to recognize opportunities of potentially staggering proportions." (p. 68). To achieve sustainability, "we need the great bulk of major corporations to incorporate sustainability as part of their corporate strategy" (Watson et al. 2008, p. 12). Organizations can achieve sustainability and demonstrate their corporate ecological responsiveness by using sustainability vision to incorporate the environmental sustainability strategies of pollution prevention, product stewardship and clean technology (Hart 1997) into their corporate strategy. Pollution prevention strategies depend on continuous improvement efforts to reduce waste and energy use; product stewardship focuses on minimizing not only pollution from manufacturing but also all environmental impacts associated with the full life cycle of a product; and clean technology refers to potential to realize major improvements through new technology (Hart 1997).

Environmental sustainability has been studied from different perspectives including the four dimensions of the sustainability portfolio: pollution prevention, product stewardship, clean technology, and sustainability vision (Hart 1997); three eco-goals: eco-efficiency (DeSimone & Popoff 1997), eco-equity (Gray & Bebbington 2000), and eco-effectiveness (McDonough & Braungart 2002). However, research on environmental sustainability from an IT/IS perspective is scarce (Melville 2010). Notable exceptions include building sustainable business processes using green IS (Watson et al. 2008), development and validation of a green IT readiness model (Molla et al. 2009), study of organizational adoption of green IS and IT from an institutional perspective (Chen et al. 2009), development of a belief-action-outcome model for information systems innovation (Melville 2010) and the energy informatics framework to use information systems in environmentally sustainable development (Watson et al. 2010). While Watson et al. (2008) suggests that IS should have a critical role in creating sustainable business systems and cite numerous examples to make their case, they turn to a global strategic framework (Ghemawat 2007) to discuss how organizations can integrate sustainability into their corporate strategy. We believe that a global strategy framework is too broad for application to a single organization with its operations within one country. Although Molla et al. (2009) included strategic foresight as a sub-component of Green IT Governance they neither defined strategic foresight nor explained how an organization can use IT strategically to increase its Green IT Readiness. Chen et al. (2009) use the natural resource-based view of the firm to examine how institutional isomorphic forces affect the adoption of green IS and IT within an organization. They consider IT as a problem and IS as a solution whereas we consider strategic use of IT as a solution to environmental sustainability problems. Melville's (2010) belief-action-outcome (BAO) framework is aimed at promoting IS research in sustainability. Our research would fall under Melville's Outcome category as we try to understand the association between information systems and organizational and sustainability performance (macro-level). While the energy informatics subfield of IS proposed by Watson et al. (2010) focuses only on the use of IS in reducing energy consumption and CO_2 emissions, which in essence is pollution prevention using IS, we focus our attention on all four sustainability strategies of pollution prevention, product stewardship, clean technology, and sustainability vision. Thus, based on a review of IS literature on environmental sustainability, it is clear that the strategic role of IT in enabling environmental sustainability strategy is one perspective of sustainability that has not been explored in depth. We address this gap in research.

We propose that organizations can use IT strategically to enable their environmental sustainability strategies. Strategic IT role is defined as the shared, aspired state of the role that IT should play in a firm (Armstrong & Sambamurthy 1999; Robbins & Duncan 1988; Zmud 1988). The strategic role played by IT can be classified into three types: automate, informate (informate up and informate down) and transform (Armstrong & Sambamurthy 1999; Dehning et al. 2003; Schein 1992; Zuboff 1988). We believe that organizations can use IT strategically to automate, inform, and transform the pollution prevention, product stewardship, clean technology, and sustainability vision strategies. We test this by conducting a positivist case study. We find support for this based on the following responses from our preliminary interviews which were conducted as a part of our case study:

> *"Automation leads to greener business processes provided it reduces the usage of resources. For example, cloud computing is all about reduction of resources."*
>
> *"An example of IT being used to informate is the use of DSS (decision-support systems) in environmental sustainability strategy."*
>
> *"Environmental information changes the behavior of organizations and IT (information technology) allows the flow of such information."*

We believe that IT moderates the relationship between firm motivations for corporate ecological responsiveness and IT-enabled environmental sustainability strategy. IT not only enables environmental sustainability strategies directly, but also through the organization's ability to demonstrate environmental ambidexterity. We define environmental ambidexterity as the ability of a firm to simultaneously achieve alignment and adaptability in its corporate ecological responsiveness initiatives. Alignment in environmental ambidexterity refers to coherence among the corporate ecological responsiveness initiatives and exploitation of such initiatives to achieve corporate payoffs. Adaptability refers to the organization's capability to transform its activities quickly to explore new opportunities in sustainability. To maximize the benefits from engaging in environmental sustainability initiatives, organizations must not only align their environmental sustainability strategies with corporate strategies, but also be able to adapt their business operations to the changing needs of environmental sustainability simultaneously. While alignment is critical to exploitation of environmental initiatives, adaptability is critical to the ability of the organization to explore new opportunities in environmental sustainability. We believe that IT enables environmental ambidexterity and that IT-enabled environmental ambidexterity moderates the relationship between firm motivations for corporate ecological responsiveness and IT-enabled environmental sustainability strategy. We propose that firms that use IT strategically to enable their environmental sustainability strategies and are environmentally ambidextrous are set to achieve competitive advantage, legitimacy, and reputation from their corporate ecological responsiveness initiatives.

The goal of this paper is to address the following research questions: "How do firm motivations for corporate ecological responsiveness drive IT-enabled environmental sustainability strategy and corporate performance?"; and "In this context, how do IT strategic role and IT-enabled environmental ambidexterity moderate and mediate respectively the relationship between firm motivations for corporate ecological responsiveness and IT-enabled environmental sustainability strategy?" We use organization as the unit of analysis. We use an in-depth case study to address our research questions as part of this research-in-progress. This paper is organized as follows. First, we present our proposed research model and the theoretical background that provides the underpinnings for each construct in our model. In this section, we also develop our hypotheses by discussing the relationships and the constructs in our model. This is followed by the methodology section where we briefly discuss the methodology we use to address our research question. Finally, we report preliminary results from our case study and discuss future plans to complete this research-in-progress.

Theoretical Background, Proposed Research Model, and Hypotheses Development

We build upon the literature in corporate ecological responsiveness, environmental sustainability strategy, IT strategic role, environmental ambidexterity, and corporate payoff for our theoretical foundation. The research model for our paper is presented in Figure 1.

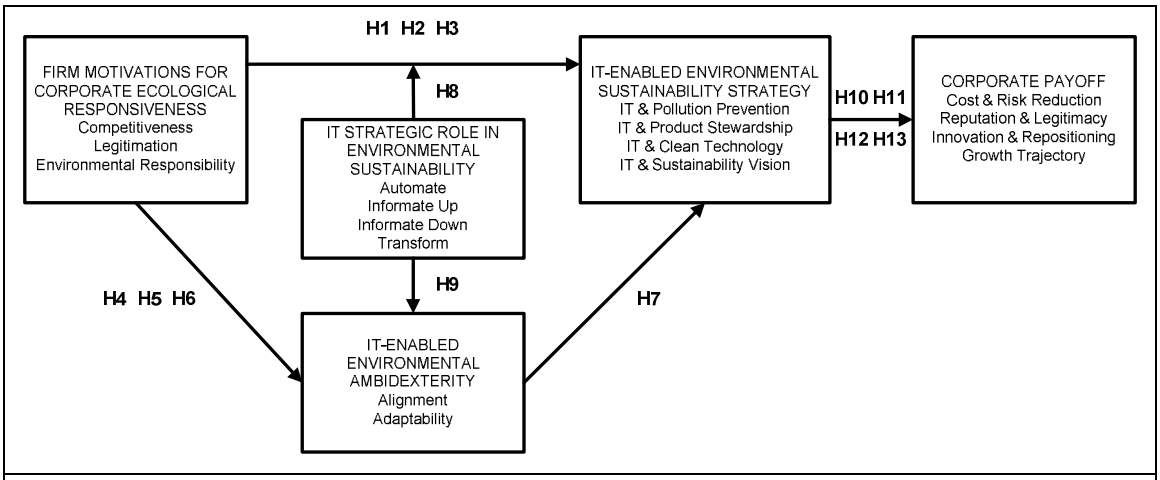

Figure 1. Proposed Model of Corporate Ecological Responsiveness and IT-Enabled Environmental Sustainability Strategy

Firm Motivations for Corporate Ecological Responsiveness

Bansal & Roth (2000) define corporate ecological responsiveness as "a set of corporate initiatives aimed at mitigating a firm's impact on the natural environment. These initiatives can include changes to the firm's products, processes, and policies, such as reducing energy consumption and waste generation, using ecologically sustainable resources, and implementing an environmental management system" (p. 717). Understanding firm motivations for corporate ecological responsiveness is critical as it helps organizational theorists predict ecologically based behaviors, and it helps expose mechanisms that foster ecologically sustainable organizations (Bansal & Roth 2000). Bansal & Roth (2000) derived three basic motivations for ecological responsiveness: competitiveness, legitimation, and ecological responsibility. They define competitiveness as "the potential for ecological responsiveness to improve long-term profitability" (p. 724). Legitimation is the desire of a firm to improve the appropriateness of its actions within an established set of regulations, norms, values, or beliefs (Suchman 1995). Bansal & Roth (2000) view ecological responsibility as "a motivation that stems from the concern that a firm has for its social obligations and values" (p. 728). They use the terms ecological responsibility, environmental responsibility, and social responsibility interchangeably.

IT-Enabled Environmental Sustainability Strategy

Hart et al. (2003) identify corporate business strategies that enable organizations to realize the opportunities presented by environmental sustainability. These include pollution prevention, product stewardship, clean technology, and sustainability vision [Hart's (1997) dimensions of sustainability portfolio]. Pollution prevention is an environmental sustainability strategy that is focused on "improving the environmental efficiency of today's products and processes-that is, reducing waste and emissions from current operations" (Hart et al. 2003). Product stewardship as an environmental sustainability strategy includes "the entire product life cycle-from raw material access, through production processes, to product use and disposal of spent products" (Hart et al. 2003, p. 61). Clean technology as an environmental sustainability strategy refers "not to the incremental improvement associated with pollution prevention, but to innovations that leapfrog standard routines and knowledge" (Hart et al. 2003). IT plays a strategic role in enabling the four sustainability strategies of pollution prevention, product stewardship, clean technology, and sustainability vision. We refer to this as IT-enabled environmental sustainability strategy. For example, IT can be used for pollution prevention to facilitate the management and reporting of material consumption, pollution and waste generation. IT can be used for product stewardship to facilitate connectivity, communication, and transparency between the organization and its stakeholders. IT helps clean technology by facilitating the development of potent, energy-efficient solutions and fostering innovation (Hart et al. 2003). IT can help sustainability vision by enabling organizations to transform the way they do business and to plan for meeting future environmental sustainability needs (Hart et al. 2003).

Firm Motivations for Corporate Ecological Responsiveness and IT-enabled Environmental Sustainability Strategy

According to Bansal & Roth (2000), ecological responses that improved competitiveness included "energy and waste management, source reductions resulting in a higher output for the same inputs (process intensification), ecolabeling and green marketing, and the development of 'ecoproducts'" (p. 724). Organizations can use IT strategically to distinguish themselves from their competitors. For example, IT can be used to gain competitive advantage by allowing organizations to assess the extent to which a final product meets the goal of the cradle-to-cradle ideal (made from 100 percent biological or technical nutrients), thereby allowing them to achieve the most environmentally friendly product by including only the least polluting vendors in their supply chains (Watson et al. 2008). Based on the above arguments, we propose the following hypothesis:

> *H1: The ability of firms to compete using corporate ecological responsiveness initiatives is related to IT-enabled environmental sustainability strategy.*

Bansal & Roth's (2000) data included examples of legitimation such as "complying with legislation, establishing an environmental committee or environmental manager position to oversee a firm's ecological impacts and advise senior management, developing networks or committees with local community representation, conducting environmental audits, establishing an emergency response system, and aligning the firm's image with environmental advocates" (p. 727). IT can help organizations achieve legitimation. For example, organizations can use environmental information systems to manage the use of resources and to generate reports that demonstrate compliance to environmental regulations. This leads to our next hypothesis.

> *H2: The ability of firms to seek legitimation from their corporate ecological responsiveness initiatives is related to IT-enabled environmental sustainability strategy.*

Examples of ecological responsibility included initiatives such as "the redevelopment of previously used land to green areas, the provision of a less profitable green product line, donations to environmental interest groups and other local community groups, the use of recycled paper, the replacement of retail items or office products with ones more ecologically benign, and the recycling of office wastes" (Bansal & Roth 2000, p. 728). Organizations can use IT to demonstrate environmental responsibility. For example, IT can facilitate better flow of environmental information between the organization and its stakeholders. Hence we propose the following:

> *H3: The ability of a firm to demonstrate environmental responsibility through its corporate ecological responsiveness initiatives is related to IT-enabled environmental sustainability strategy.*

IT-Enabled Environmental Ambidexterity

Organizational ambidexterity is a firm's simultaneous pursuit of exploration and exploitation (Beckman 2006; Gupta et al. 2006; Jansen et al. 2006, Lavie & Rosenkopf 2006, Lubatkin et al. 2006; O'Reilly & Tushman 2008). According to March (1991), exploitation pertains to the refinement of existing competencies, whereas exploration involves searching for new knowledge and opportunities. Organizations need to balance their exploitation activities with their exploration activities or risk facing certain consequences. When a firm's magnitude of exploitation well exceeds that of its exploration, the firm is likely to be subject to the risk of obsolescence; conversely, when a firm overemphasizes exploration to the exclusion of exploitation, it increases its risk of failing to appropriate returns from its costly search and experimentation activities (Cao et al. 2009). Organizations use alignment to exploit and adaptability to explore. Alignment refers to coherence among activities in the business unit; they are working together toward the same goals while adaptability refers to the capacity to reconfigure activities in the business unit quickly to meet changing demands in the task environment. Gibson & Birkinshaw (2004) define contextual ambidexterity as to the ability of an organization to achieve alignment in its current operations while also adapting effectively to changing environmental demands in a given organizational context.

We define environmental ambidexterity as the ability of a firm to simultaneously achieve alignment and adaptability in its corporate ecological responsiveness initiatives. Exploitation in the environmental sustainability context refers to the refinement of existing corporate ecological responsiveness initiatives while exploration refers to scanning for new environmental sustainability initiatives. IT enables organizations to become environmentally ambidextrous. We refer to this as IT-enabled environmental ambidexterity. An example of IT-enabled environmental ambidexterity is Gibson & Birkinshaw's (2004) *support* variable, which is an antecedent of ambidexterity and add that it "manifested

itself in the use of IT systems to increase knowledge of what was happening in other parts of the business, and various forums and councils for cooperating and sharing best practices" (p. 214).

Firm Motivations for Corporate Ecological Responsiveness and IT-Enabled Environmental Ambidexterity

Ambidexterity is critical for the success and even survival of organizations (Andriopoulos & Lewis 2009). IT-enabled environmental ambidexterity allows organizations to successfully use their corporate responsiveness initiatives to compete in the marketplace by demonstrating simultaneous sustainability alignment and adaptability capabilities. For example, Hart et al. (2003) state that disruptive technologies such as IT present opportunities for firms to reposition their internal competencies and to achieve innovation. This in essence refers to IT-enabled adaptability. Based on the above arguments, we develop the following hypothesis:

> *H4: The ability of firms to compete using corporate ecological responsiveness initiatives is related to IT-enabled environmental ambidexterity.*

Bansal & Roth's (2000) examples of legitimation included aligning the firm's image with external stakeholders such as environmental advocates. IT-enabled environmental ambidexterity allows legitimation efforts such as these by enabling the ecological responsiveness activities of the firm to be aligned with the goals environmental sustainability. For example, environmental managers can use IT to adapt to new ecological responsiveness initiatives based on the firm's current ecological impacts. Therefore, we propose the following:

> *H5: The ability of firms to seek legitimation from their corporate ecological responsiveness initiatives is related to IT-enabled environmental ambidexterity.*

Environmental responsibility is the organization's way of showing society that sometimes, it is not all about the bottom line. In terms of IT-enabled environmental ambidexterity, the activities that an organization chooses to demonstrate its environmental responsibility must align with the goals of its environmental sustainability initiatives. An example cited by Bansal & Roth (2000) is an organization's use of a less profitable green product line. This implies that the organization has the capability to adapt its business unit activities quickly to meet the changing demands of environmental sustainability. Hence we propose that:

> *H6: The ability of a firm to demonstrate environmental responsibility through its corporate ecological responsiveness initiatives is related to IT-enabled environmental ambidexterity.*

IT-Enabled Environmental Ambidexterity as a Mediator of the Relationship between Firm Motivations for Corporate Ecological Responsiveness and IT-Enabled Environmental Sustainability Strategy

Watson et al. (2008) suggest that organizations turn to a strategic framework as the foundation for aligning sustainability strategy with their corporate strategy. IT-enabled environmental ambidexterity activities of alignment and adaptation enable the environmental sustainability strategies of pollution prevention, product stewardship, clean technology, and sustainability vision. IT-enabled pollution prevention focuses on using IT to maximize efficiency by exploiting current ecological responsiveness initiatives to add incremental value. IT-enabled product stewardship involves the use of IT in "greening" of the organization's supply chain by including only those suppliers whose products demonstrate environmental friendliness. IT-enabled clean technology, which is a result of exploration activities, requires an organization to use IT to fundamentally change the way an organization conducts its business operations. Thus the organization must be adaptable to the changes associated with performing its activities using the new technology. The reason we believe that IT-enabled environmental ambidexterity plays a mediating role is that ambidexterity is a meta-capability that takes time to develop. Prior studies (Gibson & Birkinshaw 2004) support the mediating role of ambidexterity. Based on the above line of reasoning, we propose the following:

> *H7: IT-enabled environmental ambidexterity mediates the relationship between firm motivations for corporate ecological responsiveness and IT-enabled environmental sustainability strategy.*

IT Strategic Role in Environmental Sustainability Strategy

Strategic IT role is defined as the shared, aspired state of the role that IT should play in a firm (Armstrong & Sambamurthy 1999; Robbins & Duncan 1988; Zmud 1988). It evokes "organizational images of the role that IT will play in the firms' business activities and competitive strategies" (Armstrong & Sambamurthy 1999, p.308). The

strategic role played by IT can be classified into three types: automate, informate (informate up and informate down) and transform (Armstrong & Sambamurthy 1999; Dehning et al. 2003; Schein 1992; Zuboff 1988). Automation refers to replacing human labor in automating business processes, thereby enabling the organization to achieve clearly defined benefits such as process efficiency, process consistency, and cost reduction (Dehning et al. 2003). Informate-up, which refers to providing information about business activities to senior management, and informate-down, which is providing information about business activities to employees across the firm, facilitates better decision making, better collaboration and coordination to empower stakeholders (Dehning et al. 2003). Transform, which refers to fundamentally redefining business and industry processes and relationships, is aimed at gaining considerable competitive advantage by doing things differently (Dehning et al. 2003).

In the context of environmental sustainability, automate is an IT strategic role that refers to automation of environmental sustainability initiatives. For example, IT can automate the management and reporting of resource consumption and environmental pollution metrics. As a strategic IT role in environmental sustainability, informate (up and down) refers to the flow of environmental information within the organization. Examples of informating include environmental performance reporting, and communication of environmental information to stakeholders. Transformation in the environmental sustainability context refers to the use of IT to essentially change the way an organization does business from its current operations to an environmentally friendly way of doing business.

IT Strategic Role in Environmental Sustainability as a Moderator of the Relationship between Firm Motivations for Corporate Ecological Responsiveness and IT-Enabled Environmental Sustainability Strategy

Organizations can use IT strategic role to compete with their competitors, to gain legitimacy from stakeholders, and to demonstrate environmental responsibility. For example, firms can use IT strategically to compete by automating energy and waste management, and process intensification; informating ecolabeling and green marketing; and transforming business processes to enable the development of eco-friendly products. Legitimation offers many opportunities for the strategic application of IT. For example, IT can be used to automate audit reporting and emergency notification; to informate up between the environmental manager and the senior management; and to informate down between the firm and its stakeholders. IT can also be used to facilitate the flow of information between the firm and regulators and environmental advocates to demonstrate compliance. Organizations can use IT strategically to demonstrate their environmental responsibility to the society as a whole. For example, firms can use IT to automate and manage donations to environmental protection agencies; to informate their citizenship behavior to society; and to transform their existing product line into a green product line.

IT can also be used in the environmental sustainability strategies of pollution prevention, product stewardship, clean technology, and sustainability vision through the strategic roles of automate, informate (up and down), and transform. In the context of pollution prevention, IT allows measurement and monitoring of the costs, emissions, and waste of each phase of a supply chain and supports collaboration, group document management, and cooperative knowledge management (Watson et al. 2008). Watson et al. (2008) state that IT can be used to track environmental information (such as toxicity, energy used, water used, etc.) in the creation of products, their components, and the fulfillment of services; monitor a firm's operational emissions and waste products to manage them more effectively; and support team work and meetings when employees are distributed throughout the world, and thus reduce the impact of air travel. In the context of product stewardship, IT facilitates connectivity, communication, and transparency. In terms of connectivity, IT allows firms to constructively engage stakeholders, thereby increasing external confidence in the firm's intentions and activities. Watson et al. (2008) add that IT can be used to communicate to consumers and to provide them information so they can make green choices more conveniently and effectively. IT creates transparency between the firm and its stakeholders thereby allowing the firm to create sustainable value (Hart et al. 2003). In the context of clean technology, IT facilitates potent, disruptive, energy-efficient solutions that could render the basis of many of today's energy- and material-intensive industries obsolete. The distributed nature of IT eliminates the need for centralized infrastructure and wireline distribution, both of which are environmentally destructive (Hart et al. 2003). We believe that IT strategic role moderates the relationship between firm motivations for environmental sustainability and sustainability strategy. This follows prior studies that have used IT strategic role as a moderating variable including Armstrong & Sambamurthy (1999). Thus, we propose the following:

> *H8: IT strategic role in environmental sustainability moderates the relationship between firm motivations for corporate ecological responsiveness and IT-enabled environmental sustainability strategy.*

IT Strategic Role in Environmental Sustainability and IT-Enabled Environmental Ambidexterity

IT strategic role in environmental sustainability enables environmental sustainability strategy not only directly, but also through environmental ambidexterity. Firms use IT to align their ecological responsiveness initiatives with their environmental sustainability goals. For example, automated systems can be used to report environmental performance metrics to senior management who can then compare the performance of the organization with the stated goals to determine the extent to which the organization has achieved environmental ambidexterity in terms of alignment. IT facilitates exploitation-oriented activities through alignment. Firms also use IT to adapt their ecological responsiveness initiatives to explore new opportunities in environmental sustainability. For example, IT can be used to transform the current product line of an organization to a green product line, in which case, its business activities must have the capability to be quickly changed to match the demands of the new product line. IT thus enables exploration-oriented activities through adaptation. Thus, we propose the following:

H9: IT-enabled environmental ambidexterity is related to IT strategic role in environmental sustainability.

Corporate Payoff

Corporate payoffs are the anticipated benefits that organizations derive from applying sustainability strategies such as pollution prevention, product stewardship, clean technology, and sustainability vision to create sustainable value (Hart et al. 2003). These payoffs include cost and risk reduction; enhanced reputation and legitimacy; and accelerated innovation and repositioning of competencies (Hart et al. 2003). Firm motivations for corporate ecological responsiveness such as competitiveness, legitimation, and environmental responsibility are based on certain expected corporate payoffs. Corporate payoffs from competitiveness include higher profits, process intensification, larger market share, lower costs, differentiation, higher share price, and rent-earning resources and capabilities (Bansal & Roth 2000). Corporate payoffs from legitimation include "long-term sustainability, survival, license to operate, avoiding fines and penalties, lessening risks, and employee satisfaction" (p. 727). Corporate payoffs from environmental responsibility include "feel-good factors, employee morale, and individual satisfaction" (Bansal & Roth 2000, p. 727). Thus, it is clear that organizations have a lot to gain by engaging in ecologically responsive initiatives. The key to realizing these corporate payoffs is to use IT strategically to enable their environmental sustainability strategies, align their ecological responsiveness initiatives with their environmental sustainability goals, and adapt their activities to the changing demands of environmental sustainability.

IT-Enabled Environmental Sustainability Strategy and Corporate Payoff

Effective IT-enabled pollution prevention requires extensive employee involvement, along with well-developed capabilities in continuous improvement and quality management. By deriving more saleable product or service per pound of input, IT-enabled pollution prevention can lead to lower costs and reduced risk. Organizations strategically seek economies of scale by aggregating development and production processes. The intention is to reduce costs by combing activities into optimal units for efficiency. From a sustainability angle, organizations also want to use IT to aggregate activities to reduce emissions and waste. Hence, we propose the following hypothesis:

H10: IT-enabled pollution prevention leads to cost and risk reduction as a part of corporate payoffs.

IT-enabled product stewardship offers a way to both lower environmental impacts across the value chain and enhance legitimacy and reputation by involving stakeholders in the conduct of on-going operations. Reputation is a rent-earning firm-based resource (Hart 1995; Russo & Fouts 1997) that has a long-term profit potential. Legitimacy, which refers to compliance with norms and regulations, is related to organizational survival (Bansal & Roth 2000; Meyer & Rowan 1977; Zucker 1987) and to an organization's license to operate (Bansal & Roth 2000). By using IT to constructively engage stakeholders, firms increase external confidence in their intentions and activities, helping to enhance corporate reputation and legitimacy. Thus we propose the hypothesis below:

H11: IT-enabled product stewardship leads to enhanced reputation and legitimacy as a part of corporate payoffs.

The sustainable competencies that emerge from the search for IT-enabled clean technologies are central to a firm's efforts to reposition its internal skill set for the development and exploitation of future markets. Hart et al. (2003) add that without a focus on innovation, it will be difficult for the firm to create the new product and service flow needed to ensure that it prospers well into the future. The creation of shareholder value thus depends upon the firm's

ability to use IT to creatively destroy its current capabilities in favor of the innovations of tomorrow (Hart et al. 2003). We propose the following:

> *H12: IT-enabled clean technology leads to accelerated innovation and repositioning as a part of corporate payoffs.*

The goal of sustainability vision is to "create a shared roadmap for meeting unmet needs" (Hart et al. 2003, p. 60). Organizations can use IT-enabled sustainability vision to help identify opportunities in environmental sustainability that lead to future growth. For example, IT can be used to manage information on resource allocation to allow the organization to forecast future resource needs. This leads us to propose the following hypothesis:

> *H13: IT-enabled sustainability vision leads to growth trajectory as a part of corporate payoffs.*

In the next section, we discuss our methodology, preliminary results from our interviews, and future research plans to complete the research-in-progress.

Methodology

We follow Benbasat et al. (1987), Lee (1989) and Eisenhardt (2007, 1989) approach and use case study research method to address our research questions. While the case research strategy has mostly been used for exploration and hypothesis generation, Benbasat et al. (1987) argue that the case research method can also be used for providing explanation and for hypotheses testing. The reason for our use of a qualitative case study is that it is, according to Eisenhardt (2007), one of the best ways to link rich qualitative evidence to mainstream deductive research. Case studies are appropriate when the research and theory are at their early formative stages (Eisenhardt 1989; Roethlisberger 1977) as is the case with our research. First, we conducted an extensive literature review to identify the measures for firm motivations for corporate ecological responsiveness, IT-enabled environmental sustainability strategy, IT strategic role, environmental ambidexterity, and corporate payoff and used those measures to develop an interview instrument for our preliminary interviews and data collection. We followed established criteria (Eisenhardt 2007, 1989; Lee 1989; Yin 2009) for selecting potential sites for our case study approach. We already have conducted preliminary interviews, as part of ongoing research, with environmental sustainability experts at the identified site-an organization (firm name withheld due to non-disclosure agreement and approved research protocol) actively involved in environmental sustainability strategy implementation. In the following section, we provide initial evidence and support, based on our interview data analysis, for our proposed research model.

Preliminary Results, Discussion, Future Plans to Complete the Research-in-Progress

In this research, we set out to investigate how firm motivations for corporate ecological responsiveness drive IT-enabled environmental sustainability strategy and corporate performance and in this context, how IT strategic role and IT-enabled environmental ambidexterity relate to this relationship. As a part of our preliminary investigation and after careful examination of preliminary interview data, we found the following evidence that provide initial support to our proposed research model. The following are excerpts from sustainability experts at our investigation site.

"Corporate ecological responsiveness initiatives allow organizations to compete through product differentiation."
"Legitimation helps organizations to gain trust from the community and the government."
"Corporate role in environmental sustainability is pervasive. If they don't lead, no one else will."
"IT can help understand how wasteful some products are. For example, it takes 550 gallons of water to produce one pair of blue jeans. This information when made available to consumers makes them think twice before throwing out that old pair of blue jeans and replacing it with a new one."
"Organizations' IT strategies must be aligned with their environmental sustainability strategies. One can't be done without the other."
"Organizations' IT strategies must adapt to the changing needs of environmental sustainability strategies. IT strategies must constantly change to continue to provide environmental information."
"Organizations maximize share holder value. Sustainability is aimed at long-term shareholder value creation."

The results of our study have important implications for organizations that plan to align their corporate and sustainability strategies by leveraging their investments in strategic IT and IT-enabled environmental sustainability strategies. We plan to continue with our case study research method to complete this research-in progress.

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