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Overcoming the Social and Psychological Barriers to Green Building

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The green building movement has overcome formidable, technical, and economic hurdles in recent years, yet adoption of green building practices within the design and construction field remains low. Major corporations now offer products and services at a scale that is bringing costs down to competitive levels, but environmental sustainability in building design and delivery remains at the early stages of the adoption s-curve. This article argues that environmental progress in the building design and construction industry will continue to stall if the significant social and psychological barriers that remain are not addressed. After surveying the three levels of barriers—individual, organizational, and institutional—the article concludes with strategies for overcoming them. Seven specific strategies are elaborated, namely, issue framing, targeting the right demographic, education, structural and incentive change, indemnifying risk, green building standard improvements, and tax reform.

Keywords: *institutional theory; individual biases; corporate environmentalism; organizational culture and structure; organizational and institutional change; organizational innovation; built environment; LEED certification; green building movement; sustainable business.*

In 2007, the law school of a large university announced plans to add a major new building to its existing grounds. Student groups immediately lobbied for the building to achieve Leadership in Energy and Environmental Design (LEED) certification from the U.S. Green Building Council (USGBC). Despite previously successful campaigns with both business and medical school buildings at the university, law school administrators opposed the idea. In meetings with students, university architects and administrators defended their resistance in several ways. They insisted that LEED was difficult to implement; the business case did not support the added cost of LEED certification; LEED certification would cost an additional "few hundred thousand dollars"; they were already developing "high-performance buildings"; and finally, they feared setting a precedent that would require all future buildings to be LEED certified.

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Students in the meeting had done significant research and found it difficult to concur with these assertions. They pointed out that the medical school's project was far more complex than the law school's and yet was able to implement LEED. They explained that business school administrators originally opposed LEED certification based on financial grounds but changed their minds when presented with data. The students presented costs for LEED certification that were far less than administrators feared. Though high performance building was a good idea, they showed that LEED certification had credibility with a skeptical public. And finally, the students suggested that a precedent on good building design was a university's responsibility. Yet resistance remained.

These students discovered what many others find as they propose the adoption of green building practices and LEED certification: obstacles faced by the green building movement are no longer primarily technological and economic. Instead, they are social and psychological. In this article, we explore those obstacles in greater detail for both academic and practitioner audiences. The theoretical structure and presentation will interest scholars who study challenges to an industry's adoption of both material and processual innovations, whereas practitioners will find strategies for overcoming barriers in the green building field. In so doing, we fill a gap in the existing green building literature. Most of these outlets publish technical solutions, case study examples, and policy news (e.g., *Environmental Building News, GreenSource, Journal of Green Building*). But the work here examines the sociological and psychological dimensions of the green building world, treating the industry as a collection of actors working toward rational interests or social incentives. More than philosophical musings about a change in mindset or paradigm, we provide a clear assessment of the form of social and psychological obstacles and offer suggestions to overcome them.

Specifically, this article outlines the emergence of green building as part of a larger social movement toward environmental sustainability, illustrates industry achievements over technical and economic hurdles, and addresses in detail the psychological and social barriers to adoption. The complexity of the issue requires a multilevel analysis of these barriers including behaviors and taken-for-granted beliefs on three levels (Bazerman & Hoffman, 1999). First, we consider how individuals are guided in their perception of green building through cognitive biases. Second, we consider how individuals are influenced by biases in their organizations. Third, we consider the institutions that persist and guide our awareness of our connections and impact on the environment. Only by identifying the taken-for-granted social structures and psychological perceptions at each of these levels can we understand the persistence of standard methods of construction and move beyond our predisposition toward actions that lead us to continue damaging the environment. We conclude with suggestions for overcoming these behaviorally based obstacles that we hope will fuel more research in this important area of inquiry.

The Green Building Movement

Near the end of the 20th century, the built environment became a focus of attention within the environmental movement. Research revealed that buildings consume 40% of the world's materials, use 55% of the wood cut for nonfuel use, use 12.2% of the total water consumed, consume 40% of the world's energy and 71% of U.S. electricity, produce 40%

of U.S. nonindustrial waste, and create 36% of the carbon dioxide emissions that cause global warming (Roodman, Lenssen, & Peterson, 1995; USGBC Research Committee, 2008). When we look inside our buildings—realizing that Americans spend 90% of their time indoors—the U.S. Environmental Protection Agency (EPA) reports that indoor air often contains pollutant levels 2 to 5 times higher than outdoor air (U.S. EPA, 2008). And looking at a larger scale, we can see that "urbanized land consumes natural space and agricultural land at a rate 2.6 times the population growth in the United States" (Center for Sustainable Systems, 2005). Seeking to reduce this growing environmental impact, the green building movement was born.

"Green building" is a term encompassing strategies, techniques, and construction products that are less resource-intensive or pollution-producing than regular construction. In some cases, this involves merely doing without extra space, finishes, or appliances. In others, it substitutes a less polluting product for more polluting ones (e.g., low-volatile organic compounds [VOC] paint). More integrated strategies reconfigure a space to take advantage of unique site attributes (e.g., facing glass toward the sun path to use natural or passive solar heat gain instead of using natural gas or electricity to heat a space) or reconfigure design parameters to take advantage of building system synergies (e.g., downsizing the boiler after extra insulation has been added to the exterior shell).

To avoid accusations of greenwashing within the industry and to standardize the methods used to make buildings more environmentally friendly, the USGBC introduced the LEED rating system in 1998 for new institutional and commercial construction. In this system, adhering to environmental goals earns points toward four progressively higher certification levels: Certified, Silver, Gold, and Platinum. The goals for new construction are grouped into six categories: sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor air quality, and innovation and design process. LEED has become the dominant green building rating system in the United States, most likely because it differentiates itself as an unbiased, consensus-based, third-party evaluation.

Technical and Economic Achievements

LEED Certification rewards building projects for using best practices regarding the environmental impacts of buildings. Recent years have shown that green building components have become more mainstream in the industry. For example, conventional paint suppliers like Benjamin Moore and Sherwin-Williams have developed no-VOC paints, now available in most shades and hues. Building product companies like Dow and Owens Corning, previously furtive with their product formulations, now advertise high recycled content or low toxic ingredients or emissions. Waterless urinals and dual-flush toilets are supplied by mainstream manufacturers such as American Standard and Kohler, and are found as standard equipment in some new high-rise office buildings. Green roofs are emerging through the city of Chicago, including on City Hall. Even contractors like Turner Construction and Skanska have created special construction teams to market their green contracting capabilities. These environmental protection efforts are no longer in the experimental realm. They have a proven history and dependable performance in the building industry.

Economic hurdles for green components have also been reduced through the combination of increased market share for products, higher market returns, early integrated design practices, and reduced operating expenses. For example, makers of green building products reported increasing sales from December 2005 to December 2006, despite a 14.7% decrease in housing starts and a 12% decrease in lumber and construction materials sales during the same period (Hoffman & Woody, 2008). Solar cells have decreased in price from US$21.83 per watt in 1980 to US$2.70 per watt in 2005 with predictions of energy cost parity with coal by 2015. This progress is accounted for in both increased production volume and technological advances (Service, 2008). And the paybacks for many of these components are increasingly attractive. A 2007 McKinsey & Co. report ranked technologies for reducing greenhouse gas emissions and found that improvements in many building technologies are cost negative including building insulation, lighting, air-conditioning, and water heating (Enkvist, Naucler, & Rosander, 2007).

Reductions in the costs of green building components are paralleled by a steady reduction in the cost of green buildings in their entirety. Early studies showed construction cost premiums for LEED buildings that ranged from 0.66% for a LEED certified building to 6.50% for a LEED platinum building (Kats, 2003, p. 15). Another study found ranges from 0.8% for certified to 11.5% for platinum (Turner Green Buildings, 2005, p. 17). On average, green buildings were thought to have a "higher capital or construction cost than conventional buildings, on the order of 2 percent, or $2 to $5 per square foot" (Kibert, 2007, p. 327).

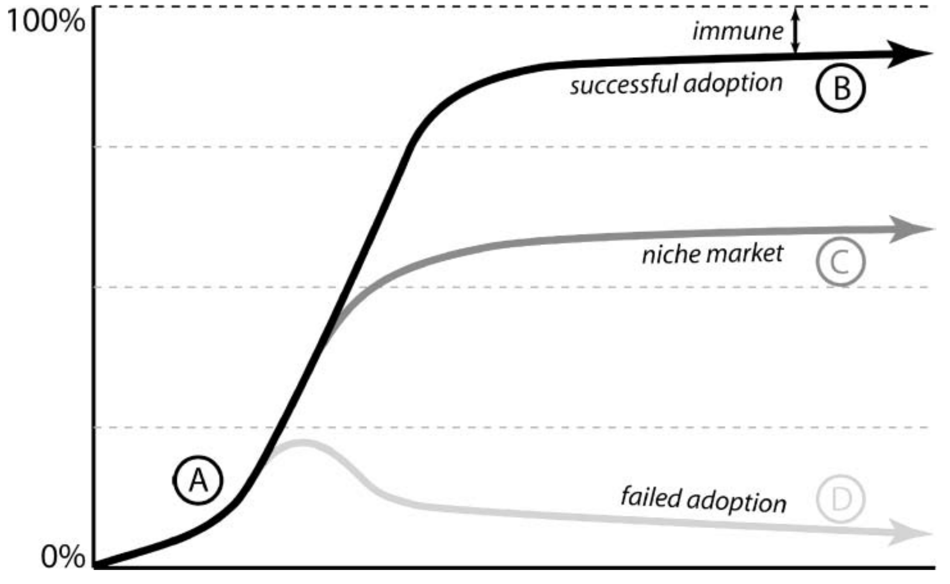
More recently, studies have suggested that these capital cost premiums are coming down. A study by Davis Langdon concluded that, "Many projects are achieving LEED within their budgets, and in the same cost range as non-LEED projects" and that "there is no significant difference in average costs for green buildings as compared to non-green buildings" (Matthiessen & Morris, 2007, p. 3). Wachovia bank even reports an US$80,000 *savings* in construction costs per retail branch by building to LEED standards (Lockwood, 2007).

Economic benefits for green building go beyond capital costs. Advocates also justify green building on the operating cost reductions in water, wastewater, and energy expenditures (hard cost benefits) and improved performance of building occupants (soft cost benefits). For example, a study by Capital E Analysis (Kats, 2003, p. ix) calculated the total net present value (NPV) of energy savings for a typical green building over a 20-year life cycle to be US$5.79/sq. ft. Other cost savings include US$1.18/sq. ft for reduced emissions and US$0.51/sq. ft. for reduced water use. In the area of soft cost benefits, green building strategies are claimed to increase "occupant performance" by 6% to 26%, whether it is students in schools (Heschong Mahone Group, 1999a), office workers in firms (Victoria & Kador Group, 2008; Wilson, 1999), or consumers in retail space (Heschong Mahone Group, 1999b). Even dental health is claimed to rise with students' exposure to daylight, as "dental health relies on our ability to metabolize vitamin E, which is only possible in the presence of UV found in daylight" (McLennan, 2004, p. 158). With employee costs comprising 90% of a firm's annual expenses, this improved productivity makes a clear economic case for green building (USGBC, 2005).

Slow Progress

Brenna Walraven, chair of the Building Owners and Managers Association International, stated in 2007, "In no more than five years—and maybe in as little as 24 to 36 months—you will face a competitive disadvantage if your building is not green and operating efficiently" (Lockwood, 2007, p. 118). Such bravado, however, does not match the numbers. Despite achievements in the technological and economic aspects of green buildings,

Figure 1
Adoption Curve for Green Construction



the adoption of green building practices is still in its infancy on the adoption curve (Foster, 1986; see point A on Figure 1). The USGBC has only certified about 1,000 buildings between the inception of LEED in 1998 and 2007 (Russell, 2007; USGBC, 2001, p. 2). The volume of commercial construction that has registered to receive LEED certification has risen from 3% in 2002 (USGBC, 2002) to some estimates as high as 6% in 2008 (based on square footage). Yet this is a small fraction of the 1.8 million homes and 170,000 commercial buildings that are built each year in the United States (Wilson & Yost, 2001). It is still unclear whether this new building form will climb the adoption curve to full market penetration (point B on Figure 1), become a niche market (point C), or fail as a dominant design (point D). To make Walraven's prediction come true and move toward successful adoption, we must overcome psychological and social barriers that stand in the way of broader adoption of LEED.

Behavioral Barriers to Green Building

When a construction project begins, participants certainly don't intend to build in an environmentally *harmful* way. Instead, unrecognized cognitive and social barriers stand between the technical and economic solutions described above, and the successful construction of a green building. These specific barriers exist on individual, organizational, and institutional levels. We start our analysis with the most micro—the cognitions of decision makers—then move to organizations and finally to the institutions that influence both individuals and organizations.

It is important to recognize that the following analyses apply to all participants in the building industry. It would be easy for us to limit our analysis to consumers of buildings (those who merely purchase or commission them—owners and developers). However, the creation of a building typically involves hundreds of people, each of whom can individually or collectively influence the outcome or sustainability of both design and construction processes, as well as the final product. These roles include architects (building and landscape), contractors, engineers, energy consultants, daylighting consultants, subcontractors (e.g., plumbing, electrical, or heating, ventilation and air conditioning [HVAC]), product manufacturers, product distributors, code inspectors, government officials (local, state, and federal), nonprofit organizations, industry trade organizations, and more. Individuals in each of these roles can be swayed by the unconscious biases elaborated below.

Individual Level Perspectives

At first, it may seem that cognitive decisions which counter technical and economic rationality are essentially irrational decisions. In other words, once the technical and economic barriers to green building are overcome, no environmentally harmful decision could be rational. But scholars within the fields of sociology, psychology, anthropology, and political science recognize this to be untrue. Instead, research shows that people make a wide variety of suboptimal decisions that are biased in systematic and predictable ways. However, these biases most typically occur without the awareness of the individual.

Behavioral decision research sees individuals as attempting to act rationally but bounded in their ability to achieve pure rationality (March & Simon, 1958; Simon, 1957). People rely on simplifying strategies, also known as cognitive heuristics. Although these heuristics are frequently useful shortcuts, they also lead to a wide variety of decision-making biases (Bazerman, 1998; Kahneman & Tversky, 1973, 1979). Here we describe how these biases relate specifically to the adoption of green building practices. In particular, we address (a) overdiscounting the future; (b) egocentrism; (c) positive illusions; (d) presumed associations; (e) mythical fixed-pie bias; and (f) environmental literacy.

Overdiscounting the future. There is an extensive body of research showing that people use extremely high discount rates in their consumption behavior (Gately, 1980; Ruderman, Levine, & McMahon, 1986). Homeowners underinsulate their homes and purchase energy-inefficient appliances despite the implications for future energy costs. This is often attributed to the lack of information or sophistication of consumers. But even well-informed, educated consumers do not take advantage of some of the most simple energy efficiency opportunities—such as energy-efficient lighting—which often provide return on investments of 30%-50% per year (U.S. EPA, 1997). Many of these consumers would reap greater returns by investing in energy efficiency rather than their current allocation to stocks, bonds, and money market funds.

One cause of the resistance to making wise long-term decisions on energy efficiency is the simple failure to calculate and then make decisions based on payback periods. For example, many balk at the US$700 price differential between a basic top loading washing machine and a hyper efficient front-loading machine. Calculating the payback period for the additional expense, however, finds consumers in the Midwest yielding a return on investment of 5.5 years,[1] and a short 1.2 years for consumers in California.[2] These calculations may still not overcome resistance if the payback period does not match the home ownership time frame. With about 1 in 6 Americans moving homes each year, and the average tenure in a single home being 6 years, consumers often assume that returns must be close to immediate (Hansen, 1993; Lautz, 2008). Otherwise, they see no hope of recovering their investment in the resale value of the home. And if they turnover a home too quickly, those expected payback periods can be unrealistically low. One study in Florida showed that consumer willingness to pay was strongly correlated to capital cost recovery, with an average 25% decline for each 2-year increase (Grosskopf & Kibert, 2006). This example can be broadened to include entire buildings, where the life cycle cost of the building is not taken into account when value engineering eliminates green building features from construction costs yet raises the building's operational costs (Chalifoux, 2006).

Furthermore, by investing capital in upgrades that are hard to see (extra insulation, tighter windows, energy-efficient water heaters), the comparative and psychological payback of tangible items like a new Jacuzzi, kitchen renovation, or new addition become more salient. Green building issues around indoor air quality become even more problematic on this front. A new wool carpet is notably more expensive than a carpet made from chemical feedstocks. Though a wool carpet will lower the concentrations of toxic pollutants in the air, it looks no different to the layman's eye and the benefit is incalculable. Companies will similarly eschew energy-efficient upgrades with short payback periods in favor of more visible makeovers in lobbies and other public spaces (Elgin, 2007)

Egocentrism. Substantial empirical work shows that people make self-serving, or egocentric, judgments of what is fair (Babcock, Loewenstein, Issacharoff, & Camerer, 1995; Bazerman & Neale, 1992; Messick & Sentis, 1983; Thompson & Loewenstein, 1992). People do not want to make unfair decisions, but instead have very different views of what a fair decision would be (Diekmann, Samuels, Ross, & Bazerman, 1997). This leads to decisions that at the individual level may seem fair but in the aggregate are contrary to a sustainably built environment. For example, a couple deciding to build or purchase a home in a respectable suburb thinks generously of a yard for their children and contributing to a community. But with each person making that decision, urban sprawl consumes natural land and increases carbon dioxide production through car dependence. These homeowners have been shown to subsequently reject expanding mass transit to maintain the exclusivity of their suburban lifestyle and support subsidies for private transportation—furthering environmental degradation (Kahn, 2006, p. 110).

Positive illusions. Related to egocentrism, positive illusions refer to the tendency of people to see themselves, their future, and the world in a better condition than it is or will be (Kramer, 1994; Taylor, 1989). Bazerman, Gillespie, and Moore (1999) argued that most companies see their products as creating more societal benefit, and less environmental harm, than reality would support. For example, many companies tout the carbon reduction benefits of their products with some, like BASF, even claiming carbon neutrality for their company's footprint due to the products they sell. But the metrics used are selective and self-serving toward a positive illusion. A consumer may purchase a hybrid vehicle to display his environmental responsibility but create large amounts of carbon emissions by flying thousands of miles per year. In one town, a bar that professes environmental and customer health responsibilities by using only organic ingredients for their site-brewed beer and liquors also allows its building to regularly fill with tobacco smoke—a known carcinogen.

Public opinion polls on environmentally responsible behavior often face weaknesses in responses due to positive illusions. People want to project an aspiration of their virtue rather than a reality of their lifestyle. Consumers may hold to a self-image of being environmentally responsible, whereas their behavior does not match that projection. For example, despite growing interest and support for environmental issues in the United States between 2005 and 2007, aluminum can recycling rates have declined from well over 60% to 50% in same time period (Hoffman, 2006).

Wade-Benzoni, Li, Thompson, and Bazerman (2007) argued that people can more easily maintain positive images of themselves on general, ambiguous issues than on specific, observable behaviors. This results from general items providing more cognitive room for self-enhancement in comparison to the specific items for which people have direct evidence of their behavior on a regular basis. In addition, Wade-Benzoni et al. found that people were much more likely to deny harming the environment than to claim that they were helping the environment—despite that the only difference was the way in which the information was presented. These results imply that most people do not do more for the environment because they see themselves as environmentally benign.

For example, in a study by RKS National (2007; $n = 834$), respondents were asked

> If 0 means your household "could do a lot more to conserve energy" and 10 means your household is "trying very hard to conserve energy" by insulating your home, purchasing high efficiency appliances, and setting the thermostat higher in the summer and lower in the winter, what number best describes the level of conservation activity in your household?

Results showed the majority of people felt that they were doing enough to help the environment with respect to energy use: 64% reported with an 8, 9, or 10 rating *doing all I can*; 20% reported with a 5, 6, 7, doing *some amount*, and 16% reported with a 0, 1, 2, 3, or 4 *could do a lot more*. Yet the relatively low amount of green building taking place, the expanding amount of sprawl, and the increasing size of homes all point to a consuming public that is actually moving in the opposite direction of environmental sustainability.

Presumed associations. People are prone to mistakenly assess the likelihood of two events occurring together or being correlated. As a result of experience based on inappropriate connections, we often create simplifying associations that lead to inaccurate and inefficient judgments. In general, this is due to the fact that people recall "frequent events more easily than infrequent events, and recall likely events more easily than unlikely events" (Bazerman, 2002, p. 18). At the most basic level, many people continue to associate green building with early and more vivid connections to hippie culture. They often recall cheese wedge house forms created during the 1970s energy crisis, or communes of the same period, and create the unsubstantiated assumption that all green buildings involve unconventional aesthetics, alternative lifestyles (such as communal living, now called cohousing) and nontraditional building materials (such as straw bale and rammed earth). For many, the simple term green building is associated with the environmental movement, which many with conservative leanings associate negatively with liberal.

Presumed associations can play themselves out on a more practical level as well. Neuman (2006) reported some customers in the New York apartment market often worry that, "A building that promoted itself as an environmental paragon might give short shrift to basic functional considerations, like water pressure." Others presume an association between green buildings and smaller space, lower comfort, or unappealing aesthetics. Such presumed associations led Whirlpool to consider removing the Energy Star label from their washers in the 1990s while still retaining the official Energy Star qualification and higher efficiency of less water and energy use. Internal market investigations showed that consumers associated high efficiency with poor performance thinking that less water meant less cleaning (Hoffman, 2006, p. 123).

Mythical fixed-pie. In conflicts or disputes between economic and environmental interests, negotiators commonly fail to find mutually beneficial solutions because of the assumption that their interests directly oppose each other (Bazerman, 1983). This is exacerbated when the other side is viewed as the enemy, which is common in environmental contexts. "What is good for the other side must be bad for us" is an unfortunate assumption in environmental disputes. Bazerman (1983) labeled this assumption the "mythical fixed-pie" because although the parties believe that the pie of disputed resources is fixed, in reality the disputants face a flexible pie that can be expanded if the parties find ways to integrate their interests. Thus though finding trade-offs can be quite easy when negotiators look for them, they are often missed because of the assumption that parties' interests are perfectly opposed.

In this way, many people see economic competitiveness and environmental protection as mutually exclusive and opposed. Others (e.g., Friedman, 2007) have argued that this is a false dichotomy, that the interests of the economy and U.S. competitiveness are tightly bound in issues related to energy efficiency, particularly in the building sector. The persistence of the mythical fixed-pie, however, leads decision makers to overestimate the true costs of green building under the assumption that, if the building is green, it must cost more. A survey by the World Business Council on Sustainable Development (WBCSD) found that people commonly overestimate the cost premium of green building to be between 11% and 28% more than a normal building, with an average overestimation of 17% (WBCSD, 2007). As stated at the opening of this article, actual premiums are generally less than 7% and can approach 0%. Another study by McGraw Hill and the National Association of Home Builders (NAHB) found that 64% of potential home purchasers cited the high costs of green building as an important obstacle, whereas 90% of actual green home buyers cited "operational cost savings" as an important motivation for purchasing one and 73% cited "potential higher home resale value" (McGraw Hill Construction, 2007).

Environmental literacy. One final consideration that exacerbates the biases just described is the relative lack of literacy with regard to environmental issues. Each year, the National Environmental Education and Training Foundation (NEEF) in collaboration with Roper

Starch Worldwide conducts a National Report Card on Environmental Knowledge, Attitudes and Behaviors. And each year, the report card finds a persistent pattern of environmental ignorance among the entire public. Its 2005 report noted that

> At a time when Americans are confronted with increasingly challenging environmental choices, we learn that our citizenry is by and large both uninformed and misinformed. . . . 45 million Americans think the ocean is a source of fresh water; 120 million think spray cans still have CFCs in them even though CFCs were banned in 1978; another 120 million people think disposable diapers are the leading problem with landfills when they actually represent about 1% of the problem; and 130 million believe that hydropower is America's top energy source, when it accounts for just 10% of the total. It is also why very few people understand the leading causes of air and water pollution or how they should be addressed. (Coyle, 2005, pp. ii, v)

Kempton, Boster, and Hartley (1995, p. 74) found that people regularly underestimate the effects of small global temperature changes. To the people surveyed, a global average temperature change of 3°F to 9°F wasn't much at all, whereas climatologists project significant global disruption as low as a 2°F change. This lack of literacy makes the link between energy conservation and climate change more difficult for people to understand and creates a reduced sense of urgency or motivation for addressing environmental issues, much less to develop green building practices.

Organizational Level Perspectives

Although resistance to green construction is influenced by the individual level biases just discussed, it is also affected by the organizations in which individuals reside. Organizations become filters through which the external world is viewed and information is developed, interpreted, disseminated, and acted on (March, 1981). As with individual biases, this filtering process alters rational expectations and perspectives. Information available to individuals regarding the viability of green building options becomes a reflection of subjective organizational goals, routines, and culture as much as objective facts (Allison, 1971).

Organizational culture shapes individual consciousness, imposing routines that reflect socially approved, purposive action (Jackall, 1988). It guides the perception and behavior of all organizational members as it develops over an organization's history and is formed around critical incidents and organizational responses (Schein, 1992). Schein (1992) defines culture as

> a pattern of shared basic assumptions that the group learned as it solved its problems of external adaptation and internal integration that has worked well enough to be valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems. (p. 12)

Within this definition lie elements of (a) internal structure and interaction, (b) language and terminology, (c) rewards, and (d) organizational inertia, all of which guide individual thought and behavior. Barriers to green construction can be found in each of these areas.

As with the earlier elaboration of individuals involved in the building process, it is worth considering the diversity of organizations that influence a building project. The owner, for example, may be a university that will own the building forever, an individual who has never built before, a development company that has many projects it owns for a very short time, or a government entity that is responsible to the taxpayers' financial influence, and so on. Likewise, a building project team can comprise an ephemeral collection of owner, architect, contractor, engineers, and so on, or it can comprise individuals all working for the same development organization. This diversity illustrates the fragmented nature of the construction industry, showing that both the problems and solutions will inevitably be multifaceted.

Structure. The structure of an organization defines its boundaries, rules of interaction, and division of responsibilities. It determines the patterns of regulated decision flows (Nelson & Winter, 1982) through which information is passed from one organizational unit to another. These decision flows are not always efficient and tend to distort organizational priorities. As such, they can create communication breakdowns that are often at the center of generating environmentally destructive behavior (Lovins, 1997). The organizational structure can reduce optimal decision making similar to the problem of the mythical fixed-pie in individual decision making. Competing interests can shield the organization from potential economic benefits. This can occur within a single organization or among the constellation of organizations that compose the building team.

Design and construction of a building create a unique form of temporary organization. The typically ephemeral team includes owners, architects, contractors, consultants, and engineers. Bechky (2006) noted that "[temporary] organizations are organized around enduring, structured role systems whose nuances are negotiated in situ" (p. 4). Within this short time frame, a temporary culture becomes set, one which includes the roles, decision rules, and power balances among each of the constituents. This jockeying for power and influence within the team can be a critical factor, leading to decisions that are suboptimal for the overall sustainability of the project, especially as new green technologies and practices are introduced into projects. A plumbing contractor may oppose waterless urinals because they lose the contract to install copper plumbing lines that would be associated with a standard urinal. On the other hand, an architect may oppose green designs if such considerations lie outside his or her area of expertise or clash with aesthetic aspirations for the project. When green is *added* to a standard construction project, the roles and relationships among the various actors become rearranged into a form that is outside the standard operating procedure. This will invite resistance.

The structural relationships within the construction team have traditionally been linear, where the owner hires the architect to produce a design, which is handed to the engineer, sent out for bid, and built by the contractor according to the drawings. This over the transom process does not promote the tight integration of systems (water, heating, power) needed in high performance buildings. In a green building, the team must engage early and in a more integrated and collaborative fashion that requires resources and a new form of thinking. During a design charrette in a green construction process, all team members are challenged to discuss and adjust design parameters that are traditionally made in isolation. The team can learn, for example, that an interior paint color influences the reflectivity of the walls, requiring electrical engineers to select appropriate lighting. Mechanical engineers then select adequate cooling for the number and type of specified light fixtures, and contractors typically must order the exact equipment specified on the drawings despite cost and availability constraints. Inefficiencies in the final building can then be a direct result of a linear method of design and construction. The integrative approach to green construction represents a new process that promises tight integration of systems. However, the new approach also threatens to disrupt the "enduring, structured role systems" mentioned above, with the potential to create either a leadership vacuum or organizational mayhem. These possibilities lead many actors to resist the integrative design process.

Within individual organizations, organizational breakdowns can also occur. For example, the federal government and many universities buy or build their buildings with one budget and operate them with another. Any up-front cost increases may be rejected despite their potential for minimizing operating expenses and yielding short payback horizons (Lovins & Lovins, 1997) because the department that reaps a long-term benefit is not the one that paid the up-front cost. Similarly, one of the finest universities in the United States began an extensive effort to improve its infrastructure. Because of a limited budget, many decisions were made that failed to use the most long-term cost-efficient products. The result was a very high implicit discount rate being used to guide the construction decisions. An observant economist at the university pointed out that these discount rates would have been thrilling to the investment office of the university and suggested that they reallocate investments from stocks and bonds into the high efficiency construction processes. This result can be Pareto efficient from all perspectives of the university (Bazerman, Wade-Benzoni, & Benzoni, 1997).

Language and terminology. Beyond structural limitations to free flows of information, the language, rhetoric, objectives, and external constituencies of the various participants can also limit opportunities for green construction (Shelton & Shopley, 1995). Many of the new technologies involved in green building comprise entirely new terms. Double-skin façade, green roofs, photovoltaics, and bioswales all describe particular technologies and concepts that are fairly opaque to the uninitiated and can therefore cause resistance to adoption. A change in terminology can also signal a change in the perceived value of a resource (e.g., *wetlands* instead of *swamp*; Kempton, 1995, p. 6).

Furthermore, language in green building challenges conventional terminology. For example, the standard terminology for identifying incandescent light bulbs is based on wattage. We buy a 75 watt or 100 watt bulb, using energy consumption as proxy for the amount of light produced. However, this terminology is completely inappropriate for new lighting technologies such as compact fluorescent lighting (CFL) and light emitting diodes (LED). The wattage of these light sources is significantly lower than incandescents and output must be measured in lumens—a term unfamiliar to most consumers—which describes actual light output. Furthermore, these new technologies require an understanding of light quality as well, something that consumers rarely considered with incandescents. This consideration involves the color rendering index (CRI) and color temperature of a light source (measured in degrees Kelvin).

Green building also adds a new set of technical terminology regarding material selection. For example, waste pipes and insulation involve complicated chemical names such as acrylonitrile butadiene styrene (ABS), polyvinyl chloride (PVC), polyisocyanurate, and polystyrene. Although a standard construction project may be unconcerned with such distinctions as long as the material provides the necessary design characteristics, these distinctions take on great significance in green construction due to the environmental and health effects of each. However, this terminology requires a new knowledge base that many within the construction process do not possess. Importantly, this terminology can then become shibboleths, quickly identifying participants who aren't yet embedded in the green construction industry (Kempton et al., 1995).

Rewards. Rewards take the form of both formal and informal signals, at times being ambiguous or conflicting. Many companies have hoped to foster improved environmental performance through the establishment of highly publicized environmental programs endorsed by top-level speeches, only to watch them fail because they did not align the reward structures properly. In one example, a refinery manager quipped that his responsibilities were to protect the environment, maintain safety, and increase process yield. But when it came time for promotions, they "skipped the first two and went straight to the third" (Hoffman, 2001). As a result, reward systems and not corporate policy guided his behavior.

In the temporary organization of the construction team, rewards vary based on participant roles and contractual agreements. As environmentally responsive building increases the site specificity of the design solution, the contributions of each member shift. This specificity can require more time than a design for a generic building, but architects and contractors are often pressured to provide these additional services for the same consulting and construction price. Because traditional payment arrangements for the design team are based on construction cost or square footage, there is no reward (and perhaps a disincentive) to spend more time making a building smaller or more energy efficient.

Similar to organizational breakdowns, misaligned reward systems have been a major obstacle to participation in the EPA's Green Lights Program, a voluntary program that encourages businesses to install energy-efficient lighting. These lighting upgrades help prevent unnecessary pollution through the more efficient use of electricity while saving the organization money on electric bills (U.S. EPA, 1997). Yet established reward and incentives systems within organizations often mask the opportunities available through change. Energy costs are often paid out of administrative overhead, whereas installation and maintenance of lighting systems are billed to the physical plant. Neither department will trigger the need to change due to departmental responsibilities and rewards. The administrative department responsible for overhead may be unaware of the technical aspects and financial opportunities of lighting upgrades. Physical plant departments would be required to commit time and resources to the program while receiving none of the financial and publicity rewards accruing to the administration. Mixed with the allocation of resources is prestige that accompanies large physical plant budgets. Though physical plant staff may ensure additional work with a lighting replacement program, longer lamp life reduces future labor needs.

One final example of reward systems that thwart attention from green practices is the way an organization selects projects. John Carberry, Director of Environmental Technology at DuPont, stated that capital investments to reduce energy consumption often meet resistance because they are not viewed as sexy or compelling. If the pool of resources is dwindling, the certainty of returns in energy-efficiency projects can actually become a liability. Carberry explained, "The problem is that when we pitch 20 percent return with 99 percent certainty on energy, we lose to a marketing group pitch of 40 percent return with 60 percent certainty" (Hoffman, 2006, p. 95).

Organizational inertia. Stability in patterns of thought and action are perpetuated by the interests of internal actors and the pressures and demands from external actors (Brint & Karabel, 1991; DiMaggio, 1991). In short, organizations do not like to change, the people within them generally prefer the certainty of the routines and structures that have been historically in place and resist the process of changing them. The source of this inertia can fall into several categories.

Habitual routine can perpetuate behaviors that participants may know are damaging the environment but involve some form of short-term costs. Although inefficient or inconsistent with long-term objectives, these established routines can become familiar, comfortable, and reliably predictable. Clark (1985) noted that the development of cultural inertia and the continued reliance on its artifacts and beliefs can be a chief obstacle to organizational innovation. Habitual routines can take form in taken for granted design practices or construction methods. Typically, the costs of learning new forms of green design are not billable to the client. With fixed resources, team members must invest in this learning process but at the cost of some other activity critical to his or her job function.

Fear of the unknown can drive both organizational inertia and the continued reliance on basic underlying assumptions. Both external and internal change can upset organizational constituents, particularly when the outcome or consequences of change cannot be predicted. Most building projects are already unique endeavors with unknown risks unlike product manufacturing, which includes iterative prototypes. Adding nontraditional technology increases the risk of unintended consequences. After the first installation of a composting toilet produces flies in a building, whose job responsibilities become expanded, and how likely is that person to embrace new technologies in the future? Contractors warrant their work and must be sure that continual repair of new technologies does not fall on their shoulders unless they are adequately compensated for the time and effort. This situation provides both resistance and increased construction costs to cover future uncertainties.

Resource limitations can restrict the ability of an organization to overcome sunk costs in plants, equipment, and personnel. These can become psychological roadblocks that bias managers away from certain actions or responses to demands for change. Short-term demands may deny an owner, developer, architect, or engineer any opportunity to consider long term gains, biasing decision makers to overdiscount the future. For example, many building owners resist performing an energy audit and developing a new lighting installation program despite an average 28% internal rate of return reported by Green Lights partners (U.S. EPA, 1997). In many cases, these owners have invested heavily in their facility lighting and have irrationally committed themselves to the existing system. This concern becomes even more acute when considering changes in materials such as sustainable flooring, non-PVC products, and low VOC paints because the benefits provide healthier and more productive workers, which is difficult to quantify.

Time is as precious a resource as money. Green technologies and products require more information processing and an understanding of the technology's life cycle. Developing an expertise in green building is often overshadowed by more pressing concerns of managing existing workloads. Understanding new terminology and performance parameters of LED lighting, for example, can take hours of research and compilation that steals time from either other projects or personal time. New technologies must be identified, integrated, and tested as the technologies themselves evolve and improve. Howard-Grenville (2006) described the Moore's Law time pressure in microchip manufacturing, which demands process innovation every 2 years. This pressure thwarts full investigation and solving of environmental issues in production. Similarly, owners looking to sell or lease a building quickly pressure the design and construction teams to use the known processes and technologies to prevent delay or lead-time extensions.

Finally, green design and construction can *threaten established power bases*. Culture establishes a structure of power, which will bias the perspectives of those for whom the existing system benefits. Any attempts to restructure will likely undermine these power structures and invite organizational confusion, interdepartmental rivalry, or organizational resistance (Mintzberg, 1979). Self-preservation may override concerns for environmental or economic objectives in managerial decision making. In the article's opening vignette, university architects for the law school resisted demands presented by a set of knowledgeable students and perceived a challenge to their authority. As the enduring, structured role systems are reconfigured with integrated design, the question must be asked, "Who gains and who loses?" Does the addition of this new skill set fall to the architect, contractor, engineer, or a new green or integrative design consultant (Chamberlain, 2008)? Existing power—expressed through financial reward, decision-making power, or even risk and liability—will inevitably change with the introduction of new green practices. Both problem definition and solution selection depend on differential power in subcultures (Howard-Grenville, 2006). Existing participants in building design and construction may resist these changes to defend their professional jurisdiction.

In summary, organizational arrangements and cultural beliefs tend to perpetuate the status quo in the building field and limit the adoption of green building practices. Individuals within organizations deviate from rational and self-interested behavior through individual biases discussed in the first section coupled with the organizational level biases discussed in this section. Overcoming these obstacles will require alterations in organizations beyond new mission statements and financial analyses. These alterations must integrate environmental concerns into the existing routines by which buildings are constructed, recasting them in ways that are mutually beneficial to the objectives of individuals, organizations, and the sustainability of the ecosystem on which they depend.

Institutional Level Perspectives

Moving to our third and final level of analysis, we consider how barriers to green construction can be perpetuated by rules, norms, and beliefs at the institutional level. We begin with the recognition that organizations exist within an open system (Katz & Kahn, 1978) where their activities are inescapably influenced by the external environment through both technical constraints such as raw materials, labor, and energy and more importantly, social influences, embodied in rules, laws, industry standards, best established practices, and conventional wisdom—what are collectively referred to as institutions (Scott & Meyer, 1992). Institutions present cultural and contextual constraints that alter individual and organizational perspectives. They give collective meaning and value to particular events and activities (Meyer, Boli, & Thomas, 1987).

To analyze the influence of institutions on the adoption of green construction practices, this section will review their implications in three categories: (a) regulative, (b) normative, and (c) cognitive (Scott, 1995). Regulative (or legal) aspects of institutions are based on coercive or legal sanctions to which organizations accede for reasons of expedience. They most commonly take the form of regulations but may also include protests, lawsuits, and political lobbying. Normative (or social) aspects of institutions are morally or ethically grounded, and organizations will comply with them based on social obligation. These take the form of rules of thumb, standard operating procedures, occupational standards, educational curricula, and membership requirements, which emerge through universities, professional training institutions, and trade associations. Cognitive (or cultural) aspects of institutions are built on a socially supported and conceptually correct bases of legitimacy. The taken for granted beliefs, which the organizations will abide by without conscious thought, reside at this level (Zucker, 1983).

Regulative institutions. Although legal standards regulating behaviors that affect the environment have historically produced positive results (Easterbrook, 1995), the benefits of standards should not blind us to the costs nor deter us from diagnosing problems that may arise from a regulatory approach to environmental problems (Tenbrunsel, Wade-Benzoni, Messick, & Bazerman, 1997). Tenbrunsel et al. (1997) proposed that legal standards became an independent force taking on a life of their own, leaving rationality, innovativeness, and societal interests behind. They suggest that suboptimal outcomes can result from an adherence to standards and that this suboptimality is due to a tendency for standards to direct attention toward the law itself and away from the purpose behind the law. As a result, decision makers may be led to select suboptimal choices that adhere to a standard over optimal choices that violate the standard.

For example, the tax code works at cross purposes with the objectives of green development and encourages sprawl. Currently, both estate and property taxes are calculated based on the land's "highest and best use value," which usually means development. These taxes serve as an incentive for landowners to (a) develop the land, (b) harvest the land's resources to pay the taxes, or (c) sell off parcels of the land to pay the taxes, thereby promoting development (Hoffman, Bazerman, & Yaffee, 1997). Similarly, energy codes for new construction in many states have not been updated in years, and efforts to do so become protracted political battles that result in compromise that is suboptimal for promoting green design. Prescriptive *R*-values for wall materials in codes penalize high thermal mass walls that contribute to passive solar design. Moreover, many regional building codes do not allow the installation of composting toilet systems or graywater systems.

Once standards are written, decision makers within organizations often become constrained by rigid rules that preclude the search for creative solutions to complex environmental problems. At times, these standards can explicitly restrict environmentally optimal solutions. Tenbrunsel et al. (1997) suggested a motivational explanation for the "misdirected attention" effect, namely, that standard-based systems can change the incentive systems for individuals and promote self-interested behavior that interferes with overarching societal interests. Suboptimal outcomes are the product of both unintentional and intentional actions on the part of the decision maker. Unintentional actions may result from individuals "just following the rules," creativity not being rewarded, a "use it or lose it" rationale, intrinsic motivation being replaced with extrinsic motivation, or a "no law against it" mentality. Intentional actions include trying to "beat the system."

Some have suggested that the LEED system itself has suffered from this misdirected attention effect. Critics charge that LEED has become a point chasing game with participants losing sight of the objectives of green building—to minimize the impact on the environment—and instead focus on gaming the point accumulation process to achieve the most points with the least effort (Schendler & Udall, 2005). Others highlight that LEED is unresponsive to local conditions that require innovation and adaptation to the one size fits all format that presently dominates. For example, water conserving or solar energy strategies under LEED yield the same points[3] whether these strategies are implemented in Detroit or in Phoenix even though the water and solar availability in the two locations are vastly different.

Normative institutions. Institutional barriers also become established at the normative level within educational curricula, business rules of thumb, standard operating procedures, and accepted economic and business indicators. The building industry is highly structured with standards set by a wide variety of organizations including the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE), The American National Standards Institute (ANSI), The Portland Cement Association, the National Council of Architecture Registration Boards (NCARB), and many others. These organizations specify detailed parameters by which products must be made, buildings must be built, and future professionals must be trained. Integration of green concerns into these standard setting bodies moves very slowly.

For example, U.S. cement producers can reduce CO_2 emissions per ton of cement manufactured through the addition of mineral components such as fly ash or slag (waste products from coal burning and steel production). Meanwhile, the two organizations with the most significant impact on the cement industry—the American Society of Testing and Materials (ASTM) and the American Association of State Highway Transportation Officials (AASHTO)—have resisted efforts to change standards to allow increased percentages of these materials (Hoffman, 2006). Furthermore, structural engineers feel secure specifying concrete meeting the same ASTM standard they've safely used for years even if the new (and less familiar) fly ash or slag standard meets the same performance criteria.

Market incentive structures can also shield opportunities to correct environmental destruction. For example, TV and VCR makers produce equipment that remain in stand-by mode while not being used, so that consumers can turn them on with remote controls and encounter no warm-up delays. They have no incentive to cut the amount of power this mode uses because they do not pay the energy bill. Consumers, likewise, have little incentive to be concerned because the incremental costs are so low. Yet, in the aggregate, the United States uses about 1,000 megawatts continuously to maintain this feature—about the output of one Chernobyl-sized power station (Lovins & Lovins, 1997). Without properly aligned incentives, this energy waste will continue. Other market incentive structures yield similarly inefficient action. Architects and engineers are often compensated on a percentage of the cost of construction, essentially penalizing them for eliminating costly equipment. This has led the U.S. to misallocate about US$1 trillion to air conditioning equipment that would not have been necessary had the building been optimally designed to produce the same or better comfort at lower cost (Houghton et al., 1992; Lovins & Lovins, 1997). Landlords have no incentive to improve the energy efficiency of their apartments because renters pay for energy costs (Lovins, 1997; van Bueren & Priemus, 2002). Domestic standards on energy pricing allow regulated utilities to increase profits based on increased energy use and, conversely, penalize them for reducing energy consumption. As a result, shareholders and customers have opposite goals with wastefully increased energy use as the end result (Lovins & Lovins, 1997). Banks are often unwilling to provide financing for certain environmentally sound technologies fearing that they are unproven or believing that they are unnecessary. For example, lenders will not generally provide financing for photovoltaic systems if more traditional (and certain) grid-connected power is available. And finally, building inspectors resist innovations integral to the environmentally sound home because they are both new and unproven.

Cognitive institutions. Finally, institutions at the cognitive level form common perceptions of behavior that are taken for granted and remain unquestioned (Zucker, 1983). Much like the individual biases in the first section, these are pervasive, powerful, and resistant to change, often influencing individual and organizational behavior without participants' knowledge. The construction of the built environment in all its multiple forms—homes, subdivisions, cities, office buildings, and so on—is supported by cognitive institutions regarding both form and purpose. Unlike the computer industry, construction is a practice so old that it is not surprising to find innumerable unquestioned biases and taken-for-granted assumptions.

For example, notions of a home in the United States include a lawn (even if the home is situated in the desert) often grown with imported, nonnative species; a garage (even if the home is situated near an urban center or public transportation); within developments (even if urban living is more convenient and communal); and an ever-increasing size. The average single-family home in the United States increased from 983 sq. ft. in 1950, to 2,492 sq. ft. in 2006 (more than 2.5 times larger), whereas the average number of occupants per household decreased from 3.37 to 2.62 over the same period (a 22% reduction). This equates to significantly more material and energy used per person. In 1950, 9% of housing units were occupied by only one person. By 2005, that number increased to 27%. As a result, total residential CO_2 emissions increased by 26% from 1990 to 2006, whereas the population increased only 20% (Center for Sustainable Systems, 2005). Alternatives to single-family homes (like cohousing), alternatives to car ownership (like car sharing), alternatives to a lawn (like xeriscaping) are considered outside the norms of our cognitive institutions and create resistance because they lack cultural legitimacy.

In cities, it is taken for granted that they are designed primarily for cars, not people. Roads dominate the structural layout of the city and parking spaces populate every facet. Walkability, although a real design consideration in some cities like New York (created long before cars), is far from the norm in places like Houston or Dallas. In the traditional American city, people drive from their home to work and rely on the car for most of their life and lifestyle. Pundits laud new construction of green buildings (often in suburbs or after tearing down existing buildings) when renovation and downtown infill would be much more environmentally sustainable. The evolving conception of a green building includes Bank of America's new glass-clad green office tower at One Bryant Park in New York City, whereas a centuries-old, continuously used, stone and concrete building in Rome may be a more accurate representation of sustainability.

Institutional structures permeate our beliefs and thoughts. Coupled with individual and organizational biases, they form systemic aspects of our society's resistance to the adoption of green building practices. Integrating a concern for environmental protection will require adjustments in the overall system in which buildings are designed and built. Changing our practices will require addressing some underlying beliefs about why and how we build.

Overcoming Barriers to Green Construction

As stated earlier, people rely on a variety of simplifying social and psychological strategies to understand and function within modern society. Whether they are cognitive heuristics, cultural norms, or institutional beliefs, they are necessary tools to help us make sense of the world around us and make decisions given the information we are receiving. We could not function without them; we would become crippled at the analysis necessary to interpret our surroundings. However, at times, these simplifying strategies become inconsistent with evolving concerns or issues. Although formerly useful shortcuts, these strategies lead to suboptimal decision making (Bazerman, 1998; Kahneman & Tversky, 1973, 1979). In green construction, we must think differently about both the form and purpose of our buildings and the process by which they are built. Changing our thinking requires that we challenge social and physiological routines that we have developed and that have worked well in the past. Such change is not easy and will invite resistance.

Consider the consumer who is able to navigate the hundreds of familiar offerings in the cereal aisle of a standard grocery store. The first time that consumer faces hundreds of *un*familiar offerings in the cereal aisle of an organic food store he becomes crippled at the analysis now necessary in what was previously an automatic decision. These decisions become even more challenging when new choice parameters are introduced. Which is better for the environment—linoleum or cork flooring, concrete or steel structure, paper or plastic packaging? Research has shown that consumers are happiest when they have a limited amount of information on which to make decisions (Tugend, 2008). Calling it the "blissful ignorance effect," Mishra, Shiv, and Nayakankuppam, (2008) found that people who have more ambiguous information about a product expect to be happier with what they have bought than those who have more specific details. Consumers can be thought of as cognitive misers, (Fiske, 1992; Fiske & Taylor, 1991) preferring to do as little thinking and research as possible when making purchasing decisions. One study shows that though people stated a preference for green electricity, their actual selections were based on the least effort by accepting the default offering, whether it was green or gray (nonrenewable) (Pichert & Katsikopoulos, 2008). In short, we recognize that people are boundedly rational.

In explaining this fact, we present three levels of analysis of social and psychological barriers for organizational purposes, but they are very much interconnected. Individual decisions influence organizational behaviors; individual and organizational behaviors affect what becomes institutionalized, and vice versa. Though many social barriers can be changed through new structures and education, individual bias, underlying beliefs of organizational culture and cognitive institutions constitute more difficult barriers. In the face of this recognition, strategies for overcoming the social and psychological obstacles to the adoption of green buildings can fall into two categories: (a) treat these obstacles as an entrepreneurial opportunity or (b) treat them as an obstacle to be overcome. In both cases, strategies cannot be targeted strictly at the individual, organization, or institutional levels. Successful strategies create change across all three levels of analysis.

Social and Psychological Barriers as Entrepreneurial Opportunity

After being charged with the task of reducing energy use in Swiss Re's buildings, Andreas Schlaepfer, Head of Internal Environmental Management found that substantial reductions from building-related conservation efforts were quite easy: "If you've never focused on energy efficiency before, achieving a 30 percent reduction is simple" (Hoffman, 2006, p. 81). If this is true, then there are economic opportunities in energy efficiency. Some firms will be more likely to capitalize on these opportunities than others. For example, Moon and deLeon (2007) showed that proximity with final consumers (such as consumer goods producers) makes the firm more likely to participate in the EPA's Green Lights program. The authors suggest that program participation influences consumer perception of the firm as responsive to green consumers. These firms are "more visible to consumers and susceptible to green publicity because their product sales are largely associated with the publicity" (Moon & deLeon, 2007, p. 484). Berkhout and Rowlands (2007) noted that firms that publish environmental metrics and espouse environmentalism as an organizational value are more likely to purchase green electricity—a public good that is only more expensive, but otherwise equivalent for the firm.

These are examples of consumer product firms that see building green as creating a comparative advantage, even suggesting product-price premiums because of firm reputation. And if social and psychological barriers are inhibiting other organizations from realizing such advantage, entrepreneurs will step forward to fill the void. New consulting firms provide an audit and installation of energy conservation technologies asking only to be paid as a percentage of energy savings.

Other companies are seeking to serve the changing demands of a growing green building sector. Fireman's Fund offers Certified Green Building Replacement and Green Upgrade coverages. Recognizing that insuring this segment requires specialized knowledge of new building systems, the policies will assure that damaged buildings are replaced with green products in minor cases, or LEED Certified buildings in major cases. Fireman's Fund offers a "discount due to lower risk factors" of green buildings (Fireman's Fund, 2006).

Some banks and other lenders are beginning to offer energy efficient or green loans. The EPA's Energy Star energy-efficient mortgage program, for example, helps home buyers purchase an Energy Star qualified new home by allowing larger loans, reducing closing costs, and/or offsetting the cost of a home energy rating. The program lists 49 private lenders who offer homebuyer assistance, home energy rating assistance, special financing, and other assistance to applicants. Recognizing that a homeowner with lower utility bills can afford a higher mortgage payment, others such as Federal Housing Authority (FHA), Department of Veteran's Affairs (VA), Fannie Mae, and Freddie Mac have offered similar instruments. The New Resource Bank in San Francisco now offers a 1/8th% discount on loans to green leadership projects in the commercial or multiunit residential sectors. Furthermore, the bank will fund up to 80% loan-to-value (LTV) for projects that are designed and built to green leadership standards (rather than 75% for a typical construction loan).

Certification programs at both the national (e.g., LEED) and regional levels (e.g., Built Green in Colorado) fill a market void by making green labeling clear, transparent, and objectively defined. These programs have been central in overcoming the social resistance to green construction.

Social and Psychological Barriers as an Obstacle to Be Overcome

Overcoming the barriers described in this article is more challenging than capitalizing on them. Lewin's (1947) classic model of change considered three phases. First, in order for change to occur and last over time, an explicit *unfreezing* process needs to take place. The importance of this unfreezing concept is central to preparing people for change by challenging the barriers that inhibit change. The second consists of the *change* itself. The individual—unfrozen from past behaviors—is willing to consider alternatives. The resisting forces are likely to remain, and the individual is likely to continually reassess the desirability of change. Even after change takes place, it is still easy for the individual, organization, or institution to revert back to past practices. Old practices still exist and can be easily used. New procedures are foreign, so they must be reinforced and *refrozen*. We see unfreezing as a key to challenging the host of mindless behaviors that we engage in on a regular basis (Langer, 1989; Louis & Sutton, 1991). Once unfrozen, people, organizations, and institutions are likely to be more susceptible to behavioral change and the adoption of green building practices. In this section, we will discuss seven strategies for unfreezing, namely, framing, targeting the right demographic, education, structural and incentive change, indemnifying risk, green building standard improvements, and tax reform.

Framing. Adoption of new practices is easier if presented as a positive and attractive option rather than as an issue of sacrifice (Howard-Grenville & Hoffman, 2003). Green buildings must be viewed as desirable and sexy (Yudelson, 2006). Lamia (2006) stressed that you should sell green building on appeals to conscience first and follow with the data about the benefits for the environment. These connections could be environmental economic, spiritual, health-based, or technological. Some people are turned off by the phrase green building and are much more engaged by terms like smart building or high performance building. One way to overcome the tendency for people to overdiscount the future is to frame green building around an appeal to protect the health and welfare of their children or grand children. Wade-Benzoni (1996) argued that overdiscounting occurred because the harms created were often far off in the future, uncertain, and affected people with little affinity to oneself. But a person's offspring shortens that distance and makes the benefits more present than might otherwise be possible.

Going further, New Urbanism is framed as an opportunity for homeowners to live in a more balanced fashion, connecting them to the local amenities they need without the use of the automobile. Similarly, in her *Not So Big House* book series, Sarah Susanka (2001, 2007) framed smaller houses as more desirable. Rather than spend money on many large rooms, a homeowner can make smaller spaces better as both a living and entertaining space. Green building advocates speaking to building clients highlight free wind, solar, or geothermal energy as an alternative to costly energy from the grid.

Framing can also move people beyond their fear of the unknown. A plumbing contractor may only see green building as lost copper piping work caused by the installation of waterless urinals. A wise advocate would point out to the same contractor how green building adds an entire second plumbing system when integrating graywater systems in a building.

Target demographic adopters. In gaining acceptance of new technologies, first movers must be identified. These are individuals who are more likely to take risks on green buildings.

Research shows that certain segments of society are more aligned with environmental values than others. (a) *Gender:* Women are generally more environmentally aware than men. (b) *Age:* Young people tend to be the most environmentally aware age group. The second most aware is the age group from 36 to 45. (c) *Education and Income:* Environmentally driven consumerism tends to increase with both education and income levels. The more affluent and more educated are more likely to select products based on environmental attributes. (d) *Urban versus Rural:* People in urban centers tend to use environmental considerations in their buying decisions more than people in rural areas. Environmental consumerism tends to be highest on the east and west coasts, and lowest in the south. California, Washington, New York, and Pennsylvania contained more than a third of the LEED Certified buildings in the United States in 2006 (Grosskopf & Kibert, 2006; USGBC, 2007). (e) *Political Affiliation:* Surveys in 2007 showed that 90% of Democrats believe that action is required on climate change compared to only 60% of Republicans (Broder & Connelly, 2007). In 2006, a similar survey found 98% of Democrats and only 23% of Republicans believing in climate change (*National Journal*, 2006).

These demographic characteristics also show up in purchasers of green buildings. The McGraw Hill *Green Homeowner* survey (2007, p. 4) described the profile of the green homebuyer as follows:

- Seventy-one percent are female, outranking men significantly.
- Two thirds have an income over US$50,000.
- Average age is 45. However, the age distribution is widespread indicating that there is wide variation in the age of the green homeowner.
- More green homeowners are married and highly educated.

Marketing professionals dub this demographic group LOHAS, signifying Lifestyles Of Health And Sustainability. Combining LOHAS with those concerned mainly with health issues (and less with environmental issues), the group represents 51% of green building users (Natural Marketing Institute, 2007).

In addition to homeowners, an unlikely BlueGreen Alliance is forming yoking trade union interests with environmental issues (Senier, Mayer, Brown, & Morello-Frosch, 2007; Silverman, 2006). With much of the construction industry still tied to trade unions, positive environmental influence can happen through both management goals and union representation (Pollin & Wicks-Lim, 2008).

Education. Members of the building industry are highly influenced by the norms and rules inculcated in their early training experience. Therefore, one way to overcome social barriers is to integrate environmental literacy within existing training systems of the building sector. This includes architecture and engineering curricula in the university, apprenticeships in the building trades, and even business education of owners and managers (Building Technology Incorporated, 2005). We can see a growing number of green construction courses emerging around the country in programs related to architecture, engineering, management, urban planning, and environmental affairs. Unfortunately, many remain siloed in disciplinary departments and do not foster the cross-disciplinary collaboration necessary for this issue. The environmental impact of buildings cannot be seen as simply another factor to be added to the standard operating practice. But rather than viewing existing models as obsolete, to be discarded and replaced by a new set of ideas and theories, they must instead be adapted, bringing them closer to a realistic understanding of the behavior of the firm. This adaptation will manifest itself in a holistic approach to understanding the relationship between the built environment and the natural environment (Egri & Pinfield, 1996). Arizona State University recently created a new School of Sustainability, where traditional theory-based research gives way to problem-based research. This approach integrates theories from multiple disciplinary sources to both understand environmental problems and teach students to design viable solutions. Another university offers a green construction course that is aimed toward—and attracts—business, natural resource, architecture, and engineering students. Students work in multidisciplinary teams and report surprising success in learning the basic assumptions and cultures of other disciplines.

Education can also take place with current professionals. On the corporate level, suppliers of energy-efficient and green building products must be ready to educate their consumers in the reasons for adoption. This is an added challenge beyond traditional marketing efforts (Ottman, 2004). Green consumers read labels, desire information, and want control in their environments. For example, rather than remove the Energy Star label from its appliances when they found that consumers equated lower energy with lower performance, Whirlpool chose to work with retailers (like Lowe's and Sears) and with consumers to address misconceptions about the efficacy of energy-efficient appliances and to educate people about their benefits, including the average 5-year payback period. Whirlpool also worked with Proctor & Gamble to ensure that detergents suitable for their more efficient machines were available and to educate consumers on their use. Finally, the company was pivotal in convincing *Consumer Reports* magazine to include energy efficiency in its appliance rankings (Hoffman, 2006).

On the personal level, homeowners need to understand the connections between their lifestyle choices and the energy use that results. They can then begin to see their monthly energy bill as something they can manage rather than merely accept. To accomplish this task, companies are developing energy monitors that track energy use and provide real time displays of its volume. One such product—the Wattson by DIY Kyoto—is a stylish box that displays the amount of electricity being used in either watts or currency (dollars or pounds sterling) and glows brighter as more energy is being used. Another product—the Eco-dashboard by GE—presents trend data for electricity, water, and gas or oil use, which allows users to track their resource use over time. Both devices serve to sensitize the homeowner about the connections between energy use and cost thereby allowing for self-imposed behavior change.

Numerous universities challenge their communities to energy, water, and waste challenges. Many schools (NYU, Harvard Business School, University of Wisconsin) challenge students in dormitories to beat each other on energy savings. Ohio University includes water savings in the dormitory competitions. RecycleMania is a 10-week competition that includes over 400 colleges and universities, calculating the percentage of recycled to total waste per capita, and include internal per-department and per-building challenges (RecycleMania, 2008).

Structural and incentive change. Constrvuction teams must alter their structural arrangements and processes to adopt a more integrated approach for handling green building issues. Collaboration that moves beyond the over the transom linear process by which buildings have traditionally been built begins with design charrettes that include all engaged parties—owners, contractors, engineers, architects, and sometimes even the local community. Furthermore, contractual relationships must be changed to accommodate innovation. True integrated design includes a contract whereby the owner, architect, and contractor agree to share all risk and reward according to a preset agreement. In these new contracts, there is an agreement to not sue, and there are no provisions for dispute resolution. The parties are truly in it together.

To align landlord incentives for energy efficiency, new policies could mandate that building owners advertise not only the rental costs, but also the energy and water costs. This would allow consumers (particularly college students) more complete information for making renting decisions. This transparency would then stimulate landlords to lower their building's energy costs by making improvements.

Indemnify the risk. Green building requires new technologies, and subcontractors' wariness is shown either through higher pricing or outright refusal to perform the work. These actors justifiably fear that equipment failure will fall on their shoulders. Contractors, engineers, or architects who are familiar with the technologies can reduce this fear by offering some form of indemnification for certain conditions of technology failure (Building Technology Incorporated, 2005). Much like the federal government used a liability cap for nuclear power plant producers to reduce the risks of building them, subcontractors could be provided liability limits should the technology (and not the installation) fail.

Green building standards must evolve. As the field of green building advances, the standards that promote it must also advance. Dominant standards must promote green building as a holistic and accurate process toward alleviating the impact of buildings on the environment. Standards should give flexibility for the construction team to focus on the right green building technologies by developing site-specific and client-specific alternative strategies that achieve equal or greater environmental benefits at lower costs. For example, when LEED for New Construction first appeared, developers became frustrated with the process whereby a building could not be certified until construction was completed. Standard operating procedures of developers include preleasing buildings before they are built, thereby prohibiting the LEED credential in marketing materials. The USGBC responded to this call and created a customized Core and Shell product, which permitted this building type to advertise a LEED rating based on drawings and specifications. Fit out of the building could then be done tenant-by-tenant with a LEED Commercial Interiors product.

Standards should also focus on the secondary effects of such regulatory programs. Policies should begin to move away from a focus on direct, marginal, and incremental mechanisms for bringing about individual change and should start to stimulate both direct and indirect pressures for industry-wide change. Specifically, attempts must be made to change core business networks, such as financial markets, inspectors, insurance, and consumer demands. The involvement of these external interests facilitates an alteration of the entire social system and goes to the source of organizational action. This can both trigger new types of organizational responses and eliminate competing institutional pressures from multiple constituencies (Hoffman, 2001).

Tax reform. Finally, new government policies can be created to stimulate demand for green buildings and components, and old policies that resist adoption can be dismantled. In terms of new policies, the Energy Policy Act of 2005 offers consumers and businesses federal tax credits beginning for purchasing fuel-efficient hybrid-electric vehicles and energy-efficient appliances and products. Although these credits expired in 2007, it demonstrates the role of the federal government in stimulating demand for energy conversation technologies. Many states also have tax incentives, particularly around the area of renewable energy installation and net metering.

In terms of changing existing policies, some are pushing for estate tax reform that would allow heirs to defer or avoid applicable estate taxes on inherited land in return for managing their land in ways that benefited the environment (and reduce sprawl). Estate tax reform could also allow the estate (or heirs) to do what the deceased could have done before death: to allow the estate (or heirs) to make tax-deductible gifts of land or an interest in land to a qualified organization. With property tax reform, credits for the cost of land management programs that benefit endangered species on private lands could create financial incentives to undertake such practices.

Conclusion

Many believe that the goal of green building is to become obsolete. In other words, green building should become so much of a standard practice that LEED and other rating systems are no longer necessary—green building will have become mainstream. As we have pointed out here, this will require more than just a development of green technologies and lower costs for these technologies. We insist that by identifying social and psychological barriers, we can influence changes in social structures, rewards, and incentives. Incremental changes like those proposed here can bring green building practices into the mainstream of business such that they are taken into consideration within every decision in the building process. This transformation cannot happen without structural changes in our organizational systems, concurrent with adjustments to society's unconscious value system (Giddens, 1979).

This article highlighted a number of ways in which our psychological and social structures bias our view on green construction and create barriers to its full adoption, often without our knowledge. It is useful to notice that we rarely highlight evil entities. Rather, seemingly benign individuals, organizations, and institutions create harm without realizing their impact. We attempt to clarify the mechanisms behind their negative influence.

We also demonstrated how existing cognitions, procedures, and routines have surprising consequence. Finally, we have attempted to use this knowledge to outline the changes that are needed behaviorally to create meaningful change. As we provided merely an overview, we encourage further research in this issue-based area. We believe that the organizational behavior intellectual community can offer valuable insights when engaging with the fields of architecture, engineering, public policy, urban planning, and others in this research domain.

Notes

1. Based on an average family of four using 392 cycles/year, a discount rate of 5% and constant water prices of US$12/1,000 gallons and constant energy prices of US$0.084/kwhr in 2007. Clearly this payback period will shorten with increasing resource prices.

2. Based on an average family of four using 392 cycles/year, a discount rate of 5% and constant water prices of US$44/1,000 gallons and constant energy prices of US$0.144/kwhr in 2007.

3. At the time of the writing of this article, the LEED system was undergoing revisions that may address this concern.

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