Creative Construction: The Capacity for Environmental Innovation in Real Estate Development Firms

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Abstract: Despite advances in understanding green building performance in property markets, the green development process is poorly understood. Green development adopters change firm structure in three ways to make adoption of environmental innovation easier: they take greater control of the projects, they seek more patient capital (either by identifying a patient investor or by providing more equity), and they create longer term relationships with design and construction talent. Through a web-based survey, and follow-up interviews with two survey respondents, the paper examines three hypotheses: (1) green development adopters and their investors take a longer-term stake in projects; (2) price competition is less important than competition over quality, and (3) the developer takes greater control, especially in the provision of design and construction services.

Two recent studies test how green real estate projects perform in comparison to conventional projects in specific markets (Eicholtz, Kok, and Quigley, 2008; Miller, Spivey, and Florance, 2008). These studies are the first to use large samples of buildings to test how green projects lease, sell, and operate as compared to conventional buildings of the same type in the same location. This breakthrough in understanding is critical. The green development movement was built around case study data that provided possible but incomplete predictions about the performance of green buildings in real estate markets (Bradshaw, 2006). Investors and developers were supposed to change their development practices without having a strong idea about what such a change meant for their bottom lines. These new studies give us the first statistically significant glimpse of what green development may mean for investors and owners, and the story is a good one. While they differ in the magnitude of their results, both studies find that green building developers have created extraordinary value. This increase in value for the space users can be captured in part by the building owner through increased lease rates, increased selling prices, and decreased vacancy. This is the first good statistical evidence of what green building advocates have believed for over a decade: that green buildings outperform conventional buildings in the market place, especially in the commercial and industrial realm (Wilson, et al. 1998; Kats, et al. 2003). A wide body of research has shown that retail customers spend more in buildings with daylight and fresh air (Wilson, et al. 1998; Kats, et al. 2003; Kats, 2007), that employees experience fewer sick days and have higher productivity in buildings with good indoor air quality (Lucuik, Trusty, Larsson,
and Charette, 2005; Kats, 2007), and that employee retention is stronger when workers feel like their employer reflects their values (Senge and Carstedt, 2001; Kats 2007). But prior to the availability of the data used in this research, no one had tested the performance of large numbers of green buildings (which are more likely to have these particular characteristics) versus large numbers of conventional ones in specific markets.

While it is wonderful to see these advances in knowledge, it is not clear that the results will speed up the diffusion of green building among other development firms, because these studies do not focus on the process by which development decisions are made. This study starts to fill that gap, focusing exclusively on the development process. In building a hypothesis, the study looks at three things: (1) the conventional relationship between the owner, design professional, and contractor; (2) the social optimum of green development; and (3) whether larger firms are better positioned to adopt green development approaches. The hypothesis is tested through a survey of green development adopters (Appendix A), and a follow-up discussion with two respondents.

### The OPC Model

The conventional and most common organizational model for development teams, the “OPC model,” addresses the complexity of the development process, the need for efficient contracting, and the capacity concerns of small firms that are embarking on complex projects. The OPC model focuses on the most critical relationships in any development team, those between the owner, the design professional, and the contractor. The traditional method for organizing this relationship is shown in Exhibit 1 (Poage, 1990).
There are several critical components to this OPC structure. First, the owner has a direct relationship with the design professional and the contractor, but the design professional administers the owners’ agreement with the contractor. In addition, many of the other professionals needed to carry out a project are sub-consultants to the design professional or the contractor. The design professional manages all engineering, landscape architecture, etc. In turn the contractor is responsible for all relationships with materials, materialmen/suppliers, and subcontractors. In this conception of the development process, the owner is responsible for the maintenance of the relationship with the design professional, and all other parties who are directly involved with the creation of plans for the building or the construction of the building are managed as an outgrowth of the agreement with the design professional. This is an excellent model for a small firm with limited capacity taking on a complex task. It puts significant emphasis on the skills and capacity of the design professional and to a lesser extent the contractor. It also makes the assembly and disassembly of a team fairly straightforward. The owner needs to contract with a design professional and a contractor, and the majority of the other critical relationships are taken care of by those two members of the team. This convenience does not come without a price. The owner is giving up significant control, but he is also adding expertise, capacity, and networks to the resources already available to his firm.

Another interesting implication of the conventional OPC structure is the suggestion of linearity in the development of a project. In this structure, the design professional fully designs the building, and then the owner and design professional competitively bid the project in order to retain the services of a contractor. This framework works best when the building can be fully conceived through the design process, and there is no time constraint pushing the developer to overlap the design process and the construction process (Gordon, 1994).

The conventional OPC structure also has some significant drawbacks. First, the process puts enormous emphasis on the knowledge of the design professional (Gordon, 1994). Not only must the design professional be a skilled designer, but the individual must also be knowledgeable about building materials, construction cost, constructability, and the availability of certain types of labor. Such expertise is unlikely to be held in a single person or single firm, particularly as projects become larger and more complex. Second, this process provides little flexibility for future changes. This lack of downstream flexibility puts a premium on understanding all future contingencies, something that is hard for any development project (due to its complexity) but particularly hard for innovative ones. Once the design documents are complete, construction bids are received, and a construction contract is awarded, it is generally expensive to make even small changes in the plans. However, other forms of this OPC relationship provide for more flexibility later in the process. Third, the conventional OPC relationship creates an adversarial quality in the relationship between the design professional and contractor (Gordon, 1994; Schlosser, 2010). The design professional in effect becomes the policeman of the contractor, working on behalf of the owner to ensure that no corners are cut, that quality is high, and that delivery of the building matches the intentions as laid out in the plans and specifications. While such
oversight is critical in a successful project, this structure can also mean that the contractor has little to no incentive to protect the interests of the owner or otherwise improve the project. These agency issues become particularly important in innovative efforts when the long-term impact of decisions may not be well understood ex ante, and an owner will want as much expertise from all team members as possible and for those people to protect the owner’s interests in ways that cannot be easily contracted.

Because of these limitations, the author believes that green developers will steer away from conventional OPC relationships, seeking out alternative contracting models (design-build, integrated design team, construction management, etc.) instead. These alternative models will place more importance on relationships, particularly the owner, design professional, and contractor relationships that are central to the development process. It’s not clear whether these relationships will follow a model where the same people are used on multiple projects but not formally contracted between projects or a more formal or truly vertically integrated approach. Eccles (1981) argues that based on the structure of development firms, inter-project relationships are hard and may actually be poor strategy except in certain circumstances. However, the requirements of green development create circumstances that would push towards greater vertical integration, as a way of minimizing risk related to new products, materials, or methods. As a result, it is also likely that green developers will take more control of their projects, in order to manage the increased complexity directly.

The Social Optimum of Green Development

As an organizing principle for the understanding of green development, the idea of the social optimum gets right to the heart of the issue in the adoption of green development, namely that there are externalities that our markets do not price in the real estate development process. This approach claims some measure of market failure (i.e., the market is not delivering the real estate solution we would collectively prefer). Buildings create pollution, the pieces and parts of buildings generate toxins that are released into the world when they are manufactured, shipped, installed, and used in buildings. Building location impacts air quality, public health, access to open space, and the ecology of a particular place. But these issues and many more are not part of the standard decision process in development, in fact thinking about them is often seen as extraneous to the central mission of a developer—to get the project built. Environmental innovation in development provides a framework for measuring the scale of these issues, but it also runs headlong into a debate, represented by the opinions of the people interviewed in this study. Andy Schlosser describes the inability to pay a penny more for anything that is not a public or private requirement. Ann Goggin says that tenants will not pay a penny more for green. David Zucker constantly works with his design, construction, and marketing teams to determine what part of green they can sell and for how much (Zucker, 2010). And Jim Lutz argues that Liberty Property Trust’s buildings are more valuable and their tenants pay more because of their overall project quality, of which greening is a component (Lutz, 2010).
This idea of the social optimum allows us to make sense of these competing comments, and to put them in a researchable framework. On the Liberty and Zocalo side of the ledger, they have learned how to extract some of the social value of green building through their projects, and to earn a premium for it. With Goggin and Schlosser, a building is a commodity product, and the drivers for space have little to do with a building’s impact on ecology. They are defining a market optimum. The real power in this framework is if we can start to define what the market is willing to absorb, and what is optimal for all forms of life, then we can also begin to define a gap between the market and social optima. This gap also points at the need to identify new types of financial resources in order to get greener projects development. These resources can come in the form of a regulatory imperative (i.e., we force everyone to meet certain green targets), or they can come in the form of more patient capital that sees opportunity in having a better building for the long term. Either way, some changed form of investment is likely to be part of greener buildings that get developed.

Does Size Matter for Green Development?

On one hand, development firms have historically been small, and there are significant productivity and operational advantages to small size as predicted by the inside contracting models of Williamson (1976) and Eccles (1981). On the other hand, large firms, particularly firms with access to public capital markets like REITs, have significant operational advantages related to their ability to scale and smooth out the lumpy nature of development cash flows. Beyond this, there is also a significant trend towards the increasing complexity of development projects and development technology, and large firms are better able to retain expertise and manage such complexity. But decades of development industry history, reflected in what the author has called the first principle of organizational structure for real estate development firms [i.e., development firms are small, on average (Bradshaw, 2010)], points in exactly the opposite direction, and there is significant evidence in other research that small firms have more aggressively adopted green building practices because they are nimble enough to do so. This conflict begs the question of which result is dominant, particularly if you accept the premise that the real estate development industry is in a state of flux, and it will ultimately settle into a new equilibrium. Will that equilibrium look like what Phil Thompson observed in Germany, with a number of small, nimble firms who are leading edge practitioners in green development (Thompson, 2010), or will it be a world where large developers with a national reach will dominate the marketplace?

Large developers have significant financial advantages that allow them to take on projects in multiple markets. This ability can also help diversify across geography, which may further enhance the financial advantages that large firms enjoy over smaller firms. However, relationships and reputation, which are the lifeblood of successful developers, are localized phenomena. One cannot translate reputation from one location to another easily, and this may be even harder with relationships. Both relationships and reputation come from a long history of delivering
successful projects on the ground in certain locations. Ultimately, size will
dominate in this field, with large developers having an advantage over their smaller
counterparts. However, smaller developers that do adopt green practices will
frequently have some patient source of capital that allows them to meet the early
cash demands of a green project.

**Three Hypotheses for Green Development**

These discussions lead to three related hypotheses for the green development
process:

1. Large developers with easier access to capital are likely to have pushed
   further than small, local developers in the adoption of environmental
   innovation. The small firms who have been leading adopters are likely to
   utilize alternative financing arrangements with at least some investors that
   give the developer or the investor a longer-term stake in the project.

2. Early adopters of environmental innovation have moved away from price
   competition in the selection of development team members, in favor
   of long-term relationships, inter-project learning, and negotiated bid
   arrangements where, especially the providers of design and construction
   services, are familiar with the requirements and the past projects of the
   developer.

3. The developer exerts greater control throughout the entire development
   process, especially in the provision of design and construction services.

These three hypotheses will be tested through this study.

**A Survey of Green Developers**

A large survey of develop firms was conducted to test these hypotheses. The
survey results provide a broad-based understanding of how frequently firms
engaged in green development also engaged in these practices.

**Respondents**

A list of 1,085 firms involved in the real estate development industry was created
largely using two websites: (1) 536 firms came from the U.S. Green Building
Council’s (USGBC) member list for groups classified as real estate service
providers (they have no category for developers) and (2) 493 firms came from the
participants in the Builder’s Challenge program of the U.S. Department of Energy
(DOE). The additional 56 firms were organizations involved in real estate
development. In addition, friends and family (12 people) of the author involved
in the industry filled out the survey during a pilot phase, which helped him to
revise the survey instrument. The responses are included in the results. This
sample of survey respondents is not representative of developers as a whole, but
rather green developers. This limits the sample in some critical ways (i.e., as to
why firms chose not to develop green buildings), but also creates an interesting perspective for interpretation, especially as it relates to the hypotheses.

Every potential respondent firm was sent a personal email beginning on February 14, 2010\(^1\) asking for their participation in the survey. This email had a read receipt from his Massachusetts Institute of Technology (MIT) webmail account, and confirmed that 290 of these emails were read by the intended recipient, and 47 survey responses were received from this group. Another 63 email requests were deleted without ever having been opened; 732 emails generated no read receipt response. Of these, 43 firms filled out the survey, so some significant portion of these emails got through to their intended recipient, but there is no way to know how many. At least ten days after receiving the initial request to complete the survey, a follow-up email was sent reminding people of the survey and asking again for their participation.\(^2\) This message also came from his MIT webmail account, and included instructions for checking his identity to ensure the author was an MIT student.\(^3\) The author closed the survey on March 20. All results were compiled on SurveyMonkey, where the survey was designed and disseminated.

There were significant data problems with this list of potential respondents. First, neither lists consists purely of real estate developers. The USGBC list includes attorneys, real estate brokerage firms, material suppliers, consultants, and other professionals, though it is predominantly developers. The DOE website includes policymakers, building science consultants, and contractors who do not traditionally act in an owner-developer role. Second, the USGBC list includes many foreign firms, which needed to be excluded from the study. Third, the real estate industry has struggled during the financial downturn, and 59 firms no longer had working email addresses. In addition, some of the firms where a no read receipt response was elicited may have gone out of business or terminated the position of the contact. Fourth, these lists are heavily slanted towards firms who are interested in green building and energy efficiency. These shortcomings were addressed in the following ways:

1. Groups who were not development firms were removed from the list by looking at the company name, and by clearly stating in the survey invitation and instrument that it was intended for people who were active real estate developers. In 102 unique responses, there was not a single respondent who does not seem to undertake some development activity.
2. Firms were removed from the list if they had an international phone number. No responses were from firms who did all of their work overseas, though several respondent firms were international with a US headquarters, and were kept in the list.
3. Firms were removed if the email was undeliverable. In two cases, respondents had started new firms under a different name than what was in the list but retained the same email address. Those responses are included in the results.
4. There was a non-adopter of green building practices in the follow-up interviews, as well as a firm who had a negative experience with green development.
Once the survey criteria were met, there were 955 potential respondent firms. There were 102 unique responses from this group, 90 not including the pilot responses, for a total response rate of around 10% (9.4% not including pilot, 10.6% including pilot). Exhibit 2 shows the geographic distribution of the respondent firms.

Characteristics of the Respondent Firms

The median respondent firm was a small, privately-held, male-led firm, where the principal had a graduate degree and was based in the South. Almost every respondent firm had developed at least one project they self-labeled as green, and they were equally likely to be involved in single-family residential, office, multi-family residential, and mixed-use development with significant though somewhat smaller representation from retail and industrial development firms. Many firms did not specialize in one of these areas, but developed several types of projects.

The top executives in the respondent firms were overwhelmingly male (82%) and between the ages of 40 and 60 with some significant representation from people under 40. Exhibit 3 shows that regardless of the metric, the respondent firms tended to be small. Even more intriguing is the fact that there are relatively few medium-sized respondents. In the case of annual revenue, commercial and industrial square footage developed annually, number of employees, and firm capitalization, the overwhelming majority of respondents were in the first two categories combined, and the third highest concentration of respondents was in the last category, which is meant to capture the biggest firms. This result may imply a story about the advantages of scale in development firms, which has been predicted in the work of Egan (1998) and Pauly (2005).

Exhibit 4 shows that nearly half of the top level executives in the respondent firms had a graduate degree or had pursued some graduate school. Over 80% had an executive with at least a bachelor’s degree. This implies that people engaged in green development activities are a very well educated group.

Exhibit 5 shows that experience in the green development industry was fairly evenly spread between people with less than five years of experience and those with over 30. Most executives had between 10 and 30 years of experience, but it
### Exhibit 3 | Size of Respondent Firms

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Size</th>
<th>Total Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Revenue</td>
<td>$1 million</td>
<td>39%</td>
</tr>
<tr>
<td></td>
<td>$1 to $5 million</td>
<td>31%</td>
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<tr>
<td></td>
<td>$5 to $10 million</td>
<td>10%</td>
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<tr>
<td></td>
<td>$10 to $20 million</td>
<td>3%</td>
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<tr>
<td></td>
<td>Over $20 million</td>
<td>16%</td>
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<tr>
<td></td>
<td></td>
<td>87</td>
</tr>
<tr>
<td>Residential Units Annually</td>
<td>Under 100 units</td>
<td>77%</td>
</tr>
<tr>
<td></td>
<td>100–250 units</td>
<td>14%</td>
</tr>
<tr>
<td></td>
<td>250–500 units</td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td>500–1000 units</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>Over 1000 units</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>74</td>
</tr>
<tr>
<td>Commercial/Industrial SF annually</td>
<td>Less than 100k sf</td>
<td>71%</td>
</tr>
<tr>
<td></td>
<td>100k–250k sf</td>
<td>14%</td>
</tr>
<tr>
<td></td>
<td>250k–500k sf</td>
<td>3%</td>
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<tr>
<td></td>
<td>500k–1M sf</td>
<td>2%</td>
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<tr>
<td></td>
<td>Over 1M sf</td>
<td>10%</td>
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<tr>
<td></td>
<td></td>
<td>63</td>
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<tr>
<td>Number of Employees</td>
<td>&lt; 10</td>
<td>57%</td>
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<td></td>
<td>10 to 25</td>
<td>19%</td>
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<td></td>
<td>25 to 50</td>
<td>4%</td>
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<tr>
<td></td>
<td>50 to 100</td>
<td>7%</td>
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<tr>
<td></td>
<td>Over 100</td>
<td>13%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>90</td>
</tr>
<tr>
<td>Firm Capitalization</td>
<td>&lt; $5M</td>
<td>71%</td>
</tr>
<tr>
<td></td>
<td>$5–$10M</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>$10–$20M</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>$20–$50M</td>
<td>6%</td>
</tr>
<tr>
<td></td>
<td>Over $50M</td>
<td>10%</td>
</tr>
<tr>
<td>Your Firm</td>
<td></td>
<td>78</td>
</tr>
</tbody>
</table>
was more likely that an executive had less than 10 years of experience than it was that they had more than 30.

The most prevalent background for executives was in construction, followed by finance and design (Exhibit 6). Interestingly enough, the lead executive was most likely to have a construction background, where every other executive was slightly more likely to have a background in finance. In addition, many people had experience not included in the listing of options, as indicated by the high number of people marking other in response to this question. There was significant previous experience in real estate sales, brokerage, and property management (9 write-in comments), engineering of some type (8 write-ins), and law (5 write-ins).

Respondent firms tended to do more than develop projects, offering a broad range of additional services including project management/construction management, property management, construction/general contracting, design, and real estate sales and leasing. In the overwhelming majority of cases (83%), the respondent firms were privately held with five or fewer people having control. The next most prevalent ownership structure was as a non-profit (nearly 10%), then private with
more than five people having control (5%), and finally firms that are publicly traded (4%).

Respondent firms also had a very high level of interest in green building and significant experience in that area. This is to be expected based on the source of respondent firms. Over 70% of respondents had completed a green project, nearly 90% had a green project in construction, and over 94% planned to have one in construction in the next two years, leaving just under 6% of the study sample with no experience in developing green and no plans to start a green development. As noted previously, respondents could self-label as green, so no determination has been made to determine how green a given project was.

Testing the Hypotheses

This analysis provides an interesting window into the mindset of firms who adopt green practices, and their motivations and challenges in doing this. In addition, it builds some basic knowledge about the makeup and constitution of real estate development firms who have decided to carry out a green project: who runs them, what they do, how big they are, where they are located, and what types of projects they take on. This information is very helpful in building a general picture of the green real estate development industry. But the purpose of this study is to take that information one step further. The three hypotheses imply that real estate development firms are poorly organized for the adoption of green development practices, and that leading edge adopters of green development will adjust those standard practices in predictable ways. The survey responses show mixed results, but generally support the hypotheses.

Finding Investors for the Long-term

Looking at the whole survey sample shows that the two most common sources of project financing for survey respondents were conventional debt and developer equity. This is not a surprising result, and it is not clear that this rate would be any more or less for developers of conventional projects. Beyond this, there were
fairly low rates of participation by non-traditional sources of equity that are likely to be very patient sources of capital such as direct public investment, program-related investments from foundations, and the use of specialized financing tools like the New Markets Tax Credit or Low-Income Housing Tax Credit. In addition, only two of 94 firms that responded to another question said they had created their own equity or financing practice, independent of their development work.

Even more instructive than the tabulation of responses to this question were the comments that people made in response to it. Sixteen firms made comments in their answer to this question, and fifteen of which referred to patient investments that made the project in question possible. These comments ranged from people saying that the project had been built for cash or all equity provided by the developer or ultimate owner, to comments about public investments or guarantees that made the difference in the deal. Of these comments, eight referred to private investments of developers, ultimate owners distinct from the developer, or outside investors. Six referred to public investments of some type that pushed the project forward, and one referred to small grants and donations provided to the project. This level of response indicates that there may be more investment of this type going into projects than the initial survey captured. More research is needed on this point.

These responses become even more interesting when cross-tabulated by ownership structure, including private closely held (control rests with less than five people), private widely held (control rests with more than five people), public, and non-profit/community development corporations. For private firms, both closely held and widely held, conventional debt (74%) is by far the most frequent source of capital for projects, with developer equity (45%) and investor equity (27%) as a distant second and third. Other sources are rarely present (13% or less of the time) in the capital stacks of these projects. These are all fairly conventional investment sources, and especially with conventional debt and investor equity as there are likely to be time pressures around performance that will be placed on a project, notwithstanding its green approach. However, the projects carried out by publicly traded companies were built entirely with developer equity or with the backing of the company balance sheet. No external time pressure would be applied to these projects, except any discipline which would come from the public capital markets. This is a significant advantage for publicly-traded companies wanting to do green projects. The other interesting finding was the frequency that public and philanthropic financing drives the work of non-profit developers, coupled with conventional debt. Even though the use of PRI, public financing, tax credit equity, and other sources that help groups make more patient investments in projects was low in the general sample, these sources were the dominant source of financing for non-profit projects, followed closely by conventional debt. This implies that non-profit organizations may also be well positioned (at least with respect to access to patient capital) to adopt environmental innovations.

In summary, patient sources of capital are not frequently used when looking at the full sample, but when that sample is parsed into various types of owners, more interesting results are observable. The survey bears out the hypothesis that publicly-traded firms have more flexibility around greening because they finance...
development with their balance sheet and their own liquidity. This gives them opportunities to try things that privately-held developers might not be able to do because of requirements of their conventional debt and equity investment sources. Non-profit developers do utilize patient equity sources that are outside the firm in large percentages, including tax credit equity (43%), public financing (86%), program-related investments (14%), and philanthropic grants (14%). This indicates that they are another group that has some financing advantages around greening.\textsuperscript{5} In addition, only a small number of firms have developed a robust financing or equity arm that might invest in projects developed by another firm. Follow-up interviews with participating firms provide some insight into how their financing is structured. This investigation lends support to the idea that publicly-traded firms have significant financial flexibility due to their access to public capital markets, and privately-held firms struggle with access to capital, often seeing it as their most significant obstacle to scale.

\textit{Reduced Price Competition in Design and Construction}

There is significant evidence that vertical integration of design and/or construction services is happening at the firm level with groups adopting green development. The work of Poage (1990), Gordon (1994), and Geltner and Miller (2001) suggests that the most common way of organizing a development team is through a conventional OPC relationship. The findings of the current work support this observation. However, of the 94 firms, predominantly firms engaged in green development, who answered questions about their services, 47 included construction, 52 included project management and construction management, and 42 included design and design/build. Twenty-five firms engaged in two of these services, and 20 engaged in all three, meaning that 76 of the 94 respondents to this question had vertically integrated design or construction services on some level. Only one in four firms who have not completed a green project provide construction/general contracting in-house, one in four provide design/design-build, and two in four provide construction management. In addition, one company performs construction/general contracting, construction management, and design/design-build, meaning that three out of the four firms provide no design or construction services in house, and two of the four provide no construction management/project management services either. Even though this sample of non-adopters is very small and non-representative, it agrees with the earlier result that green developers are more interested in longer-term relationships with design and construction expertise, often going so far that they have internalized those services into their shop.

At the project level, there is also significant evidence that owner/developers are utilizing alternative forms of project delivery that create a more team-based approach between the architect and the contractor (Exhibit 7). Of the 65 respondents to a question about the contract form used for project delivery, 28 said they used a conventional contract (think conventional OPC or the GMP-FP from Gordon), the single largest number. However, 18 owners self-performed construction work, twelve used multiple primes, another eleven used a design-build process, and two used a construction manager. All of these forms endeavor
to create less adversarial relationships between the development team members, especially design-build and the use of a construction manager. In addition, they all imply a more involved owner than would be conventional for a development project. Self-performed construction and the use of a multiple-primes contract generally indicates an owner who has vertically integrated around the delivery of some construction and/or design services. Taken together, 28 owners say they used a conventional contract form while 43 used a form that gives the owner more control over the process and engenders a less adversarial approach to the OPC relationship than is conventional.

Twenty-two of the thirty comments in this section indicated long-term relationships among the OPC partners, relationships that would not be utilized under a conventional OPC structure. In many cases, respondents said that they used traditional contract forms but the designer or the builder worked for or was wholly owned by the developer. In others, the respondent described the increased level of control that the developer/owner exerted in every phase of design and construction. There were also some comments about the owner, designer, and contractor having worked as a team before, or at least starting to work as a team on each project very early in the conceptual design phase.

In summary, there was much evidence that price competition around procuring design and construction services was reduced in favor of quality competition and instilling inter-project learning among team members. In the extreme cases, this resulted in actual vertical integration, which occurred in a surprisingly high number of cases, in fact it seemed to be the dominant form of organization among
respondents. The in-depth interviews further support this story, including an analysis of a firm, Zocalo, who self-performs construction services and has a captive design partner, as well as other firms who are examining how to choose partners based on the quality of service and not just the price.

**Increased Developer Control of the Process**

Most of the evidence for developer control comes out in the in-depth case studies of two firms. However, there are some findings from the web-based survey that provide some support for this hypothesis. First, there are the results from the previous section about the amount of vertical integration that is taking place in design and construction. If developers are finding that they need to aggressively incorporate design and construction services into their own shop, and/or enter into inter-project arrangements with design professionals and contractors, this is a strong indicator that they are taking more control of the process, and they are demanding certain outcomes from their development teams.

The survey results show that commissioning an energy model (75%), using an integrated design process (59%), and a post-occupancy evaluation of the building (51%) were done fairly frequently by survey respondents. These are changes that would imply greater developer involvement in the design process than typical in a conventional OPC structure. In the case of an energy model or post-occupancy evaluation, the fact that these studies are done show significant developer interest (they are willing to pay someone to do this) in the performance of the building before, during, and after its development. And the use of an integrated design process implies that a developer will also need to be more involved in steering the work of the team, since there will be more people.

The final sections of this study will investigate the survey findings in more detail through the analysis of two development firms who have been leading adopters of green practices. These firms are intended to highlight specific areas of interest for further investigation.

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**Liberty Property Trust**

**Liberty’s First Green Project**

Liberty Property Trust is the largest industrial real estate investment trust (REIT) in the United States and possibly the largest owner of LEED-certified real estate development projects in the world. They own seven million square feet of LEED-certified buildings representing $1.3 billion in investment. They became interested in green building in 2001, based on the interest of two of the firm’s leaders, Jim Lutz and John Gatusso.

Liberty’s first green project, the PP&L building, cost $58 million, roughly $230 per square foot. It was a 252,000-square foot, eight-story building, and it was almost all build to suit for PP&L. There was a small amount of retail space on the ground floor and one speculative floor. Liberty retained ownership of the entire
building for a number of years (Lutz could not recall the exact transfer date), and because they are a REIT, they were able to finance the project in house and place corporate debt on it when it was advantageous. The project was leased to PP&L and mostly used as offices.

In addition to being the first private, LEED-Gold certified building in Pennsylvania, it was also named an AIA top 10 green building of the year in 2003, it received a ULI Award of Excellence, and they had the building ENERGY STAR certified in 2005.

Finding the Right Partners

One of the main changes Liberty makes with contracts is to lessen the control of the architect. As Lutz says, “the standard AIA forms make the architect god. We are much too concerned with being long-term owners to be comfortable with that arrangement.” They make final decisions on design, pricing, change orders, etc. in consultation with the architect. In the actual contract, they replace “the architect decides” with “the owner decides in consultation with the architect.” Lutz says that this is not meant to be arrogant, but rather to signal that they are willing to spend more money on some things and want to keep that control. This also directly reflects the idea that green building adopters will take more control of the design process, and work to create a less adversarial relationship between the design professional and the contractor.

They also like having long-term relationships with design and construction partners, and have developed relationships with architects and contractors that they use over and over again. Lutz says that these long-term partners understand their requirements. “When I sit down with a contractor for the first time, I say, ‘I want to explain to you what I’m looking for in a general contractor.’ I’m completely okay if you say that it’s not for you. But, I don’t want a contractor who is bidding plans and specs. Don’t ever come to me in the middle of a job and say these doors don’t have any hinges in the plans and specs. If you are a quality contractor you know that doors need hinges. So don’t put errors in your price. I want a builder who knows how to build buildings of this type. I don’t want to hear later on that you had no foundations because page S1 was missing from your bid set. If you know page S1 is missing ask for it ahead of time and put the foundation in your price.” This discussion continues to underscore the idea that Liberty wants design and construction partners to compete on quality, not just price, and they need team members that will protect Liberty’s interests throughout a project. In addition, both points together underscore something about their approach to development that predated their interest in green building, but likely made them more open to that approach: their interest in being a long-term owner of a building. We see this patient investment strategy with the PP&L project in Allentown, and it is reflected in the way they approach their relationships with their contractors and design professionals. They want people doing the best work possible for them, and are willing to pay for that quality in order to have a better building over the long term.

“I’m asking you to take more responsibility. I’m also allowing you to come in and say the architect asked you to put this in and I don’t think you need it. I want
you to be part of a team. If you do this well, I’m more likely to use you again. I want you to protect me in all sorts of ways that I could never contract. You found things that are missing or unnecessary. I’m asking you for more, but because of that you also get more in terms of future jobs. But I need someone who likes doing that, someone who likes being part of a team. When I find people like that I’m more likely to use them over and over again. We have general contractors we have worked with for 30 years. There are going to be times where I’m going to do negotiated work because we have a deal that is moving too fast for a standard bid process. So I go to the guys I know we can trust, guys that we have worked with before. I tell them, if we win, you win. I don’t have to worry, because the builder knew this new job was kind of like the building he made for me before. He knows what it takes to build that building. He can give me a price on very sketchy plans and knows that I’ll work with him. If he comes to me and says, they are killing me on the design, we will work together on the design.”

Lutz believes that the people who work with them over the long term like that challenge. They like adding value to the project, and they generally do add value. There are also other contractors who argue about what is and is not in the plans. As far as Lutz is concerned, “It’s not on the plans” is not a good excuse for anything. He wants people to be more thorough. “Don’t get lazy, and you can get the benefit of working with us. We pay on time. We are not going to go out of business. You will get a check at the end of the day. If we work well together you can do work for us for decades.”

“Our contracts haven’t changed significantly over time other than we will reference requirements in the contract to do what is necessary to meet LEED requirements. So they know what is expected with documentation and with the way that they do certain things, like recycle construction and demolition waste on the job site. There are certain things that need to be taken into account. They have to be aware that this will be a LEED building, and that they need to be cooperative and responsive to do what is necessary to get points,” Lutz said.

**Liberty and the Green Building Hypotheses**

The Liberty Property Trust story provides strong support for the three hypotheses presented earlier. On the investment side, Liberty has a natural advantage over most developers through their structure as a REIT. Because of their access to the public capital markets, they can be their own long-term investor, and this attitude was reflected over and over again through the comments of Lutz. In addition, this approach of making long-term investments in green building reinforced the sort of long-term investments in better buildings that Liberty was already used to making. They made decisions on the basis of 5-, 10-, and 15-year holding patterns in particular markets with their buildings, and they are always working to enhance and protect their ability to get high value leases for their space. They see better energy performance, air quality, more access to light, better storm water maintenance, and other green building attributes as critical to protecting the long-term value in their assets.

With respect to design and construction firms, the Liberty story reinforces the idea that firms engaged in green development actively work to create long-term
relationships with designers and contractors, and that they structure the team to lessen the adversarial relationship between the two in order to get more of the expertise of both design professionals and contractors involved in the process. Liberty’s approach to doing this is somewhat different, but they have the construction and design expertise in house to manage it. In addition, Lutz clearly prioritizes quality over price in selecting team members. He wants people to be able and willing to protect his interests, and in exchange for doing that, he will give them work over a period of decades.

Liberty takes much more control of their projects than would be typical under standard contractual forms. Lutz mentioned specifically that they change their AIA contracts so that every place that it says “the architect decides” they write “the owner decides in consultation with the architect.” In addition, they have both the contractor and the architect report directly to Liberty, and final decisions about how to design and construct the building rest with the owner and (where possible) the tenant.

Zocalo Community Development

Zocalo’s First Green Project

Zocalo Community Development is a Denver-based developer of mixed-income, mixed-use communities. They have their own construction company and an exclusive relationship with an architect who is technically a third party. In addition, Zocalo also manages the properties that they develop. Their principal, David Zucker, founded Zocalo with a commitment to social equity. In 2005, they began to explore sustainability and green building due to a confluence of factors relating to both “people and process,” (Zucker 2010). Some of their team had some tangential experience with issues of sustainability, and they felt that it was not only a growing interest, but it fit with their principles of community-based development and mixed-income projects.

This first green project was a 62-unit condominium, of which two condos were commercial. It was a total of 160,000-square feet inclusive of the parking structure within the building. They had 1.2 parking spaces per unit, for a total of 74. Their average residential condo was about 1,150-square feet, and they had a $17.8 million total development cost. The building took 14 months to build.

They wanted to meet the LEED-New Construction guidelines, and they focused on energy conservation. At first, Zucker did not think they’d be able to achieve their 30% energy reduction target, but in the end they exceeded it. They got their LEED certification, and they “didn’t go broke doing it.”

Finding the Right Partners

For Zocalo, design, construction, and development are all in-house. The architect is legally a third party, but he does all his work for Zocalo, and they never use anyone else. The three partners (designer, contractor, and developer) work together
at a design-build firm. This gives them comfort with a development process where they are their own general contractor and architect. However, the way this design-build firm did business is a bit too loose for Zucker’s taste. They make things work in the design-build arrangement by being a little bit loose with the numbers. If they are able to save on one thing, they can shift it to another item that is running over budget. Their drawings don’t need to be tight. They don’t make money on drawings, but on the construction side. And the Zocalo team, Chris (licensed architect and general contractor), John Ganyon (architect of record), and Zucker feel that the design-build process cannot be an apology or an excuse to provide less detail in the plans.

Ganyon went to work for another firm, but he feels like an in-house partner, except for about one week on every project when they negotiate contracts. “We execute an A111 or a GC-form we use occasionally, and everything else is a handshake,” Zucker said. “This is not a relationship that is heavy-handed or that involves finger-pointing.”

This structure directly supports the hypothesis about the likelihood that green developers will vertically integrate around design and construction. Zocalo is a perfect illustration of this approach, and they have had a great deal of success working in that arrangement. In addition, there is a similarity to Liberty, in the sense that this multi-headed team pre-dated their interest in green. So they were already working in a way that made adoption of green building easier prior to adoption.

According to Zucker the best part of this team is the institutional memory that comes with it. The design process becomes “a type of Vulcan mind merge.” This iterative learning means that every project is smarter in its design than the last. There are also checks that make sure “we don’t blow it again and don’t put the vent too low for the vent off the dryer.” Zucker recognizes that if you do not have the same team that things can easily be lost, and because of these relationships they are able to learn faster and better than their competition.

There is also a happy confluence of skill sets and expertise that support the “meritorious tinkering” of creating a LEED-certified project. The design process ends up not just being about design, but the construction guys incorporate information on what is buildable while the property management team says what is marketable. It is a “virtuous network of connections” that help them adopt something like LEED, which is so focused on process. These connections help them determine, within the context of meeting LEED goals, when there are diminishing returns for energy efficiency, indoor air quality, etc., and also where there is a balance between what they can sell and the marketing of sustainability. Zucker also notes that this relationship between their marketing, development, construction, and design functions pre-dates their decision to go green. They had already become a “four-headed mammal,” according to Zucker, and “that four-headed mammal has been quite useful in the transition to greener projects.”

They decided to venture out of this structure to respond to a request for proposals that the Housing Authority issued. The project did not go well and it was their
fault. This reinforced Zucker’s commitment to working with John Ganyon on all their projects, even if they have more design work than Ganyon can do on his own. “It just makes a lot of sense, if his knowledge base is in the deal,” Zucker says. “If there are more projects that we’re building than he can design and bring to 100% construction drawings himself, he could be the governor making sure that the new temporal relationship with a new architect conforms to how we design, develop, and construct properties.”

This sense of carrying lessons from project to project is critical to the hypotheses presented in this study about green building. By doing that, they blur the lines between development teams and development firms in ways that benefit the ability of any given team to deliver a better building. Zucker continues, “It’s an iterative process of trying to figure out what’s viable, what level of score is viable within that category, and how are we going to achieve it. These are things we never needed help with in a standard project. But everything about the LEED process is opened up for meritorious tinkering, and we design a better project as a result.”

Specialized Financing

Zucker says they did not receive any specialized financing as a result of greening, but greening was a nice benefit that some of their investors included in their consideration of the project. For example, they had subordinate debt from the non-profit lender, Seedco. The green goals were a motivating factor for them to take a position, but not the motivating factor. Green was an additional check box that most projects could not really check. Zocalo paid off the Seedco investment as scheduled.

In addition, they had about 50 kilowatts of photovoltaic panels on the roof. Ten kilowatts powered the common areas. Each of the 36 owners received 1,260 watts. Zocalo worked to figure out how to make solar work as an operating cost neutral expense. They knew the federal tax credit, estimated savings, etc. and in the end Zucker convinced Countrywide to reduce the interest rate on the mortgage they were charging the condo buyers by 1/8 of a point. He doubts he could get Bank of America to do this today.

One of the largest obstacles Zucker has to expanding on the Zocalo model and their successful track record to date is access to equity financing, particularly access to patient investment partners. Unlike Liberty, he has to raise all the investment dollars he needs in private markets.

Zocalo and the Green Development Hypotheses

Zocalo provides strong support for the three hypotheses presented earlier. Zucker’s central frustration around his ability to scale is their lack of access to patient capital. He is currently seeking pre-development dollars that former investors (people he has paid back as agreed) are unwilling to provide. He is seeking other equity backers that are scared away from commercial real estate investment despite his track record of success. So for Zocalo, his inability to find patient capital is the instructive point. Despite a track record of significant success over a number
of years, the private market is currently unwilling to invest in Zucker’s company, and public capital markets are not available to him as they are to Liberty.

Zocalo has, for all practical purposes, vertically integrated design, construction, development, and property management services. For them, this process is about iterative learning, and they are self-conscious about driving beyond the targets they have already hit in each of their projects. This relationship pre-dates their commitment to green building, and, like Liberty, makes them more capable of successfully adopting green innovation. Their success to date with green building certainly supports that argument.

Zocalo has taken much greater control of their projects than would be typical. First, they are vertically integrated with construction and property management, and work with a captive design professional. By itself, this level of integration points toward greater involvement. In addition, Zucker is clearly quite involved in the design and construction processes, which is atypical.

### Analyzing the Cases

Exhibit 8 shows that there is strong support for the three hypotheses. This reinforces the results from the web-based survey presented earlier. There are three themes that shed light on the questions about whether development firms are structured in a way that hampers environmental innovation: (1) green as a better business; (integrating for green); and green as a mission.

### Green as Better Business

Koebel, Papadakis, Hudson, and Cavell (2003) suggest that development firms who adopt environmental innovations do not do so because they believe it will improve short-term profits or cut short-term costs. They do so because they believe that innovation adoption will make them more competitive in the long run and change their reputation with their clients. This idea is consistent with the web-based survey results.

These two ideas point at a critical conflict in the world of green development; the system may have at least two optimal points. One might be thought of as the *market* optimum. This optimum would be sought by those who are trying to figure out what their customers will pay for, and how much they will pay. Their decision-
making is motivated by an attempt to maximize profits. The other may be thought of as the *social* optimum. This optimum would be concerned with what the best outcome is for the natural context in which a project is placed, and decision-making would be based on an attempt to maximize community welfare in the broadest sense. It is not a stretch to say that this second optimum would involve more green development than what the market currently provides, and it would necessitate some mechanism for calculating the positive externalities of green development so we might better understand the social and environmental value of things like reducing the heat island effect or producing solar power.

In this market optimum versus social optimum framework, early adopters of green innovation in development are straddling the two optima. Groups like Zocalo and Liberty Property Trust invest in a different way of doing business because they believe it will pay off for them in the long run. They are willing to develop properties in a way that pushes them closer to the social optimum because they believe they have a way of capturing some of the social value that their projects create.

In the Liberty case, they are a long-term building owner and operator of commercial and industrial space, and they believe that worker productivity is higher in better buildings. They can extract a premium in comparison to conventional space, because their tenants stay longer and are more successful in their buildings. They also believe that this trend will continue, so by investing in better buildings today, they will have buildings that are more competitive and give them greater value tomorrow. Also, Liberty has a critical advantage over the other developers interviewed in this study; they have access to the public capital markets. This means that they do not have the problems of lumpy returns that most developers face, and this access to capital gives them an opportunity to smooth out any hiccups in their cash flow that might result from spending a little more on building quality.

In the Zocalo case, they are a long-term building operator7 in a particular geographic area. This geographic focus means that they can develop a reputation of quality that will generate greater interest in Zocalo projects versus their competitors. In addition, since they have a captive team that runs the whole project from start to finish, they are able to directly incorporate learning from one project into the next. This iterative learning process makes them increasingly efficient, and means that they are constantly achieving better green development results at lower costs when viewed on an inter-project basis. But the most telling piece of the Zocalo “green as better business story” is that they do not have access to the equity they need to make their deals happen. This lack of access to capital is the most difficult obstacle for Zocalo to overcome, and it underscores the hypotheses about what green developers will do to make their work easier. Zucker has vertically integrated around design and construction. He has taken greater control of his projects to create greener results, yet he still struggles to get the equity to fund his projects.

Several key lessons can be distilled from these cases: (1) Easy access to patient capital is a critical component of success for developers who adopt environmental
innovation; (2) Long-term behavioral trends and buyer preferences will have a significant impact on whether or not the long-term investments that these companies have made in green development will pay significant dividends; and (3) reputational issues are paramount and can be a driver of long-term value and access to projects or customers over the long term. These two firms believe that green is better business, and they have organized themselves in ways that allow them to seamlessly transition to a greener practice.

**Integrating for Green**

All three hypotheses about how green developers would organize themselves to better adopt environmental innovations are central to the idea of integrating for green. The reasons why such vertical integration would happen, namely so that the developer could retain additional control over critical stages in the development process where their green building goals may not align with other team members, do seem to have influenced behavior among adopter firms.

Both case study firms said that they took on an expanded role in the process as developer, especially with respect to design and construction. In addition, they both support the idea of multi-project relationships with particular designers and contractors to instill learning around the green development process, ensuring that there was a clear understanding about the working relationships between developer, contractor, and architect.

In the case of Zocalo, vertical integration is critical for their success. Zucker talks specifically about their ability to move all the lessons from one project to the next through their team approach, and how important it is that everyone shares in the success and failures of the team. It’s not just about how something got designed and making sure we don’t blow it again and give enough room in the laundry closet to fit the laundry in. But, we can figure out, in this virtuous network of connections, which (aspects of LEED) are reasonable to attempt to achieve, where there are diminishing returns, and also where there is a balance between the buyer and renter and the marketing of sustainability.” Zucker believes that through that long-term partnership, they can find the places where the market optimum, which allows them to out-compete other development firms, can be pushed towards the social optimum of green building activity in Denver.

In the Liberty case, their focus on long-term relationships with suppliers, design firms, and contractors, as well as their integration with equity, has predates their interest in green. This raises an interesting question about whether these stories around vertical integration of various components of the development team have to do with green development exclusively or if they are more indicative of a certain developer ethic focused on quality and value generated through long-term ownership. For Jim Lutz, it is clear that a green building equates to a better building: it is easier and cheaper to operate, it is more desirable to tenants, and it functions better in the space where it is located than a traditional building would. They also have had several competitive advantages: (1) they are REIT with access to public capital markets, which allows them to expand in ways that most developers cannot; (2) they are long-term owners of quality products, and they
engage in differentiating partners by quality, not just price; (3) they have two executives who are knowledgeable in green building; and (4) they had a client who wanted to do a major green project at a time where most institutional investors and large-scale developers thought green was just a color.

These interviews indicate that some level of vertical integration is desirable for development firms taking on green projects. It is not clear whether this occurs through integrating their operations with contractors and designers, or through using the same contractor or designer repeatedly, but not formally integrating. In addition, there is some movement towards vertically integrating with equity, though the only group of those interviewed to do that successfully has been Liberty Property Trust. In the case of Zocalo, greater access to patient equity and closer integration with those sources would greatly expand their ability to deliver on projects.

**Green as Mission**

Critics of green development often claim that people undertake green development projects because they are motivated by something other than profit (Wendall, 2008). This sense of mission is characteristic of many firms involved in green development, and is reflected in the results of the survey and would be predicted by the work of Koebel, Papadakis Hudson, and Cavell (2003). The predominant reason that respondent firms had taken on green projects was that they believed it was the right thing to do. Of the two case firms, Zocalo Community Development can be described as mission driven. Their story highlights a number of important characteristics of the mission-driven company involved in for-profit green development. While Zocalo has motivating factors beyond profit, management must organize the firm to compete with other companies, both green and conventional. Stated simply, they decided ex ante that they would be green and had to figure out how to make money doing double or triple-bottom line projects. Taken together, their stories indicate that there are two critical factors that define success for the mission-driven green developer: (1) integrate design, construction, and investment in a way that creates cooperation between team members; (2) participate actively in design, engineering, construction, finance, and marketing discussions and ensure that insights from each of these areas impact the decision making in others.

Zucker’s story reflects a profound interest in team structure, particularly in finding team members with the right knowledge and skills, and incentivizing them in an appropriate way to make the project successful. Zocalo is reliant on the development team to meet its goals, and there is a huge emphasis on getting everyone to transition the same way at the same time.

**Conclusion**

The three hypotheses are supported by both the survey responses and the follow-up case studies. They suggest that the conventional development process creates problems for the adoption of green development, and leading edge adopters of
green practices will adjust their operating structure in predictable ways. Namely, they will take greater control of their projects, they will seek out more patient capital (either by identifying a patient investor or by providing more equity), and they will create longer-term relationships with design and construction talent. Understanding these changes to the development process is just as important as understanding how changes in the development product will impact the market for real estate in a given place and product type. However, this study only begins to analyze the development process.

There are many ways in which the available data are incomplete, and additional research is needed to more fully understand these behaviors and phenomena. In particular, it would be helpful if the US Green Building Council, the National Association of Homebuilders, the National Association of Office and Industrial Properties, and/or the Urban Land Institute would support future research in this area. They all declined to participate directly in this study, and access to their data and membership records would dramatically improve the conclusions that could be drawn here. Such an addition would help to strengthen the largely anecdotal arguments made in this work.
Appendix A
Survey Instrument

Green Development Adoption
1. Company and Top Executives

CONSENT TO PARTICIPATE IN SURVEY

The capacity for environmental innovation in real estate development

You have been asked to participate in a research study conducted by Will Bradshaw from the Department of Urban Studies and Planning at the Massachusetts Institute of Technology (M.I.T.). The purpose of the study is to understand more about the capacity for environmental innovation in the real estate development industry. The results of this study will be included in Will Bradshaw’s dissertation. You were selected as a possible participant in this study because of your involvement in the development industry. You should read the information below, and ask questions about anything you do not understand, before deciding whether or not to participate.

- This survey is voluntary. You have the right not to answer any question, and to stop the survey at any time or for any reason. We expect that the survey will take about 30 minutes.

- You will not be compensated for this survey.

This project will be completed by summer 2010.

I understand the procedures described above. By continuing with this survey, I agree to participate in this study.

Please contact Will Bradshaw at willyb@mit.edu or 504-715-1129 with any questions or concerns or to get a copy of the results, which we will be happy to share in a fashion that does not identify any respondents.

If you feel you have been treated unfairly, or you have questions regarding your rights as a research subject, you may contact the Chairman of the Committee on the Use of Humans as Experimental Subjects, M.I.T., Room E25-143b, 77 Massachusetts Ave, Cambridge, MA 02139, phone 1-617-253-6787.

Each respondent to the survey will receive a number, based on their order of response. That number will be used to identify the participants’ answers to questions, and their identifying information will not appear with the data.

Paper records related to survey responses will be kept in a locked filing cabinet in the principal investigator’s office. Electronic records will be kept on the PI’s personal computer and on-line at survey monkey in a password protected account. Records without identifying information will be stored in a regular filing cabinet. When the study is complete, survey data will be stored in a locked filing cabinet and ultimately destroyed.

*1. Please tell us the name of your firm and its principal location (an answer is required for this question).

| Company: |  
| City/Town: |  
| State: |  
| ZIP: |  
| Country: |  

*2. Please list the city and state of company offices other than the principal office. If you have no other offices, please write none (an answer is required for this question).

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Green Development Adoption

3. Provide the names and titles of the five most senior executives in your firm (an answer is required for this question, but you do not need to list 5 senior executives, if you do not have that many. Listing 1 is sufficient).

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<td>Person 5 (Name and Title):</td>
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4. Tell us more about these executives by filling out the chart below.

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<th>Age</th>
<th>Gender</th>
<th>Education Level (Check highest level obtained)</th>
<th>Years of Development Experience</th>
<th>Background (If multiple, write in all that apply in comment field below)</th>
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Green Development Adoption

2. Company Demographics

This page collects information about the size and focus of the company.

1. How big is your firm, on any or all of the following metrics

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<th>Annual Revenue</th>
<th>Residential Development Annually</th>
<th>Commercial/Industrial Development Annually</th>
<th>Number of Employees</th>
<th>Firm Capitalization</th>
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Please provide any clarifying comments

2. Describe the geographic focus of your company

- Single City (please name in comment section below)
- Single State (please name in comment section below)
- Regional (please describe in comment section below)
- Nationwide
- International
- Other (please describe in comment section below)

Comment

3. Tell us more about the type of projects you take on (please check all that apply)

- Single Family
- Multi-Family
- Commercial/Office
- Industrial
- Retail
- Mixed-Use
- Other (please describe)
Green Development Adoption

4. Tell us more about the services you offer (please check all that apply)
   - Own/Develop
   - Property Management
   - Project Management/Construction Management
   - Real Estate Sales/Leasing
   - Construction/General Contracting
   - Design/Design Build
   - Other (please describe)

5. What is your ownership structure?
   - Private-Closely Held (control rests with less than 5 people)
   - Private (More than five people have majority control)
   - Publicly Traded
   - Community Development Corporation/other non-profit
   - Other (describe below)
Green Development Adoption

3. Green Building Projects

This page will ask you for information about how your firm decided to undertake green projects and the systems you have used to measure your success.

1. On any green project that your firm has undertaken, have you used a green building guideline or standard? If so, which ones (please mark all that apply)?

- [ ] LEED-Home
- [ ] LEED-Core and Shell
- [ ] Energy Star
- [ ] LEED-Neighborhood Development
- [ ] LEED-Operations and Maintenance
- [ ] DOE Builder’s Challenge
- [ ] LEED-Commercial/Major Renovation
- [ ] NAHB Green Building Guideline
- [ ] Enterprise Green Communities
- [ ] LEED-Interiors
- [ ] NAHB Green Building Standard (After ANSI adoption in 2009)
- [ ] Other (please specify)

2. If you have developed green projects, what were some obstacles you faced in those projects (check all that apply)?

- [ ] Lender ignorance/unwillingness related to green building approach
- [ ] Increased cost
- [ ] Lack of material availability
- [ ] Builder ignorance/unwillingness related to green building approach
- [ ] Uncertainty and/or limited data about the performance of the project or particular components
- [ ] My firm has not developed green projects
- [ ] It is harder to get a permit or necessary zoning approvals because of green approach
- [ ] Our customers are unwilling to pay a premium for a green approach
- [ ] Green approach increases construction time
- [ ] Other (please specify)
Green Development Adoption

3. What is the single largest obstacle you have faced to developing green projects?
   - My firm has not developed green projects
   - Increased cost
   - Lack of material availability
   - Long-term uncertainty about the performance of the project or particular components
   - Increased enforcement risk as a result of green approach
   - Our customers won’t pay a premium for a green approach
   - A green approach increases construction time
   - Other (please specify)

4. If you have undertaken green projects, why have you done this? Please check all that apply.
   - My firm has not developed green projects
   - An investment partner wanted to develop green projects
   - A green approach was required by a public agency
   - Other (please specify)
   - One of our principals wanted to develop green projects
   - We believe green projects are more profitable
   - Green building is part of our commitment to high quality spaces
   - Our customers demand green projects
   - We believe green projects are the right thing to do
Green Development Adoption

5. What is the single largest reason you have undertaken green projects? Please select one from the list below.

- My firm has not developed green projects
- An investment partner wanted to develop green projects
- A green approach was required by a public agency
- One of our principals wanted to develop green projects
- We believe green projects are more profitable
- Green building is part of our commitment to high quality spaces
- Our customers demand green projects
- We believe green projects are the right thing to do

- Other (please specify)
Green Development Adoption

4. Specific Green Projects

This page will ask you specifically about a green project (for you to select) that your firm has completed.

1. Has your firm developed a green project? (There is currently much debate about what constitutes a green project, and much research is focused on distinguishing between something that is "truly green" and "green washing". This is not our purpose here. If you believe that you developed a project that was green, then for the purpose of this survey you did. We are going to ask you about the characteristics of that project and how you organized your development team to manage it.)

   ○ We have completed at least one green project
   ○ We have a green project under development, but have not completed it.
   ○ We are planning a green project in the next 2 years.
   ○ We have not developed a green project.

2. What percent of your projects are green?

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>75-100%</th>
<th>50-75%</th>
<th>25-50%</th>
<th>Less than 25%</th>
<th>zero</th>
</tr>
</thead>
<tbody>
<tr>
<td>Currently</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expected over the next 5 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Please tell us about a green building project your firm completed.

   Project Name
   Year completed
   Size (# of square feet of space)
   Green Building Rating
   System Used
   Level Achieved in Rating
   Other major goals for project
   Biggest challenges
   Additional comments about the project

4. What specifically did you do to make this a green project? For example, you might have followed a green building rating system (please state the system and level of performance achieved), focused on energy efficiency, indoor air quality, the use of recycled materials, etc (please provide some examples about materials and systems used).
Green Development Adoption

5. Would you describe this project as a success? Why or why not?

6. After this project, did your firm decide to take on additional green projects? Why or why not?

7. Did you do any of the following on this project (please mark all that apply).
   - Hire builder or construction manager before the design was complete so they could participate in design decision-making
   - Commission an energy model on the existing building or proposed design
   - A pre-occupancy evaluation of the building
   - Obtain performance guarantees from your general/subs that extend beyond the statutory minimums (please describe below in comments section)
   - Obtain performance guarantees from someone else on the development team (please describe below in comments section)
   - Contract with any development team members for multiple projects rather than just this one
   - Contracts with development team members that include clearly delineated expectations about building performance

Comments

8. What contract form did you use for project delivery (please check all that apply)?

   This project

   - Conventional owner hires architect and builder, architect administers construction process and certifies completion
   - Multiple primes (owner contracts with various subs for specialized construction)
   - Owner-contractor (where owner acts as the general contractor)
   - Design-build (where architect acts as the contractor)
   - Construction manager (where third-party construction manager delivers the project)
   - Other (please describe below in comments box)

Comments
Green Development Adoption

9. Indicate the type of financing you used in this development project (please check all that apply).

<table>
<thead>
<tr>
<th>Financing Type</th>
<th>This project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional Debt</td>
<td></td>
</tr>
<tr>
<td>Developer equity - company funds or funds</td>
<td></td>
</tr>
<tr>
<td>from principals</td>
<td></td>
</tr>
<tr>
<td>Investor equity</td>
<td></td>
</tr>
<tr>
<td>Tax Credit Equity (NMTC, LHTC, HTC, solar credits, etc)</td>
<td></td>
</tr>
<tr>
<td>Other public financing (GDBG, HOME, etc)</td>
<td></td>
</tr>
<tr>
<td>Philanthropic grants</td>
<td></td>
</tr>
<tr>
<td>Program Related Investments (PRI) - a debt or equity investment made by a philanthropic entity out of its endowment and not funds used for grant-making</td>
<td></td>
</tr>
<tr>
<td>Other (please describe below in comments section)</td>
<td></td>
</tr>
</tbody>
</table>

Comments

10. Indicate the project delivery approach you used on this real estate project (please check all that apply).

<table>
<thead>
<tr>
<th>Delivery Approach</th>
<th>This project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site-built</td>
<td></td>
</tr>
<tr>
<td>Modular</td>
<td></td>
</tr>
<tr>
<td>Panelized (including structural insulated panels)</td>
<td></td>
</tr>
<tr>
<td>Computer assisted design/computer assisted manufacturing</td>
<td></td>
</tr>
<tr>
<td>Other (please describe below in comments section)</td>
<td></td>
</tr>
</tbody>
</table>

Comments
Appendix B

Emails to Potential Respondents

I, Will Bradshaw, am a PhD candidate in Urban Economics and Sustainable Community Development at MIT, and I am doing a study on the capacity for real estate development firms to adopt environmental innovation, looking particularly at the structure of the development process and whether it leads to slower adoption of environmentally-related improvements in buildings. One of the participants in the study is my own firm, Green Coast Enterprises, a triple-bottom line developer based in New Orleans. The attached link connects to a survey targeted at real estate developers designed to understand more about their interest in green development, and their efforts to carry out green projects. It should take about 15 minutes to complete, and I would be pleased to have you fill out the survey. I will be happy to share tabulated results with anyone that asks, with identifying information removed of course. The study is scheduled to be complete in summer 2010.

You can access the survey at http://www.surveymonkey.com/s/XFZ28KX. Thank you for your time and consideration.

Sincerely,
Will

Recently, I sent you an email requesting that you participate in a survey related to my dissertation research on the capacity for real estate development firms to adopt environmental innovations. I do not believe you have yet responded to the survey, and I wanted to send this follow-up asking again for your participation. I know from a few of the responses I received that there was some question about my identity and whether or not this research is real, especially since the survey asks for some sensitive information. To address that issue, I wanted to send the following:

If you go to the MIT homepage at web.mit.edu, you will see a people search at the top right of the screen. You can search for my full name, William Bradshaw, and it will show you that I am a graduate student in the Department of Urban Studies and Planning and provide my home address in New Orleans. The survey itself also has contact information for MIT’s Institutional Review Board (called the Committee on the Use of Humans as Experimental Subjects) which sets standards for research ethics and the treatment of sensitive information. They have approved this research based on protocols that I am following to keep your information private, and you can contact them directly if you have concerns about my activities.

I would greatly appreciate your participation in this survey, which I plan to close on March 19 at midnight CST. Thank you very much for your time and consideration. I could not complete this study without you. The link to the survey is http://www.surveymonkey.com/s/XFZ28KX.

Sincerely,
Will
Endnotes

1 The text of the letter is available in Appendix B.
2 The text of the second letter is available in Appendix B.
3 I received several responses to the first email doubting his purpose and student status.
4 This result is not representative of the development industry and it indicates that his survey respondents were generally green developers rather than a cross-section of the development industry. Efforts were made to counter this problem, but ultimately the Urban Land Institute, the National Association of Homebuilders, and the National Association of Industrial and Office Properties declined to support this research by sharing access to their membership or their own demographics in a way that could be cited, and the Economic Survey data provides no baseline for a real estate development firm.
5 Despite a significant interest in this finding, the balance of this study will not test it further. It is an interesting opportunity for further research.
6 This question did not preclude firms from selecting multiple answers. In fact, almost everyone who selected other did so to clarify the particular nature of the relationship that the owner had to the rest of the team members.
7 As distinct from a long-term owner since they sell condo units in most of their projects, but then manage the property for the condo association.

References
Bradshaw, W.B. Buying Green. Department of Urban Studies and Planning and the Center for Real Estate. Cambridge, MA Massachusetts Institute of Technology. MSRED and MCP, 2006.


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