Influences on Sustainable Innovation Adoption: Evidence from Leadership in Energy and Environmental Design

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ABSTRACT

The adoption of innovations associated with environmental sustainability has been a topic of growing interest among scholars. The research presented in this paper draws on Abrahamson’s theoretical framework of fads and fashions to argue that dimensions of uncertainty and degree of external versus internal influence provide significant insights into firms’ decisions to adopt sustainable building innovations. We develop three hypotheses, reflecting three views of adoption in influence: fad, fashion, and efficient-choice. We find that adoption of Leadership in Energy and Environmental Design (LEED) green building certification in the United States was more likely among firms similarly oriented toward end-consumers and among firms strategically positioned as environmental leaders. These results provide support for the fad and efficient-choice views of adoption, respectively. Contrary to expectations suggested by the fashion perspective, adoption was not more likely among firms located in states whose political leaders are more committed to environmental protection. Our findings offer important implications for practitioners and policy makers seeking to encourage sustainable building design. Copyright © 2011 John Wiley & Sons, Ltd and ERP Environment.

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Introduction

In addressing issues of environmental sustainability, organizations may choose to adopt a range of potential innovations. Motivations for such adoptions, however, may vary. Much of the literature on the diffusion of innovations assumes that firms independently choose to adopt innovations through rational cost–benefit analyses, in which managers possess a high degree of certainty regarding the likely economic impact of adoption (Abrahamson, 1991; Rogers, 2003). Alternatively, uncertain financial benefits may cause imitation to influence adoption. This imitation, in turn, may arise from external or internal factors. Under conditions of uncertainty and varying degrees of external versus internal influence, some firms’ adoption decisions may be characterized as induced by fads or fashions (Abrahamson, 1991).

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As interest in the sources of variation in adoption of sustainable innovations has grown, management scholars have identified a variety of factors that influence such adoptions (Larson, 2000; Rothenberg and Zyglidopoulos, 2007; Smith and Crotty, 2008). Rothenberg and Zyglidopoulos (2007), for instance, note three broad categories of influence: nature of the innovative technology, factors internal to the firm, and external factors. These categories provide support for the assumptions inherent in Abrahamson’s (1991) view of fads and fashions: the nature of sustainable innovations may be marked by a significant degree of uncertainty, and relevant factors may be associated with varying degrees of external versus internal influence.

The goal of this study is to examine the influences on adoption of sustainable building design from the perspective of Abrahamson’s (1991) theoretical framework of fads and fashions. Given that buildings consume an estimated 40% of the world’s materials and account for 40% of the world’s energy use (Hoffman and Henn, 2008), the subject of innovation in building design merits significant attention. Our empirical context is Leadership in Energy and Environmental Design (LEED), the leading sustainable building certification program in the United States. We develop three hypotheses, reflecting three views of adoption: fashion, fad, and efficient-choice. Using logistic regression analysis, we test our hypotheses by segmenting a large sample of US-based firms according to whether they adopted LEED certification for at least one new or existing building. Our findings contribute to scholarship that explores the determinants of sustainable innovation adoption. Our results provide further insights for both individual managers and policy makers interested in encouraging sustainable construction.

The remainder of the paper is organized as follows. First, we present a brief overview of the LEED program. Next, we review theory regarding management fads and fashions in the context of LEED and develop associated hypotheses concerning adoption. We then discuss the study’s methods, followed by the results of our empirical tests. The paper closes with a discussion of implications for scholars, practitioners, and policy makers.

**Leadership in Energy and Environmental Design (LEED)**

Building owners may choose to seek LEED certification for new or existing buildings through the United States Green Building Council (USGBC), a non-profit trade organization. With origins in the work of former Natural Resources Defense Council (NRDC) senior scientist Robert K. Watson, LEED began development in 1993 in a broad consensus process with multiple stakeholder groups. The LEED 1.0 pilot program commenced in 1998, and full release occurred 2 years later. LEED certification rewards building projects that adhere to best practices in environmental sustainability (Hoffman and Henn, 2008). It requires that adopters embrace a product stewardship mindset, considering the environmental impact associated with the building’s life cycle. Certification is based on an assessment of the building’s impact in the following five categories: sustainable sites, water efficiency, energy and atmosphere, materials and resources, and indoor environmental quality (USGBC, 2009). As of December 2010, 8131 commercial projects had achieved LEED certification.

The details of the LEED program are as follows. A project may attain a maximum of 100 base points across the five aforementioned categories, with 26 potential points for sustainable sites, 10 points for water efficiency, 35 points for energy and atmosphere, 14 points for materials and resources, and 15 points for indoor environmental quality. Each category contains both required elements (necessary to achieve any points within that category) and individual credits. For example, the materials and resources category requires storage and collection of recyclables in order to achieve any of the potential 14 points, and one of these points may be achieved through an individual credit for the use of certified wood. Beyond the 100 base points, an additional 6 points may be earned for innovation in design, and a further 4 points may be gained through regional priority credits. Four levels of certification are possible: certified (40–49 points), silver (50–59 points), gold (60–79 points), and platinum (80 points and above) (USGBC, 2009).

Green building certification systems outside the US include the United Kingdom’s Building Research Establishment Environmental Assessment Method (BREEAM), Japan’s Comprehensive Assessment System for Building Environmental Efficiency (CASBEE), and Australia’s Green Star (Saunders, 2008). BREEAM was introduced in 1990 and awards credits across eight areas: management, health and well-being, energy, transport, water, material and waste, land use and ecology, and pollution. Five levels of certification may be achieved: pass, good, very good, excellent, or outstanding. CASBEE was launched in 2004 and assigns weightings on the basis of
six major categories: indoor environment, quality of service, outdoor environment on site, energy, resources and materials, and off-site environment. One of the following five grades may be assigned, ordered from lowest to highest: C, B–, B+, A, or S. Finally, Green Star, initiated in 2003, assesses performance in nine categories, slightly modified from those of BREEAM: management, indoor environmental quality, energy, transport, water, materials, land use and ecology, emissions, and innovation. Three certified ratings are possible: four stars, indicative of best practice, five stars, representing Australian excellence, or six stars, signifying world leadership. Although the details of each certification program differ in terms of specific categories and rating levels, the underlying goals are similar: to provide credible environmental assessment methodologies for buildings and to encourage the diffusion of green building design (Saunders, 2008).

Public perceptions of green building are largely positive. The media has extolled the environmental benefits of LEED and praised those companies who chose to adopt (e.g. Arndt, 2009; Friedman, 2008). The consensus of such praise is that green building construction represents a viable means for companies to reduce their negative environmental externalities. Environmental justifications have been combined with financial justifications, as reports have found that many green building technologies ultimately have positive net financial benefits (Enkvist et al., 2007).

LEED is not without controversy, however. While some reports have suggested that LEED has positive net financial benefits, others have found construction cost premiums for companies (Kats, 2003) and questioned whether anticipated energy savings ultimately materialize (Cater, 2010). Although LEED-certified buildings would logically be expected to generate cost savings associated with energy, emissions, and water, it is difficult to ascertain whether the present value of future savings exceeds corresponding construction cost premiums. Payback periods vary on a case-by-case basis across numerous factors, including the discount rate selected for the firm. The reality is that analysts have not unequivocally shown that LEED certification yields financial benefits greater than the corresponding cost premium.

Despite the uncertainty associated with the potential financial benefits of LEED, certifications have diffused rapidly. Seventy-two per cent of the 8131 total certifications were achieved in 2009 and 2010 alone. Rapid diffusion, combined with uncertain financial benefits, has led some media reports to question whether green building is a fad (Hagman, 2006). Our interest in this study is to join the ongoing discourse surrounding LEED and, in so doing, shed light on the determinants of adoption of sustainable innovation. Acknowledging that the uncertainty inherent in LEED may strengthen the role of imitation in influencing adoption, we posit that Abrahamson’s (1991) theory of fads and fashions provides an effective lens with which to view the adoption of LEED. To that end, we next review the associated literature on management fads and fashions and develop hypotheses regarding LEED adoption.

Theory and Hypotheses

Pro-innovation arguments have been found to dominate the diffusion of innovations literature (Abrahamson, 1991; Rogers, 2003). Such contentions originate from an efficient-choice perspective, which holds that organizations in a group act freely and independently in a choice of adoption and have a high degree of certainty regarding their assessments of how adoption will facilitate the achievement of organizational goals (March, 1978). A critical assessment of assumptions of the efficient-choice perspective, however, leads to a more nuanced view of innovation adoption (Abrahamson, 1991).

Abrahamson (1991) proposes a counter-assumption that organizations either outside or within a group may exert pressures on organizations within that group. In addition, it has been argued that organizations have uncertain goals and uncertain assessments of how innovation adoption will affect those goals (March and Olsen, 1976). Abrahamson extends this argument to contend that imitation may diffuse innovations as companies faced with uncertainty choose to mimic the choices of other organizations (DiMaggio and Powell, 1983).

If we accept these counter-assumptions, it is then possible to construct a typology of innovation adoption encompassing four perspectives. The efficient-choice perspective holds when organizations within a group determine diffusion and imitation does not impel diffusion. A forced-selection perspective applies when organizations outside a group determine diffusion and imitation does not impel diffusion. When imitation impels diffusion, either a fad perspective (in the absence of outside influence) or a fashion perspective (when outside influence dominates) will apply (Abrahamson, 1991). A summary of these perspectives, integrated with the hypotheses for LEED adoption.
developed in this section, is presented in Table 1. We note that while many governments now mandate LEED for public buildings (Cater, 2010), the focus of our study is voluntary diffusion among for-profit firms; as such, we do not consider the forced-selection perspective in the following pages. We first review the fashion perspective and its applicability to LEED adoption.

**Fashion**

The fashion perspective holds under conditions of uncertainty in which imitation influences diffusion. Norms of rationality (Meyer and Rowan, 1977; Abrahamson, 1996) enhance the influence of outside organizations in impelling diffusion, as organizations within a group seek the legitimacy that the adoption of innovations promoted by outside organizations may be expected to confer. Such outside organizations may include networks of fashion-setting organizations fundamentally committed to the dissemination of particular products or models (Hirsch, 1972). Consultants, scholars, and business mass media are among the outside organizations and actors that may be particularly influential (Abrahamson, 1996; Abrahamson and Fairchild, 1999).

Consistent with the fashion perspective, the financial benefits of sustainable innovation adoption are marked by uncertainty. Although scholars have argued that a proactive approach to environmental issues holds the potential to generate competitive advantage (Hart, 1995; Porter and van der Linde, 1995), the financial implications of adoption of sustainable innovation remain unclear. The development of a clean technology strategy requires a strong innovation focus, for example, and there is a risk that uncertainty may prevent firms from maintaining a competitive advantage in this area (Hart and Dowell, in press).

Similarly, the financial benefits associated with LEED are uncertain. While some studies have found construction cost premiums to reach 6.5% for the highest level of LEED certification (Kats, 2003), other reports have identified no significant difference in construction costs between green buildings and non-green buildings (Matthiessen and Morris, 2007). Critics have also argued that LEED buildings may not, in fact, generate reductions in energy use (Cater, 2010). If projected reductions in energy use do not materialize, then the associated cost savings from reductions in energy use will also not materialize. Such a high degree of uncertainty can be expected to increase the influence of imitation for firms contemplating LEED adoption.

In particular, strong external influences may result in imitation of the norms articulated by actors supportive of LEED. The USGBC, the organization that conducts certification, is committed to the diffusion of LEED standards. Influential columnists (e.g. Friedman, 2008) have enthusiastically promoted the environmental benefits of LEED. Mass business media such as *BusinessWeek* have published favorable profiles of companies whose headquarters have achieved LEED certification (e.g. Arndt, 2009). Leading management consultants such as McKinsey & Co. have released reports concluding that the cost savings resulting from many green building technologies exceed the requisite investment costs (Enkvist *et al.*, 2007). Furthermore, prominent political leaders such as US Senator Olympia Snowe have voiced strong support for LEED (Snowe, 2006).

The previous arguments suggest an important role for state political leaders in influencing LEED adoption. Environmental advocacy organizations such as the League of Conservation voters have analyzed the voting records of state congressional delegations, recently awarding Connecticut and Hawaii the highest environmental scores and Wyoming the lowest scores (2009). Given substantial state-specific differences in environmental voting records and the strength of the organizational desire for legitimacy (Meyer and Rowan, 1977; Suchman, 1995), we would...

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<th>External Influence</th>
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<th>Fad (H2)</th>
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<td>Strategic Positioning (Environmental Leadership)</td>
<td>Nature of Business (Selling to End-Consumers)</td>
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<td></td>
<td>Forced-Selection (NA)</td>
<td>Fashion (H1)</td>
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<td>State Political Leadership (Environmental Commitment)</td>
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Table 1. Perspectives on sustainable innovation adoption (adapted from Abrahamson, 1991)
anticipate that LEED adoption rates would be higher among organizations in states with more environmentally proactive political leaders. Recent indications that the adoption of sustainability assurance services depends on levels of sustainability awareness in a country (Kolk and Perego, 2010) provide support for this view, insofar as political leaders are both a reflection and a driver of geographic differences in awareness. Firms may respond to the normative power of state political leadership by seeking to conform to state environmental norms. In short, organizational legitimacy would be seen to increase through adoption of sustainability-promoting innovations in environmentally proactive states. This suggests the following hypothesis:

**Hypothesis 1.** The adoption of LEED certification will be more prevalent among firms located in states whose political leaders are more committed to environmental protection.

**Fad**

In the fad perspective, as in the fashion perspective, conditions of uncertainty cause imitation to influence diffusion. The perspectives differ according to the source of influence. While the fashion perspective emphasizes the role of outside influence, the fad perspective stresses internal influence. Organizations within a group imitate other organizations within, rather than outside, the group. A firm’s group may be defined in terms of its customer base (e.g. end-consumers), among other variables. Firms within such similar groups can be expected to imitate each other’s adoption decisions (Abrahamson, 1991). Although the benefits of adoption are uncertain, perceived economic self-interest may nonetheless impel imitation through competitive bandwagon pressures in which non-adopters fear the potential advantage that adopters of an innovation may realize (Abrahamson and Rosenkopf, 1993).

Thus, the fad perspective’s internally driven focus maintains that firms with fundamental business similarities will imitate each other when adoption benefits are unclear. Research on organizations and the natural environment suggests that an integral driver of such similarities is the nature of the firm’s customers. As Haddock-Fraser and Tourelle (2010) note, companies can be segmented according to their proximity to the end-consumer. Firms selling to end-consumers have been found to engage in many environmental management processes and activities at higher rates than business-to-business firms (Haddock-Fraser and Tourelle, 2010). Similarly, Khanna and Anton (2002) found that organizations selling primarily final goods have a greater likelihood of adopting higher-quality environmental management systems than organizations selling predominantly intermediate goods. Arora and Cason (1996) concluded that firms with more contact with consumers were more likely to adopt a voluntary environmental regulation program. Ultimately, the logic of the fad perspective would suggest that such differences in environmental policies and practices are driven by fundamental business similarities, as imitation among final goods firms influences adoption decisions.

As noted earlier, one of the necessary conditions of the fad perspective holds in the case of LEED: financial benefits may be perceived as uncertain. The characteristics of LEED further suggest the means by which the fad perspective’s second condition may be met: internal influence may drive diffusion, as organizations imitate the adoption decisions of similar organizations. Prior LEED adoption decisions may be communicated through a number of channels, including the USGBC’s publication of case studies. As consumer-oriented non-adopters learn of the adoption decisions of other consumer-oriented organizations, bandwagon pressures may impel adoption. Although they may lack explicit evidence of the financial benefits of sustainable building innovations, non-adopters may nevertheless surmise that prior adopters have acted out of perceived self-interest and therefore imitate their decisions to adopt.

Thus, the fad perspective implies that organizations similarly oriented toward end-consumers will be more likely to adopt LEED than business-to-business organizations. This contention is supported by findings of more environmentally proactive adoption behaviors among firms selling to consumers (Haddock-Fraser and Tourelle, 2010; Khanna and Anton, 2002). Although they may share a general sense that consumers value sustainability, many consumer-oriented firms may lack the information necessary to conduct rational cost–benefit analyses with respect to LEED adoption. Given this constraint, consumer-oriented firms can be expected to look toward the prior adoption decisions of other consumer-oriented firms as a proxy for the desirability of LEED adoption. This logic suggests the following hypothesis:

**Hypothesis 2.** The adoption of LEED certification will be more prevalent among firms selling to end-consumers.
Efficient-choice

Under the efficient-choice perspective, firms are assumed to possess greater certainty with respect to the potential benefits of innovation adoption than under the fad and fashion perspectives. Imitation, therefore, does not impel diffusion. External influence is believed to be negligible, as the choice of adoption is conducted rationally, freely, and independently (Abrahamson, 1991).

Consistent with an efficient-choice view, firms may project that financial benefits are likely to result from the adoption of certain sustainable innovations. The broader question of whether improved environmental performance can lead to improved financial performance, of which sustainable innovation adoption is one part, suggests several mechanisms through which financial benefits may be realized. As Ambec and Lanoie (2008) note, revenue gains may result from improved access to certain markets, differentiating products, and the sale of pollution-control technologies. Additionally, cost reduction may result from risk management and external stakeholder relations, cost of material, energy, and services, cost of capital, and labor costs (Ambec and Lanoie, 2008).

Management scholarship has helped to reduce the economic uncertainty inherent in actions undertaken to improve environmental performance. In their review of the ‘pays to be green’ literature, Berchicci and King (2007) note the influence of the Porter hypothesis (Porter and van der Linde, 1995) and natural-resource-based view of the firm (Hart, 1995), describing the former as ‘a theory of how environmental performance helps industries or nations gain competitive advantage’ and the latter as ‘a theory of how an individual firm might gain a competitive advantage by going green’ (p. 516). A number of empirical tests of the relationship between environmental and financial performance have been conducted (e.g. Christmann, 2000; Hart and Ahuja, 1996; King and Lenox, 2002; Klassen and McLaughlin, 1996; Nehrt, 1996; Russo and Fouts, 1997). The contingencies developed in this literature have implications for practitioners seeking to reduce the uncertainty associated with investments in improved environmental performance. Again, it is important to note that sustainable innovation adoption is only one of the multiple facets of this literature.

Reduced uncertainty enables an efficient-choice perspective of sustainable innovation adoption. To the extent that many innovations, such as those associated with green building design, remain difficult to value, uncertainty is nevertheless reduced among firms strategically positioned as environmental leaders. The internal consistency of an organization’s strategic decisions is one of the primary determinants of organizational success (Andrews, 1971). Organizations that do not achieve an appropriate strategic fit may be considered strategic failures (Miles and Snow, 1978). A well-articulated strategy of environmental leadership provides an overall sense of direction, which in turn allows managers to act in accordance with the vision projected by leadership (Mintzberg and Waters, 1985). The decision to adopt LEED is one of internal consistency for environmental leaders.

Thus, an efficient-choice perspective on LEED adoption can be informed through an analysis of strategic positioning. LEED’s status as the leading green building certification program in the USA (Saunders, 2008) carries significant weight for US firms committed to a strategic position of environmental leadership. We would therefore anticipate that firms positioned as environmental leaders will make a rational, free, and independent choice to adopt, reflecting the belief that LEED adoption enhances the internal consistency of a firm’s strategic decisions and improves strategic fit. This reasoning suggests the following hypothesis:

**Hypothesis 3.** The adoption of LEED certification will be more prevalent among firms that are strategically positioned as environmental leaders.

Methods

Sample

Our hypotheses necessitated a large sample of US-based firms whose environmental leadership had been measured by a rating service. On this basis, we drew our sample from the S&P 500 as of year-end 2009. Given that firms owning no buildings would not be able to adopt LEED, we examined each company’s most recent 10-K filing for evidence of ownership of at least one building. A total of 448 companies remained in the sample after companies lacking such evidence were removed.
Dependent Variable

LEED adoption information was secured from the USGBC’s database of all publicly disclosed projects. This spatially specific data set included projects’ street addresses and owner organizations, enabling us to test Hypothesis 1 by capturing the states in which certified properties were located. In determining how to code adoption, we conducted a sensitivity analysis based on the number of buildings certified by each firm. Our analysis revealed that 80% of adopters had certified only one building. A binary parameterization was therefore appropriate.

We considered new certifications achieved in 2009 and 2010, encompassing 72% of all certifications. This time restriction was required because firm environmental leadership data used to test Hypothesis 3 were available for calendar years 2008 and 2009 only; a 1-year lag between the dependent and independent variables was necessary to address potential endogeneity issues. We coded adoption as follows. Each firm was assigned a value of 1 if it had certified at least one building under any LEED rating system in either 2009 or 2010. Firms certifying no buildings in any year received a value of 0. Firms that certified prior to 2009 but did not certify in 2009 or 2010 were removed from the sample.

It is worth noting that LEED is applicable to both new and existing buildings, and therefore new construction is not a prerequisite for certification. For all firms that had no records of any certifications in the USGBC database, we conducted a supplemental search in the Lexis-Nexis database for evidence of certification announcements. Our search revealed no such announcements, suggesting that the USGBC database was comprehensive.

Independent Variables

To operationalize state political leaders’ commitment to environmental protection, we used the results of the National Environmental Scorecard. The scorecard, published by the League of Conservation Voters, assigns ratings to members of the US Senate and House of Representatives based on their votes on issues of clean energy, climate, public lands, water, and wildlife conservation. Each legislator receives a score ranging from 0 to 100. We calculated a score for each state, based on the sum of the mean legislator scores for each chamber. For example, the state of Alabama’s mean House and Senate scores were 26 and 14, respectively, resulting in a state score of 40 out of a possible 200. We assigned scores to firms on the basis of the states in which their certified projects were located. For any firm certifying multiple projects in multiple states, we assigned a weighted average of those states’ scores, based on the number of projects certified in each state. For non-adopters, where no buildings were certified in any states, we based our score on the state in which the company’s headquarters was located.

With respect to firms’ consumer orientation, we recognized the limitations of using Standard Industrial Classification (SIC) codes as a proxy. Thus, we followed Haddock-Fraser and Tourelle’s (2010) operationalization of company focus by reviewing company annual reports and web sites for evidence of any products or services that may be purchased by end-consumers. We classified firms with any such evidence as selling to end-consumers, regardless of whether they also had significant business-to-business operations. For example, Deere & Company was classified as selling to end-consumers on the basis of its consumer equipment products, despite extensive commercial operations. Firms selling to end-consumers were coded 1, while those not selling to end-consumers were coded 0. Hence, this approach reflects Haddock-Fraser and Tourelle’s (2010) categorization of close to consumer and business-to-business firms.

For firm environmental leadership, we used Newsweek’s environmental ratings of US-based firms (Deveny, 2010; McGinn, 2009). Ratings were based on an environmental impact score, green policies score, and reputation score. The environmental impact score was based on data compiled by Trucost and includes an assessment of greenhouse gas emissions, water use, solid waste disposed, and acid rain emissions, normalized by revenue. The green policies score, derived from KLD Research & Analytics, captures climate change policies and performance, pollution policies and performance, product impacts, environmental stewardship, and environmental management. The reputation score was calculated on the basis of survey results through CorporateRegister.com. The survey asked respondents to rate company leadership in the areas of green performance, commitment, communications, track record, and ambassadors. The overall rating was the weighted sum of the three scores: 45% for environmental impact, 45% for green policies, and 10% for reputation.
Control Variables

We controlled for several other factors that have been suggested to influence environmental policies and practices, including firm size (Sharma and Henriques, 2005), industry (Elsayed and Paton, 2009), and financial performance (Bansal, 2005). The natural logarithm of sales was used to measure firm size. For industry, we created dummy variables based on two-digit SIC codes. Profitability was operationalized using return on assets. We also considered that firm age and leverage may affect our dependent variable. Firm age was measured as the number of years since incorporation. We operationalized leverage using the long-term debt to total assets ratio. Data for our control variables were gathered from Compustat and Mergent Online.

Analysis

Following prior research on environmental innovation adoption (Henriques and Sadorsky, 2007; Sangle, in press), we used logistic regression analysis to test the paper’s hypotheses. Logistic regression is appropriate for models in which the dependent variable is dichotomous. As previously noted, our dependent variable was equal to 1 for adopters and 0 for non-adopters.

Results

Descriptive statistics and correlations for the sample are provided in Table 2. A total of 404 companies remained after accounting for missing data. We tested for multicollinearity by examining the variance inflation factors for each variable. All were below the generally accepted threshold of 10 (Chatterjee and Hadi, 2006). None exceeded 2, suggesting that multicollinearity was not a problem.

Table 3 presents the results of the logistic regression analysis. The model is significant, with a chi-square of 78.74 ($P < 0.01$) and pseudo-$R^2$ of 0.26. The odds ratios reported in Table 3 should be interpreted as the proportional change in adoption likelihood associated with a one-unit change in the independent variable. Hypothesis 1 predicts that LEED adoption will be more prevalent among firms located in states whose political leaders are more committed to environmental protection. The coefficient for state political leadership was not significant. Thus, the results provide no support for Hypothesis 1.

Hypothesis 2 predicts that LEED adoption will be more prevalent among companies selling to end-consumers. The coefficient for consumer orientation was significant ($P < 0.01$), providing support for the hypothesis. The odds ratio indicates that firms selling to end-consumers are 2.3 times more likely to adopt LEED than firms selling exclusively to other businesses.

Hypothesis 3 predicts that firms strategically positioned as environmental leaders will be more likely to adopt LEED. The coefficient for firm environmental leadership was significant ($P < 0.01$), indicating support for the hypothesis. For each one-point increase in environmental leadership score, the likelihood of LEED adoption increases by 9.2%.

Discussion and Conclusion

Adoption of sustainable innovation is a dynamic area of inquiry that has greatly benefited from the contributions of management scholars in recent years (Bos-Brouwers, 2010; Rothenberg and Zyglidopoulos, 2007; Smith and Crotty, 2008; Wagner, 2009). Our study was conducted to explore the influences on adoption of sustainable building innovation. We posited that uncertain financial benefits may cause imitation to influence adoption. We explicitly drew on Abrahamson’s (1991) theoretical framework of fads and fashions to hypothesize that adoption of LEED green building certification would be more likely among firms located in states whose political leadership is more committed to environmental protection. We further hypothesized that LEED adoption would be more likely among firms selling to end-consumers. Finally, we hypothesized that LEED adoption would be more likely among firms strategically positioned as environmental leaders, reflecting an efficient-choice view of adoption.
Through logistic regression analysis of adopters and non-adopters within the S&P 500, we found that LEED adoption was, in fact, more prevalent among firms selling to end-consumers. This finding provides support for a fad view of adoption, in which organizations within a group imitate other organizations within that group. The boundaries of a firm’s group may be determined by the characteristics of its customer base (e.g. end-consumers versus business customers), among other factors. Given the difficulty of conducting a rational cost–benefit analysis of LEED based on uncertain information, consumer-oriented organizations appear to be influenced by the adoption decisions of other similarly consumer-oriented organizations. Thus, similarities in the fundamental nature of firms’ businesses seem to influence LEED adoption, as the fad perspective suggests.

We also found that LEED adoption was more common among firms strategically positioned as environmental leaders, lending support to an efficient-choice view of adoption. Uncertainty regarding LEED’s benefits may be reduced for environmental leaders, for whom adoption becomes a matter of proper strategic fit. Given the link between strategic fit and organizational performance (Miles and Snow, 1978), the adoption of sustainable building innovations is a rational choice for such organizations.

Contrary to our hypothesis, we found that LEED adoption was not more likely among firms located in states whose political leadership is more committed to environmental protection. One explanation for this result arises from dual sources of state power. First, the state possesses coercive power, which has been exercised by some governments to mandate LEED certification for public buildings. Second, the state possesses normative power, which may manifest itself in public statements supportive of LEED by prominent political leaders. The results of our analysis suggest that

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<td>Firm age</td>
<td>48.60</td>
<td>35.51</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>Leverage</td>
<td>0.21</td>
<td>0.15</td>
<td>0.09</td>
<td>0.09</td>
<td>0.09</td>
<td>0.09</td>
<td>0.09</td>
<td>0.09</td>
<td>0.09</td>
</tr>
</tbody>
</table>

Table 2. Means, standard deviations, and correlations
For parsimony, industry dummy variables are omitted from the table.

\[ n = 404. \]
\[ \ast P < 0.05; \ast \ast P < 0.01. \]

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Wald</th>
<th>Significance</th>
<th>Odds ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-9.929**</td>
<td>33.148</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>H1: State political leadership</td>
<td>-0.002</td>
<td>0.640</td>
<td>0.424</td>
<td>0.998</td>
</tr>
<tr>
<td>H2: Nature of business</td>
<td>0.812**</td>
<td>6.780</td>
<td>0.009</td>
<td>2.253</td>
</tr>
<tr>
<td>H3: Strategic positioning</td>
<td>0.088**</td>
<td>22.517</td>
<td>0.000</td>
<td>1.092</td>
</tr>
<tr>
<td>Firm size</td>
<td>0.338**</td>
<td>6.851</td>
<td>0.009</td>
<td>1.401</td>
</tr>
<tr>
<td>Financial performance</td>
<td>1.085</td>
<td>0.221</td>
<td>0.638</td>
<td>2.958</td>
</tr>
<tr>
<td>Firm age</td>
<td>-0.001</td>
<td>0.080</td>
<td>0.777</td>
<td>0.999</td>
</tr>
<tr>
<td>Leverage</td>
<td>-0.592</td>
<td>0.384</td>
<td>0.535</td>
<td>0.533</td>
</tr>
</tbody>
</table>

Pseudo-R^2 (Nagelkerke) = 0.259
\[ \chi^2 = 78.74** \]

Table 3. Results of logistic regression analysis for LEED adoption
For parsimony, industry dummy variables are omitted from the table.

\[ n = 404. \]
\[ \ast P < 0.05; \ast \ast P < 0.01. \]
the normative power of the state in influencing adoption of sustainable building innovations may be limited. In circumstances in which imitation impels adoption, organizations seem inclined to imitate other organizations within their group, rather than outside organizations or actors.

The central contribution of this work is to the literature that investigates the determinants of adoption of sustainable innovation. Given the impact of buildings on material consumption, energy use, and greenhouse gas emissions, the adoption of sustainable building innovations will be a subject of increasing interest to scholars, practitioners, and policy makers in the coming years. Our study is, to our knowledge, the first empirical test of influences on the adoption of LEED, the leading green building certification program in the USA. Our findings provide empirical support for the argument that LEED adoption has been driven in part by imitation among organizations. This paper further suggests a revised interpretation of Abrahamson’s (1991) theoretical framework of fads and fashions. While we find support for efficient-choice and fad perspectives of adoption, we find no such support for the fashion perspective. Thus, we demonstrate potential limitations in the ability of outside organizations and actors to promote voluntary adoption of sustainable innovations.

The results of our research offer implications for practitioners. For managers with decision-making authority for LEED adoption, our findings suggest the contexts in which the benefits of LEED carry greater certainty. For firms pursuing strategies of environmental leadership, the adoption of LEED can be seen to facilitate organizational goals. Within such firms, managerial decisions to adopt may thus be viewed as a rational choice to improve organizational performance by enhancing strategic fit. For managers lacking decision-making authority, our findings suggest championing strategies that may be productively employed in support of green building design. Research on issue selling asserts that the probability of success is enhanced when sellers attach their issues to potential solutions or when they frame issues as strategic (Dutton and Ashford, 1993). Champions should therefore attach the issue of sustainable building to LEED certification, a possible solution whose credibility is enhanced through evidence of over 8000 prior adoptions. Additionally, champions within firms positioned as environmental leaders should emphasize that sustainable building design is a strategic issue whose adoption improves the internal consistency of the firm’s strategic decisions.

For policy makers, our study reveals the limitations of political leaders’ normative role in promoting the diffusion of sustainable innovations. Our analysis suggests that both the efficient-choice and fad perspectives help to explain the decision of for-profit firms to adopt LEED. Given that the efficient-choice perspective is enabled by a sense of reduced uncertainty, policy makers may wish to focus their efforts on disseminating information regarding the cost savings that can be expected to be achieved through LEED. Such information provision would reduce the uncertainty for firms contemplating LEED adoption and allow firms to model LEED’s anticipated benefits with a greater degree of confidence. In the course of our research, we noted that the USGBC publishes case studies of prior adoptions, some of which contain estimates of realized cost savings. However, to our knowledge, these estimates have not yet been aggregated in a single repository that businesses may easily access. Policy makers should encourage the development of information delivery platforms that deliver such relevant financial data to businesses.

As we have noted, many governments now mandate LEED for new construction of public buildings. Policy makers may wish to consider expanding LEED mandates, particularly in the light of our findings that the normative power of political leadership alone appears insufficient to impel diffusion. However, we suggest that policy makers should proceed with caution in this area. LEED, similar to the ISO 14001 environmental management standard, was designed for voluntary adoption. Mandated certification of LEED holds similar risks to mandated adoption of ISO 14001: that ‘like any tool designed for one purpose and applied to another, its effectiveness will diminish’ (Russo, 2009. p. 317).

Policy makers may therefore wish to exercise caution with respect to expanded mandates and instead focus on timely provision of information about realized cost savings. Over time, an emphasis on information provision to reduce uncertainty holds the potential to strengthen efficient-choice motivations and weaken fad-like motivations. Such an outcome would have positive implications for the natural environment, given that the implementation of sustainable building design may be incomplete among firms motivated solely by fad influences. Again, the analogy of ISO 14001 is useful, in that recent research indicates that ISO 14001 implementation is symbolic rather than substantive among many firms (Boiral, 2007).

Finally, policy makers may wish to acknowledge that LEED is one of a multiplicity of mechanisms through which to promote sustainability. Eco-industrial parks represent another potential instrument. Scholars have generated
significant insights in this area (Deutz and Gibbs, 2004), and further research should be encouraged. It is also worth noting that architecture and urban design are strategic tools that can be used to encourage sustainability-oriented behavior among individuals (Mateo-Babiano and Ieda, 2009). At the firm level, those organizations possessing strong environmental innovation capabilities might deliver more substantial environmental benefits by reducing their building-related impact through more creative efforts than the pursuit of a legitimated certification.

To the extent that such firms enjoy capabilities that enable more creative solutions, the commitment of limited financial resources to certification costs may serve to impede true innovation.

We acknowledge that our study contains a number of limitations. First, our analysis was based exclusively on publicly available information. Given the growing public interest in sustainable building design and the absence of empirical scholarly research on LEED adoption, we sought to contribute to the public discourse through an exploratory study of influences on adoption. In future research, we hope to build on these initial findings through surveys and interviews of both adopters and non-adopters.

Second, the limited diffusion of LEED required us to examine adoption as a dichotomy. Thus, we were unable to differentiate between an adopter certifying one building and an adopter certifying multiple buildings. Although 80% of adopter organizations have indeed certified only one building, we would anticipate that organizations will increasingly certify multiple properties in the coming years. As diffusion spreads, future research designs should incorporate the number of buildings each adopter certifies.

Third, we did not attempt to quantify the financial costs and benefits of LEED adoption. As we have noted, some of the case studies published by the USGBC include estimates of realized cost savings. However, we found few case studies for firms in our sample that disclosed such information, and we were unable to find associated financial information through other channels. Although we recognize the difficulty of securing financial information associated with LEED projects, we hope that increasing disclosure by adopters will permit future research to quantify the financial costs and benefits of adoption.

Despite these limitations, our study contributes to scholarship on the adoption of sustainable innovation and provides insights into the influences on adoption of sustainable building innovations. While adoption appears to have been a rational and independent choice for many firms, our research suggests that imitation among similar organizations, intensified by uncertainty, has also been a significant influence on the diffusion of green building design. Future studies should build on theoretical frameworks such as Abrahamson’s (1991) to identify the contexts in which different motivations are most likely to impact upon adoption decisions.

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**References**


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