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

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Abstract

Based on his own experience as a green development entrepreneur, the author argues that much of the pressure to create greener real estate developments fundamentally misunderstands the nature of the real estate development industry. Beginning with a model of real estate development firms, the author identifies four areas where green development practice creates tension in the conventional development process. These tensions lead to four hypotheses that green developers will share several common characteristics.

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 partners, 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.

4) Early adopters of environmental innovation have moved aggressively towards industrial construction and CAD/CAM construction techniques because it gives the developer more control over the installation of products and the ability to reduce waste.

These hypotheses is tested and refined through a three-part study involving surveys of commercial and residential development practitioners, including the author’s own firm. The study concludes with a predictive statement about the future of the real estate development industry and a restatement of the hypotheses given the research findings.
Introduction

Two recent studies test how green real estate projects perform in comparison to conventional projects in specific markets (Eicholtz, Kok et al. 2008; Miller, Spivey et al. 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, Seal et al. 1998; Kats, Alevantis et al. 2003). A wide body of research has shown that retail customers spend more in buildings with daylight and fresh air (Wilson, Seal et al. 1998; Kats, Alevantis et al. 2003; Kats 2007), that employees experience fewer sick days and have higher productivity in buildings with good indoor air quality (Lucuik, Trusty et al. 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 those advances in knowledge, it is not clear that the results will speed up the diffusion of green building among other development firms. To help answer this question, this study focuses on the development process rather than the product. My contention is that green development presents difficult challenges to the current organization of many real estate development firms. In other words, real estate development firms are not well organized to adopt environmental innovations. I have come to these hypotheses through working in real estate development and running a green development firm. But a single interaction I had with the past-president of the Greater New Orleans Homebuilders Association, Toni Wendell, can probably best illustrate my thinking for why an examination of these processes is so critical.

I was surprised when I received the invitation. Toni had asked me to join her to speak at the upcoming home show. This was not company that typically sought me out to participate in public speaking engagements. She wanted me to serve on a panel with her, familiarizing the audience with the National Association of Homebuilders (NAHB) Green Building Standard. I agreed. In the days leading up to the event, I prepared some notes about cost variations related
to different green building targets, and looked back through my own research on cost-benefit analyses of green homebuilding.

On the day of the panel, Toni opened the discussion by saying that green building was something to do because it was right, not because it was affordable. Annoyed, I immediately corrected her. I provided my own data that showed that significant greening improvements increased house price by less than 3% and those cost increases were repaid by operating savings within 5 years when those improvements did not include photovoltaic panels. I pulled out research from the NAHB itself, showing that to meet their lowest level of certification required roughly a 1% increase in cost of construction and these changes would generate significant energy and durability benefits that more than paid for themselves. Then I saw my own builder sitting in the crowd. He provided significant energy upgrades and beat the pricing of most people I knew in the local community. I pointed this out to the audience and what had been an increasingly tense discussion graduated into hostile. We both made half-hearted apologies later, which were really attempts to ply the other with our position. I have not been invited to do anything with the local homebuilders since.

After nearly two years of reflection, I have decided I was wrong. Not because of what I presented, but because of how the exchange occurred. The 8 people in the audience did not leave any more educated about green building because of our side show of a presentation. More importantly, Toni was more resistant to my ideas and information after the presentation than she was before it. This was the real loss in the exchange. Through her success as a business woman, Toni has enormous influence on the opinions of homebuilders throughout New Orleans, and is a powerful voice in the policy discussions around rebuilding this region. Because I insisted on publicly arguing her empirically untrue statement about the costs of green building, I pushed her further away from understanding a green approach to construction and development, something that could help the recovery of this entire region.

I do not think this exchange is unique. I think it happens every day in various guises, particularly as green building grows in prominence while the rest of the real estate market falls off a metaphorical cliff. Our exchange is indicative of a major tension in developer adoption in green building, a tension between the networks, processes, and norms that developers rely on to complete their projects, and the changes in physical products required by green building. My observation of the green building advocacy community (myself included in this case) is that we discount the challenges a business person faces in shifting networks, processes, and norms. To take this challenge into account requires a rethinking of much of the advocacy research done on green building to date.

That research is focused largely on cost-benefit analyses of far-flung green building projects, and it distills lessons about how to undertake such a project. My own work has focused on this green building policy and practice research. The central conclusion of this field of inquiry is that slow adoption of green building practices by development firms is related to an information gap; that these firms simply don’t know enough about how and why to build green, even though it is better for them and their bottom line. You see this argument made in most cost-
benefit studies (Wilson, Seal et al. 1998; Kats, Alevantis et al. 2003; Bradshaw, Connelly et al. 2005). I deviated slightly from this line of inquiry in a 2006 paper that claimed these costs and benefit studies present information in a way that is not useful to the average developer because the studies answer questions about extraordinary buildings and development decisions are made about ordinary ones (Bradshaw 2006). But, this paper, like the Eicholtz, Kok, and Quigley and Miller, Spivey, Florance papers presented at the beginning of this discussion, did not break from the underlying cost-benefit argument that if developers simply knew more about what was good for them, they would build green.

Altogether there is much that is helpful in this work. It has raised consciousness about the challenge of changing development practice, and helped build a broad-based movement that has an alternative vision for how people can build. Every major development membership organization in the country is trying to figure out how to relate to green building, and a few, like the United States Green Building Council, exist explicitly in support of this development paradigm. These are extraordinary accomplishments that are not to be understated. But I don’t think they lend themselves well to the argument I had with Toni. In some respects, these studies may even be counter-productive in convincing Toni to change her business practices. The cost-benefit research can be interpreted as saying that she is too stupid to know what is best for her and her company. That is a tough argument to accept. Reflecting on my own experience operating a development business in New Orleans for the last 3 years, I have come to believe that these strains of green building literature miss something fundamental about the character of the development industry. My interest in innovation and organizational change theory springs from this concern, and from reflection on a single lunch I attended in 2006 with Leith Sharp, the director, at the time, of the Harvard Green Campus Initiative.

At this lunch, Ms. Sharp said something like the following. She had spent her career, up to the point that she became director of the green campus initiative, as an environmental advocate. Despite a confidence in her own intelligence, work ethic, and ability to attract support, she looked back on that career and saw that she had made very little difference in the day to day decision making of the organizations with which she worked. This troubled her, and upon reflection, she decided to run something of an experiment. Instead of relying on her former advocacy strategies like door knocking, fundraisers, white papers, etc. she was going to learn something about how people influence behavior, especially in major institutions, and she would implement these lessons in the strategies that would guide the green campus initiative. The results surprised her. Her focus moved away from the argument she was making to focusing on the structure and makeup of the institution to which she was making the argument. How did decisions get made in that institution? Who had to approve what? How did information flow, formally and informally? Where are the places that transitions to a new practice could break down or flounder? Beyond this, she started developing programs that focused on mass appeal and that incited competition between groups about who could do a better job at turning out the lights, monitoring the HVAC system, collecting recyclables, etc. Finally, the Green Campus Initiative was very careful to instill learning, especially on green building projects that they undertook, as part of their construction and development process, and to utilize relationships and networks in a self-conscious way to make sure that each new project started somewhere
near (from a learning perspective) where the previous project had left off. Her results were staggering. The Harvard Green Campus Initiative rapidly became one of the most successful college greening programs, and developed a loan fund that at the time was delivering a 33% annualized return back to the Harvard endowment.

I recognize that this is a single case, and that it involved a single institution (albeit a massive one), but those realizations cannot shake me from the idea that she was on to something in her process. To summarize, Sharp made three main points about influencing behavior:

1) Start with a well-mapped understanding of the decision-making structure and norms of the group(s) you are trying to influence,
2) Focus on mass appeal and incite competition between influential groups to meet stated goals,
3) Instill learning in an iterative manner, so that one adjusts processes in the future based on challenges and successes from the past, and people instituting change are never far away (in terms of behavior) from something they already know how to do.

Obviously, changing common practice in an industry is different than changing common practice in a university, but there are still important lessons for research on environmental innovation in development. As I look at early and aggressive adopters of environmental innovation in development, I will want to take into account the manner in which they used internal and external competition to motivate change, and the extent to which they were able to instill learning, either internally or externally, around their previous projects.

This dissertation will be organized in part to address Sharp’s approach. I begin by creating a picture of the real estate development industry, and how it has been conventionally organized. From there, I explore the challenges that green development presents for real estate development, building to my hypotheses that green developers are likely to have four distinct characteristics not commonly seen among conventional developers. Those characteristics are:

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 (including their own investment approach as a developer) 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 for the providers of design and construction services, partner firms 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.
4) Early adopters of environmental innovation have moved aggressively towards industrial construction and CAD/CAM construction techniques because it gives the developer more control over the installation of products and the ability to reduce waste.

From there, I will present the results of an original web-based survey of 102 unique real estate development firms, mostly firms who have adopted green development practices. Using that survey as a base, I will select six respondent firms for additional study, including my own firm, Green Coast Enterprises. In addition to my own firm, the firms I investigate will include three early and aggressive adopters of green development practices, one group that has not adopted green development, and one group who has had a negative experience with green development. Synthesizing the lessons learned from these case studies, I will reinvestigate my hypotheses and conclude with a predictive view of the real estate development industry going forward.
Chapter I. The Real Estate Development Process

I teach a class on Sustainable Real Estate Development at the Tulane School of Architecture. Over the last three years, I have had 43 Architecture students who wanted to learn about sustainable real estate development. All of them come with the impression that a developer earns more money than an architect, but none of my students have entered the course with a good sense of what a real estate developer does. As a result, I begin by defining terms. We discuss real estate as a “bundle of rights associated with the use of, ownership of, and benefit from real property.” We talk about all sorts of examples that illustrate the edges of our definition: property rentals, easements, national parks, air rights development, etc. We move from there to discuss what development is, and my students are generally as imprecise about this as they are about real estate. But we ultimately define development as an “Entrepreneurial activity that assembles and applies the financial and physical resources to construct new built space, convert existing buildings to a new use, and/or reallocate the bundle of rights associated with real property.” This makes it much easier to define the job of a developer. Developers are entrepreneurs who assemble and apply financial and physical resources to create new space, reuse existing space, and/or reallocate the bundle of rights associated with a particular piece of property.¹

Real estate development is also a huge portion of our national economy. In 1992, investment in new space accounted for 7% of our gross domestic product and was the largest single industry (DiPasquale and Wheaton 1995). By 1994, Christopher Gordon estimates that building construction had grown to nearly 10% of the economy in the United States (Gordon 1994). Despite the size and relative importance of the industry, the development process remains poorly understood. In my own review of the 2007 North American Industrial Classification System (NAICS), the author found that the words “real estate” show up in 84 different NAICS 6-digit industry descriptions, and there are at least 5 NAICS 6-digit codes related to development, though none that are called real estate development. The most closely related 3-digit sectors to real estate development include sector 236 (Construction of Buildings), sector 237 (Heavy and civil engineering construction), and 531 (Real Estate). If one compares these three sectors to all 3-digit sectors in NAICS, you see that the NAICS codes which imprecisely include real estate development companies consist of firms that are very small. The average number of employees for sector 531 is 5.1 people per firm, the lowest of all 3-digit sectors. Sector 236, with 6.7 employees per firm, has the sixth lowest average among 82 3-digit NAICS sectors. Sector 237 (25.6 employees per firm) is just above the median, but the 6-digit designation related to real estate development within that three-digit classification (Industry Code 237210 – real estate sub-dividers) has only 12.8 employees per firm, which is slightly higher than the 25th percentile of firm size in the 3-digit sectors. So while we cannot precisely define real estate development from the classifications within the NAICS, we can make a case for what I will call the first principle of the structure of real estate development firms, namely that on average real estate development firms are small.

¹ This definition is intended to be inclusive of for-profit and non-profit developers, including community development corporations.
development firms are small. The work of Sommerville adds some interesting depth to this prediction about small development firms. In looking at the size of homebuilders\(^2\) in multiple markets, Sommerville finds that builder size increases in more active markets with larger supplies of available land and greater demand, and that builder size is also inversely proportional to the scope and intensity of municipal land-use regulation. The finding about regulation mirrors the earlier work of Oster and Quigley (1977) and their look at builder adoption of innovation.

The idea that development firms are small is not a surprising result. One can readily imagine a developer not needing a firm at all. If Joe Jackson buys an apartment complex, does some basic renovations, and lives off the rental income, Joe is a developer, however limited in scale and scope his operations might be. All of the work of the business can be sub-contracted out, from construction to rent collection to property management. Joe, by providing the capital and taking the risk, can collect the residual value of his investment. On the other end of the spectrum, AvalonBay Communities owns over 50,000 units in the United States. While operating a similar business, except with regard to scale and scope, AvalonBay owns its management company, has its own construction, development, and finance departments, and operates nearly $7 billion in real estate (AvalonBay 2009). One of the motivating questions of this thesis involves whether or not we can simultaneously characterize the development activities of Joe Jackson and AvalonBay Communities. Are there predictable reasons, like those proposed by Sommerville for homebuilders, that AvalonBay expanded its operation and chose to provide construction, development, finance, and property management in-house, rather than contracting for those services like Joe Jackson? And in either or both cases, can we say something about their ability, based on the structure of their operation, to adopt environmental innovations?

To begin, we need to look in more detail at the job of a developer and at the structure and make-up of conventional development teams. This chapter is devoted to that exploration, beginning with a description of the development process, including the members of the development team. From there, we will discuss the “OPC” model which defines the conventional relationship between Owner, Design Professional, and Contractor, and think through its relationship to the inside contracting model presented by Williamson (1975) and adapted to the construction industry by Eccles (1981). The chapter will conclude with a discussion of alternative relationships between Owner, Design Professional, and Contractor, and the reasons for using them on any particular development project. All this will serve as the groundwork for a more detailed investigation of the nature of the development firm and whether it is structured well for the adoption of environmental innovation, which will come in Chapter 2.

\(^2\) The author notes that there is a distinction between homebuilders and developers, an issue that will raise itself multiple times in the literature review around real estate development and development firms.
Development teams and the process of development

The chart below lays out a basic conception of the development process, moving from the idea stage through to asset management, once a building is completed.

One: Inception of an Idea
- Not feasible
- Feasible

Two: Refinement of the Idea
- Not feasible
- Feasible

Three: Feasibility
- Not feasible
- Feasible

Four: Contract Negotiation
- Cannot reach binding contracts
- Can reach binding contracts

Five: Formal Commitment

Six: Construction

Seven: Completion and Formal Opening

Eight: Property, Asset, and Portfolio Management

Miles et al: Real Estate Development: Principles and Process (published by ULI)

One of the key aspects of this diagram is that development is iterative, and the successful developer has to be able to manage the critical feedback being received and make appropriate decisions, often with incomplete information. For example, the author is interested in renovating the abandoned convenience store by his house for making and selling ice cream. The initial review of this idea requires some basic analysis of the area. Is there another ice

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3 The connections to the model used by Eccles (1981) and adapted from Williamson (1975) that discuss pairs of factors, one human and one environmental, that effect decision-making in firms are clear here. Development is an endeavor with uncertainty/complexity where there is bounded rationality as a result of that uncertainty. We will return to this framework throughout the next two chapters.
cream shop nearby? Can one acquire the building? Is there a market for ice cream sales in the area? Are there ice cream companies who would want to move to this space? If the answers to these early questions are yes, then the idea might move to the second stage, where this idea is refined. At this step, one might begin discussions with the building owner, begin discussions with various ice cream makers, visit the building to get a sense of what it would need to be converted, and carry out a more detailed study of the size of the market for ice cream at this location. It is entirely possible that some obstacle would be encountered at this point that makes the development unfeasible, but if not, then the team would continue to a full feasibility study. At this point, the developer would determine, to the greatest extent possible, the true costs and benefits for acquiring and converting the building to an ice cream store. This might include a number of formal and informal investigations like a structural analysis of the building, a survey, an appraisal both as is and as intended, a preliminary design concept, construction cost estimates, an environmental study of the subject property, and a complete market analysis for the intended use and location. The developer might also begin negotiations for use of the space with several of the ice cream manufacturers he reached out to in the previous step. These formal investigations are intended to uncover reasons that the project might not go forward, but again information is somewhat incomplete. Still, if the project looks feasible, it will proceed to the fourth step, where the developer seeks out binding contracts with the interested parties involved. In this case, those binding contracts might be a lease with the ice cream store operator, a purchase agreement with the property owner, a construction contract with the builder, a design services agreement with the architect, a loan from the bank financing the project, a commitment of equity from any equity investors that are needed, and the necessary entitlements (zoning approvals, building permit, etc) to allow the conversion to be undertaken. What originally seemed like a simple idea, let’s buy the building and make it an ice cream store, now has a number of moving parts. Once you reach formal commitment, construction begins, the project is completed and opened, and then it must be effectively managed as a long-term asset.

This description of the process points out another critical component of development, namely that the product of development (a building) generally requires participation beyond the boundaries of the development firm. To state another way, the developer must rely on a number of other actors (generally not within her own firm) to deliver on key components of the project. These other actors are frequently coordinated in a development team, where each actor has key roles and responsibilities, and the developer keeps their progress coordinated and on schedule. This insight leads to what we will call the second principle of the organizational structure of developers. Simply stated, development teams make buildings; development firms assemble and disassemble development teams. This concept is closely tied to Eccles conception of the quasi-firm, and underscores the idea that contractual obligations in development tend to last for the duration of a project and then dissolve to free up all parties to pursue other opportunities.

The second principle of the organizational structure of developers leads to an obvious question: who are these other members of the development team? That question can be answered by thinking about the sort of specialized services needed to carry out the work described above in
the story about opening an ice cream shop. First, we need an architect or design professional and a contractor. The design professional is generally responsible for providing the plans and specifications for how the building will be put together and then certifying that the contractor made the building in keeping with those plans and specifications. The contractor, in turn, is responsible for choosing the means and methods to be used to put the building together. We will return to this discussion in intricate detail in the next section, as we work through the “OPC” Model, which stands for Owner, Design Professional, Contractor (Poage 1990). But the Owner, Design Professional, and Contractor are certainly not the only people needed on the project. The following other professionals are also generally a part of development teams, though depending on the scale and scope of the project they may or may not be involved:

- **Lender** – The entity that provides debt financing to a project. This relationship is usually characterized as a contractual repayment of certain cash flows on an agreed upon schedule, and may be secured by the property and/or a company or personal guarantee.

- **Equity Investor** – The entity that provides equity financing to a project. This relationship is usually characterized by ownership of the asset and residuals that are left at the end of development. It may or may not include certain preferred returns to be paid on a regular schedule.

- **Real Estate Brokers/Sales team** – Real estate brokers are responsible for identifying interested end users and executing contracts with those end users to lease or purchase the space. Usually the broker’s compensation is a percentage of the contracts that they successfully execute.

- **Property Manager** – The property manager is responsible for the long-term operation of the property including tenant services, rent collection, property maintenance, etc. Often, a property manager will join the team while the project is still under development to provide insight into things that will make the property easier to operate over the long-term.

- **Environmental Consultant** – Traditionally, an environmental consultant has provided analyses about the real or perceived contamination on a site, both through historical documentation and the actual testing of air, soil, water, and other materials on site. In cases where there is contamination, then an environmental consultant would help to establish and carry out a plan for removing that contamination. More recently, the term environmental consultant has also been used to describe a member of the team who can provide expertise around environmentally preferable approaches to development such as green building, and/or compliance with various rating systems and programs that measure the effectiveness of environmentally preferable development like LEED and Energy Star.

- **Market Analysis Consultant** – The market analysis consultant is responsible for determining the size, scope, and characteristics of the market for the intended real estate product at the intended location. A third-party market analysis is frequently required for participation in various public programs, as well as by some private investors.

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This discussion draws significantly on Miles et. al (2000), particularly the second chapter “Developers and their Partners.” It also reflects the author’s own experience.
- **Appraiser** – The appraiser performs a determination of the value of the property by following established methods for making this determination, including the transaction prices of other properties in the market, the cash flows projected from operations, and any value created through specialized financing or operation at this location.
- **Structural Engineer** – The structural engineer oversees the structural components of various interventions made on site. This would include an analysis of any existing structures and what should be done to ensure that they can carry their intended loads, as well as how the structural components of any new construction must work.
- **Public Officials** – Public officials grant necessary entitlements to a project, and may also control specialized financing programs that can directly or indirectly support development efforts. Entitlements would include zoning authority for the particular collection of uses planned, interpretation of building codes, the inspection of work being installed, and more. In addition, local governmental authorities may also control special tax incentive programs, direct investment in projects or surrounding infrastructure, and other public investments that can help a project move forward.
- **Attorney** – Development teams are always filled with attorneys, in fact most parties to a development transaction will come with their own legal counsel. So not only does a developer need to interact with his own attorney, but in most cases his lender, equity investor, architect, contractor, end user, etc. will all have their own attorneys intimately involved in the deal.
- **Accountant** – The accountant will certify all the costs that go into a development, creating the eligible basis for the project, which will be depreciated for tax purposes based on Internal Revenue Service (IRS) rules. The accountant becomes a critical piece of the long-term financial strategy for any project.
- **Civil Engineer** – The civil engineer is responsible for managing all issues related to storm water, sewer, site access, drainage, and access to power on site. They will work closely with the designer, the geo-technical consultant, the traffic engineer, the land planner, the landscape architect, and the MEP team to ensure that project requirements can be accommodated on site given the existing building codes and tie-in requirements in the area.
- **MEP Engineer(s)** – MEP stands for Mechanical, Electrical, and Plumbing, and the MEP engineer(s) will be responsible for design and construction oversight of the mechanical (heating, ventilation, and air conditioning) systems, electrical, and plumbing systems within the building.
- **Traffic Engineer** – The traffic engineer is responsible for determining the impact that any development will have on surrounding traffic patterns, and any needed interventions as a result of that development. The Traffic Engineer may be part of the Civil Engineering team or distinct from it.
- **Land Planner** – The Land Planner provides a conceptual understanding of the particular property on which a development is planned, and creates a layout based on zoning, project requirements, natural features of the site, and specific engineering and building requirements. The land planner is generally involved very early in a project, and is most typically used in areas where services streets, water, sewer, etc. are not already available.
- **Landscape Architect** – The landscape architect designs the landscape in which the building will be placed. Their job generally revolves around selection of plant material, design of any drainage
systems that are required (in cooperation with the civil engineer), and integration of various landscape features, including the necessary parking.

- **Geo-technical Consultant** – the geo-technical consultant provides analysis of the soil and sub-surface conditions on site, as well as recommendations for the structural engineer about how the foundation must be designed to support the intended load of the building. This consultant may be separate from or part of either the civil engineering or structural engineering team.

- **Land surveyor** – The land surveyor is responsible for recording the legal boundaries of the property as well as any easements, encroachments, or encumbrances, especially those that may not be immediately apparent.

- **End User** – The end user is the tenant, buyer, or operator of any particular project, and ultimately it is the end user’s willingness to pay for space that makes a project successful or not.

- **Materialmen** – Materialmen or suppliers provide the building materials necessary for completing a project. They might include a lumberyard, a hardware store, a door and window distributor, a plumbing supply house, an appliance manufacturer, and many more. They are generally distinct from other sub-contractors in the sense that they provide the building material or product, and then someone else on site is responsible for installation.

- **Plumber** – The plumber is responsible for installing (in keeping with the plumbing engineer’s plan) the system needed to carry all water into the building (including any water used in the mechanical system) and to carry out all the sewage and waste water created by the building and its occupants.

- **Electrician** – The electrician (in keeping with the MEP Engineers plan) must install the power distribution system within the building, as required by building code and the intended occupants. This is distinct from the job of the civil engineer who must ensure that the building has enough access to the power grid in order to operate, and the Electrical Engineer who will design the power distribution system required.

- **Heating, Ventilation, and Air Conditioning (HVAC) Installer** – The HVAC installer (in keeping with the Mechanical Engineers Plan) will build the system necessary to distribute thermal comfort throughout the building. The three levers that an HVAC installer can control are generally temperature, humidity, and wind speed. They are also responsible for ensuring that a building is properly ventilated, per the Mechanical Engineer’s plan.

- **Other Sub-contractors** – Most Contractors don’t perform all the work onsite themselves. They generally hire sub-contractors for particular portions of a job. I describe the role of the plumber, the electrician, and the HVAC installer above, but there are also a number of other construction sub-contractors who may perform work on a particular project including masonry crews, framing crews, painters, etc.

The developer’s role is to coordinate these disparate parties and get them to act in concert in order to deliver a particular project. This description leads to the third principle of the organizational structure of development, namely, development is a complex task. It requires the coordination of many discrete players with their own particular interests. The developer’s job is to keep everyone moving towards a common goal, completion of the intended project. In doing this job, the developer frequently must make decisions with limited and incomplete information, and must understand the dynamics and motivations of the other members of the
team. This framework matches well with Eccles discussion of industries that are characterized by complexity and bounded rationality.

The “OPC Model”
Over the previous two sections, we laid out the three principles of the organizational structure of development firms, which are:

1) Development firms tend to be small on average, though they are not always in any individual instance, and there may be reasons that average size may vary based on market and product type as suggested by Somerville;
2) Development teams make buildings, and development firms assemble and disassemble development teams (Eccles model of the quasi-firm);
3) Development is a complex task marked by uncertainty, and decision-making is marked by bounded rationality, as described by Eccles (1981).

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 who 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 the diagram below.

![OPC Structure Diagram](image-url)

**OPC Structure Diagram adapted from Figure 1.1 in Poage 1990, page 4.**

There are several critical components to this OPC structure that relate back to our three principles of the organizational structure of development firms. 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 materialmen/suppliers, and sub-
contractors. 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 doesn’t 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 him and 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 that may make other
structures more desirable. 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 he must also be knowledgeable about building materials, construction cost, constructability, and the availability of certain types of labor in order to make good decisions in
the design process. Such expertise is unlikely to be held in a single person or even a 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 significant 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 on in the process. Third, the conventional OPC
relationship creates an adversarial quality in the relationship between 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 various 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 team members to protect her interests in ways that cannot be easily contracted.

Gordon has provided a thoughtful analysis that outlines some alternative options for the organization of development teams. He argues that the conventional OPC structure requires that: 1) the project is clearly defined, 2) it is well and completely designed, 3) there is no time pressure, and 4) the project is unlikely to change during construction. He argues that Owners may want to pursue a different structure based on project, owner, or market drivers that would allow them to:

1. Shorten the time period of project delivery,
2. Provide flexibility for changes,
3. Create a team atmosphere, particularly between the designer and contractor,
4. Include the contractor in the design process and get their expertise in guiding decisions,
5. Incentivize the contractor to save the owner money, and/or
6. Provide for alternative financing methods.

The Table below (taken from Figure 2 in Gordon 1994) provides a breakdown of several alternative approaches as well as the reasons that a particular Owner might organize a team in this way. In this figure, MP = Multiple Primes, GC = General Contractor, DB = Design-Build Team, CM= Construction Manager, T = Turnkey team, BOT = Build Operate Transfer, FP = Fixed Price, and R = Reimbursable Price.\(^5\)

<table>
<thead>
<tr>
<th>Drivers</th>
<th>GC-FP</th>
<th>GC-R</th>
<th>CM</th>
<th>MP</th>
<th>DB-FP</th>
<th>DB-R</th>
<th>T-FP</th>
<th>T-R</th>
<th>BOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast Track Schedule</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Sequential Schedule</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>More Flexibility</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less Flexibility</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Pre-Construction Advice Needed</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>No Pre-Construction Advice Needed</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Design Interaction</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Less Design Interaction</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Construction Financing Needed</td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permanent Financing Needed</td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Owner Financing</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In this conception, the conventional OPC model would correlate to the GC-FP structure shown in the chart above. This would mean that this structure does not allow fast-tracking, provides little to no flexibility around future changes, provides no pre-construction advice, and provides

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\(^5\) See appendix for definitions drawn directly from Gordon 1994.
no contractor financing. In particular, Eccles points out two impediments to innovation present in this conventional structure.

1) Fixed price contracts leave little room for the builder to experiment with new construction means and methods. A reliance on fixed-price contracts creates a situation where the builder has little incentive to try a new or unfamiliar approach because of the potential volatility in its cost, or, if such volatility was included in the price, then he likely prices himself out of the work given the use of bids to determine contract awards.

2) The builder and subcontractors traditionally have little room to innovate around particular products because material selection, product specification, and performance measures are the purview of the architect. This conventional OPC relationship denies the builder much opportunity to participate in decisions about form or performance. They are relegated to a role of paid technician that simply puts the known parts of a project together. Structures that decrease the adversarial nature of the P-C relationship and/or generate greater input from the builder should create more fertile ground for innovation in the final product, a building.

Other options start to address these shortcomings in development team structure. The use of a reimbursable price generates future flexibility around design changes and/or the potential for sequential scheduling. The introduction of the construction manager, multiple primes, and design-build concepts all decrease the adversarial relationship between Design Professional and Contractor, while also getting the Contractor involved earlier in the development process. Finally, the Turnkey and Build-Operate-Transfer teams provide options where both construction and/or permanent financing may be managed by the contractor rather than the owner, in addition to providing benefits that the other approaches may also provide. Gordon correctly points out that these alternative structures are not the dominant way of doing business, but they do represent some innovation in the structure and makeup of development teams in response to particular drivers. We will return to these alternative structures as we discuss the theory of the green development firm, and as we test that theory through the web-based survey and six case studies of development firms.
Chapter II. A Theory of the Green Development Firm

This chapter will investigate how these observations about the development process and development team structure build to a general theory of the real estate development firm, which allows me to tease out a special case for green development firms. This will lead to the formation of my hypotheses about how development firms should be structured to easily adopt environmental innovations. This exploration will rely heavily on Eccles and his look at firm structure among general contractors. Even though general contractors and developers are different but related entities, there is much that is helpful in this exploration; in particular, it helps illuminate critical differences between the theory of the manufacturing firm (relying heavily on Williamson) and the construction firm, a much closer cousin of developers. In fact, Eccles sums up the challenge for understanding the organizational structure of developers when he says:

“A fundamental question of economic organization is the extent to which a firm is directly responsible for producing all of the inputs required for its products. This is the general question of vertical integration. Should the firm decide to vertically integrate, it is then faced by the question of how to organize to complete the work. If the firm chooses to obtain certain inputs from other firms it faces the question of how to manage these relationships.”

The balance of this chapter will be devoted to building a theory about how development firms answer these questions about self-organization.

The Make, Buy, or Contract Decision

The literature on the theory of the firm can be distilled into two competing strands, contract and control (Gibbons 2005). Control ideas spring from Ronald Coase in his seminal paper, “The Nature of the Firm” (1937). His idea was that because transactions are not costless, firms are created around the most common routines of business, allowing a business to internalize its transactional costs and negotiate a long-term fixed price for certain things, like the labor of a given worker. To paraphrase Oliver Williamson, firms exist because it is more efficient to make decisions by fiat rather than haggling. The contract line springs from Alchian and Demsetz (1972) who argue that because of incentives to shirk in team production, firms create greater efficiencies by hiring a central manager with hiring and firing capacity who owns the residual from team production.

This control theory is nicely summarized by Brickley, Smith, and Zimmerman (1997), who lay out a continuum for every transactional decision between purchasing on the spot market and vertically integrating around a given activity. That continuum is presented in figure 1 below, adapted from (Brickley, Smith et al. 1997)
On the spot market, the business has no price control, and must pay the going rate for goods and services. At the vertical integration end, the firm internalizes this activity, and begins acquiring this particular good or service from itself. In the middle, a business creates a contract with a particular supplier. These contracts may be short-term, and may be almost the same as a spot market purchase, and they may be long-term and look almost like a vertically integrated business, but some interesting theory explaining the differences has been developed. Where a certain activity falls on this continuum has been distilled to two characteristics of the activity and its relationship to the firm’s core business:

1) How specialized the good or service is to the needs of a particular business. (Klein, Crawford et al. 1978; Anderson and Schmittlein 1984; Williamson 1985; Kim, Mayers et al. 1996)

2) How volatile the market is for the delivery of a particular good or service (Milgrom and Roberts 1994)

If a firm has a highly specialized need with a low residual value of the good or service in the second-best use, then this activity is likely to fall on the vertical integration end of the continuum. If the second-best use will pay close to as much for this particular good or service, then it is likely to fall on the spot market end of the continuum. This makes sense if we think about it. Imagine that a company A needs a certain type of tool in order to make its product, and that this tool is completely unique to their manufacturing process. If company A goes out of business, then the value of the tool is almost nothing, basically whatever can be gained from salvage of its component parts. Buying that tool in the spot market would be very risky for company A. First, it is unlikely that many people would be making them. Because there is such a limited market for the tool, only a few suppliers would have any, and those suppliers would have market power over the price. Every time company A came calling, they might increase the price by 20%, and company A would have to pay. But company A could employ other strategies. They might enter into a long-term fixed price contract for the production of the tool. Now the supplier knows how many tools are needed and when, and company A is no longer at the mercy of its supplier. In addition, company A may decide that the tool is so specialized that they need to produce it in-house and they may acquire the supplier, and internalize that production process to their business.

The other characteristic has to do with price volatility in the market for a specific good or service. If the delivery of that good or service has a very volatile price, then firms are likely to move towards the vertical integration end of the continuum. If the delivery of that good or service has a stable price, then firms are likely to move towards the spot market end. These

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6 This example is borrowed from Brickley, Smith, and Zimmerman (2003).
characteristics allow one to draw a decision matrix\(^7\) that helps predict whether a business will vertically integrate around a certain activity, purchase that good or service in the spot market, or enter into some form of a contract with a given supplier.

<table>
<thead>
<tr>
<th>Uncertainty</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Market transaction</td>
<td>Market transaction</td>
<td>Market transaction</td>
</tr>
<tr>
<td>Medium</td>
<td>Contract</td>
<td>Contract or vertical integration</td>
<td>Contract or vertical integration</td>
</tr>
<tr>
<td>High</td>
<td>Contract</td>
<td>Contract or vertical integration</td>
<td>Contract or vertical integration</td>
</tr>
</tbody>
</table>

A critique of this theory arose in the idea, first voiced by Alchian and Demsetz (1972) that it was not the control of assets, skills, or services that led to the creation of firms (control theory), but rather a way of organizing or motivating work to reduce the tendency to shirk in team production (contract theory). This theory argues that when it is difficult to measure the direct connection between your work and output (i.e. in situations with team production), workers have a tendency to free-ride on the efforts of others. As a result of this tendency to free-ride, having someone who is responsible for the structure and operation of the team, and who then receives at least part of the residual from the work of the team, creates a more efficient management process and leads to the creation and continuation of firms.

This idea also makes sense on the face of it. Imagine two scenarios for a bottle-manufacturing plant. In both scenarios, workers are paid for time not output, the owner has no active role in the management of the plant, and the plant is sufficiently large that it is difficult to measure the relationship between one person’s effort and the output of the plant. In the first scenario, the owner hires laborers under long-term contracts, but employs no management. The laborers self-organize, and they make decisions about how to organize their efforts. In the second scenario, a plant manager oversees the work of long-term laborers who work for an hourly wage. The manager shares part of the residual difference between production costs and revenue from bottle sales. The manager is also given the authority to hire and fire laborers.

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\(^7\) This figure is drawn from page 477 of Brickley, Smith, and Zimmerman (2003).
In both scenarios, the owner makes money when the plant sells bottles, meaning that the owner’s profit is a function of the costs to produce each bottle and the revenue earned from bottle sales. But which organizational structure is likely to be most effective for the owner? The contract theory of the firm says the second. In this case, the owner has created a management level where managers organize the laborers and workflow, and they receive increased compensation when the entire operation makes money. This theory predicts that the second firm will survive when the first won’t, because of incentive alignment between owners and managers.

Eccles work is an interesting extension of this case, also growing out of the contract strand of this literature. He points out that the choice to use subcontractors rather than vertically integrate may be strategic and efficient in areas like construction because of the ability to hire expertise but not maintain that expertise in-house through volatile periods of demand. Subcontracting is a preferred method because the relationship does not have to last any longer than a particular project. His investigation revolves around Williamson’s “inside contracting system” where one firm contracts with an individual or other firm for piecework and/or certain tasks under fixed price contracts, with all necessary materials, equipment, etc. provided by the subcontractor firm.

In summary, we have four critical points that will help us build a predictive model of the make, buy, contract decision around the scale and scope of developer operations. Those ideas are:

1) The need for highly specialized products or services in a production process will tend towards integration, where less specialized products or services will be purchased in the marketplace (i.e. not become part of the firm).
2) The need for inputs with highly volatile pricing in a production process will tend towards integration, where inputs with more stable pricing will be acquired in the spot market (i.e. not become part of the firm).
3) Successful firms engaged in team production (where connecting firm outputs with individual inputs is hard) will employ a manager who has control of hiring and firing and is compensated at least partially by the residual between firm revenues and costs.
4) Firm size may not be just a function of ability to integrate or not, but there may be particular circumstances where team production is more efficient with sub-contractor relationships (inside contracting) rather than vertically integrated ones. In those cases, small size results from industry characteristics, not firm performance (in fact bigger firms may perform less well).

Towards a theory of the real estate development firm

Eccles describes five drivers of inside contracting in construction and why Williamson’s eight impediments to inside contracting are not major problems for general contractors. Using this framework as a base, I will translate it into our discussion of the development firm. As I describe each driver or impediment, I will also provide commentary on how Eccles assumptions about construction relate to the development industry. Eccles’ five drivers of inside contracting in construction are listed below.
1) Inside contracting puts all the people needed to do a job in one physical location. As Eccles points out, this is almost tautological for conventional construction processes, because the project gets built on a particular site where all the laborers come to work. However, the introduction of industrial construction techniques (which has grown rapidly in the 30 years since Eccles published his study) does present an interesting challenge to this premise. In addition, co-location on a single site is one of the places where construction and development differ considerably. The development team is not necessarily assembled in a single location to carry out successive manufacturing processes, as in Williamson’s initial model. So a developer may need to emphasize the “economies of communication” that Eccles sees in on-site construction, and that communication is probably most important in the P-C relationship, which is the axis along which most critical decisions are made in a development project.

2) The general contractor has little physical capital he needs to use productively because the subcontractor provides the expertise for the use of capital. This can be even more pronounced in the development realm. A developer can subcontract for most or all of his responsibilities, remember the Joe Jackson example from earlier. This ability to bring in talent, expertise, and capacity on an as-needed basis is not only a hallmark of the development process; it may have significant advantages for the developer because he does not need to build that expertise in house, and pay to maintain it through volatile market conditions. But this also creates an agency problem—i.e. the developer is not sure whether the people he contracts with will fulfill their responsibilities. In standard economic theory, competition is supposed to handle this problem by weeding out the bad guys, but one or two bad projects may put a developer out of business, and that competitive mechanism may take too long to work.

3) Special trade contractors have incentives for efficient labor production in order to maintain competitiveness in the market for that trade. Because there is not generally a shortage of particular types of subcontractors (electricians, plumbers, HVAC subs, etc) and because engagements don’t have to last longer than one project, there are significant incentives to be efficient with labor. Otherwise, the specialized trades will be uncompetitive with others in the market. This is also generally true for developers, who have the universe of general contractors and design professionals to choose between, along with a myriad of other potential development partners.

4) The temporary nature of construction projects resolves the problems with monopoly power that the sub-contractors could have over a general contractor. The same is true for development, where the term of engagement means that the developer’s partners have to continually prove their value to the development firm.

5) Information flow is improved by having all parties at the same site. Like the closely related discussion in point 1, above, generally all parties to a development agreement do not do the majority of their work at the site. The best developers are able to create an environment where information flow happens despite any challenges around the geographical separation of team members, and a focus on building a stronger P-C relationship is critical in that effort.
Eccles also recounts Williamson’s eight constraints to inside contracting, which he claims are mostly not a problem for general contractors because of their differences from standard manufacturing firms (Williamson 1976; Eccles 1981). Those constraints are:

1) The inside contracting structure can create a bilateral monopoly. Eccles argues that this is not a problem in construction because of the temporary nature of the contracts. The same would be true for development.

2) Periodic renegotiation of agreements encourages the hoarding of information. Eccles argues this is not a problem because the market price is knowable (there are many providers of any service even though quality may not be consistent) and constantly being re-established. The same would be true for development agreements.

3) It’s difficult to regulate the flow of components in an inside contracting structure. Eccles argues that there is no component flow in construction. Everything comes to the site and is built there. In development, this problem exists, and one of the central challenges for the developer is ensuring that the right members of the development team have the right information and resources at the right time. Work product really does need to flow from the Design Professional to the Contractor to the Lender to the Environmental Consultant, etc. and back again in this series of iterative loops. While many of the components of development are not physical products (as in manufacturing) this same challenge is present with the sharing of information.

4) Inside contracting leads to excessive work-in progress, and later-stage processes will waste components from early stage work. Eccles claims this is not a problem in construction because the trades rely on each other. In development, this can be managed through the draw process, where work is only paid for as completed, inspected, and accepted by the Design Professional or Owner.

5) Inside contracting can lead to situations where contractor incomes are excessive in relation to the capitalist. Eccles argues that this is not a problem in construction, and provides data on the average compensation earned in general construction versus specialized construction. The wages earned in general construction are higher. In development, it is likely that a similar situation is true, but because there is no good data on real estate development firms from NAICS, it is unclear how to make the comparison quantitatively.

6) Equipment is not utilized and maintained well under an inside contracting structure. Eccles argues that this is not a problem in construction because of the short-term nature of projects, and the need to maintain competitiveness in a marketplace with lots of competition. The same situation is true for development.

7) Inside contracting drives innovation on labor-saving approaches, rather than material saving. Eccles argues that selecting construction materials are not in the Contractor’s or Sub-contractor’s scope so it’s not a problem. This is not true for development, where both labor-saving and material-saving innovations may be desirable. In addition, the standard contract forms for development (fixed-price for Contractor, percentage of construction for Design Professional) do not create an environment where material-saving innovations are likely to be paramount. It’s likely related that, globally, buildings use 40% of raw materials produced annually (Lennssen and Roodman 1995).
There are few incentives for product innovation in an inside contracting structure. Eccles argues again that this is unimportant in construction because product innovation is not in the contractor’s scope. But this is not true for development, just like above. And there is much evidence that the development industry (along with construction) lags other industries in the development of new products (Oster and Quigley 1977; Egan 1998; Pauly 2005).

To sum up, developers would experience many of the same drivers towards inside contracting that builders do, especially a desire for the efficient use of capital, a desire for the efficient use of labor, and recognition that projects are temporary which solves the monopoly issues that could develop in longer-term engagements. However, the nature of the development process makes physical co-location and information sharing somewhat remote from the framework laid out by Eccles, and places more emphasis on creating a strong working relationship between the Design Professional and Contractor. With respect to the impediments to inside contracting, a developer faces obstacles that the contractor does not. The problems of bilateral monopoly, information hoarding, excessive work-in-progress, excessive income for the contractors, and poorly maintained equipment are not likely impediments for developers. However, regulating the flow of components, a lack of material-saving innovations, and a lack of product innovation may all impact the operations of a developer or development firm. These problems might drive them away from inside contracting or push them to create special innovations that allow them to address these problems through contracts.

Beyond this, there are at least four major differences between real estate development and a conventional industrial process that motivate organizational form in real estate development. Those four differences are 1) product uniqueness, 2) on-site assembly, 3) local regulation, and 4) localized markets. What do we mean by each of these terms?

1) Product uniqueness argues that the process of building any particular building has never happened before and will never happen again. A development firm gets one chance to make that particular building (DiPasquale and Wheaton 1995; Geltner and Miller 2001).

2) On-site assembly refers to the fact that most buildings are made by having component parts shipped to the site where the building will be used and then put together. During assembly the component parts are exposed to the weather and subject to handling by a large number of subcontractors who are acting with limited oversight, in comparison to factory-based production (Eccles 1981; Gordon 1994).

3) Local regulation points out that unlike other industrial processes, development is regulated locally as a police power, and there is wide variation between municipalities around the cost of doing business as a developer (Oster and Quigley 1977; DiPasquale and Wheaton 1995; Geltner and Miller 2001; Koebel 2008).

4) Finally, real estate products trade in a highly localized market, and not a national or international one. Buildings are not transferable between locations, and one cannot understand the real estate market nationally. You have to look at the price for particular types of space in
particular locations, i.e. office space in Chicago (DiPasquale and Wheaton 1995; Geltner and Miller 2001; Bradshaw 2006).\(^8\)

While it is true that many aspects of the development process are replicable and can even become rote, every project is unique in some way, causing at least some level of specialization within the team that is fairly uncommon in most industrial processes. Based on our previous discussion of the theory of the firm, this uniqueness creates pressure to internalize some goods and services needed for production to the firm, either through contracting or vertical integration. Consider a particular building, the value of that building in its second-best use may be significantly lower than the first. Development projects also have a long production process, and market conditions change during the timeline that it takes to complete a project. Very frequently, someone begins a deal in a time when demand for a particular product is strong, and by the time they finish the project that segment of the market is overbuilt. A building is also capital intensive to create, and the level of risk taken on by many developers is well beyond their personal ability to repay. In effect, many real estate projects have two potential outcomes for the development firm: the project is successful or the firm (possibly along with its principals) goes bankrupt. This represents significant volatility, and would also push developers towards creating greater access to capital, which would allow them to muddle through downturns and survive until the market was stronger. In practice, some mechanisms to deal with this problem have been developed. First, developers quite commonly have relationships with large-scale capital interests, either with high-net worth individuals or with other institutional grade investors like banks, life insurance companies, and pension funds. In addition, successful developers frequently become high net worth individuals, effectively allowing them to act as their own financing source. Second, some firms that engage in development activities (REITs and REOCs) have created new mechanisms and legal structures that provide access to public capital markets. This creates a financing efficiency that has historically been lacking in development. Third, firms frequently utilize strategies that minimize the volatility of their assets. These might include internal rules about loan to value, lease guarantee requirements, developing only in supply-constrained geographies, and more. Over the long-term these strategies are a hedge against catastrophic events, like project or firm bankruptcy.

Development projects are also highly durable, and they are expensive to replace or change once they are completed. There is a high premium placed on getting something right the first time since how it is done the first time is likely how it will stay for a generation or longer. Again, this points development towards the vertical integration end of the continuum, emphasizing the developer relationship to design and construction services. There is a difference, however, between being pushed to the vertical integration end of the continuum and being pushed to

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\(^8\) Granted, there is some heterogeneity in this, i.e. the residential market is most localized (one is not likely to move across the country because you found a nice apartment) and more regional/national markets develop for more homogeneous space (i.e. a retail facility may want to locate in a certain type of building in the Southeast or the market for self-storage may be under-supplied in Georgia), but the basic premise holds. Geography is a critical component of the market for space, in a way that it is less important in the market for tires or shoes, which can theoretically be shipped anywhere.
vertically integrate with design and construction, which is well described in Eccles. As we have seen earlier in this chapter, there may be strategic reasons that project to project contracts with design and construction services are preferable for a developer rather than true vertical integration. First, there is a problem with having to pay for these services in house when demand is quite volatile, and developers may not be able to afford such services in the valley of the economic cycle. Second, there is an efficiency that has been developed in the industry about how such contracting relationships work, and a developer can rely on the norms and processes that have been created. Third, allowing for specialization may create greater labor productivity overall because the Contractor, Design Professional, Sub-contractors, etc. will become very good at doing one particular thing in the development process, and therefore can deliver that thing much more efficiently than a firm or person seeking to do many things. In effect, this labor productivity argument is really a dressed up version of an argument about scale economies – i.e. a design firm may reach greater efficiency and productivity by getting really good at design, rather than also getting good at construction or development.

Despite any pressure to integrate (and create larger development firms), the first principle of the structure of development firms theorizes that they are small, on average. There are several other industry characteristics that support this empirical result. First, many places have fairly nebulous rules for development, particularly big projects, and much of the work of the developer is to secure the necessary entitlements to carry out the vision for the project. Not only is this a long and painstaking process with unclear direction in many cases, but it is particular to the municipality in which the project is proposed. So just because one understands the permitting process in San Diego does not mean that he will be able to navigate the same process in Fresno. This characteristic points away from horizontal integration (i.e. working in many geographies at once) and is supported by the work of Somerville and Oster and Quigley. Second, developers experience lumpy returns, and they have highly varied access to capital. Because the time lag between payoffs is so long (a characteristic of the long production process and an uncertain regulatory environment) it is hard for a development firm to create a highly integrated company that controls suppliers and labor used in production. The lumpy and uncertain nature of the returns from development mean that there is a lot of pressure to maintain a small, efficient labor pool in house and to contract with other factors of production especially construction labor, material suppliers, and debt investment. Where other firms might attempt to vertically integrate to control their production and supply chains, most developers do not do this. The lack of integration may be a function of inability, or (as suggested by Eccles) it may be a function of strategy. This question underscores a distinction between a development firm and a development project.

While development firms, from project to project, will keep a lean staff, they will very quickly scale up their ability to deliver on projects by creating fairly long-term contractual relationships with other parties that fill in the areas of expertise and product distribution that they do not have. This generally includes design services, construction services, debt investment, and the supplying of materials, systems, and building components. In a sense, the development team becomes Eccles quasi-firm delivering on a particular project in a particular time period, before it is dissolved again, with the participants left to pursue other opportunities.
This underscores the importance of contract law in development, and how contract law has established well-worn relationships between the various actors in a development project, most especially the Owner, Design Professional, and Contractor. These well-worn contractual relationships make it much easier to assemble, dissolve, and reassemble the factors of production needed to create buildings and develop property. However, it also means that these relationships rely on institutional norms and modes of practice much more frequently than in other industries. It is also of note, that we are not discussing spot market transactions. Because of the nature of the real estate product, spot market transactions are avoided, but because of the timing of the cash flows, full vertical integration is rarely possible and probably not desirable. Most developers would prefer to be in the inside contracting space described by Eccles, as it responds better to their size, capacity, and the characteristics of their industry, especially complexity/uncertainty coupled with bounded rationality.

The creation of Real Estate Investment Trusts (REITs) and Real Estate Operating Companies (REOCs) add an interesting wrinkle to this argument. The financial and legal innovation behind REITs and REOCs provides these development companies access to public capital markets. In the history of U.S. based real estate development, this is a fairly new innovation, and one that arguably has not had time to reach equilibrium with respect to the size of firms. Through access to public capital markets and liquidity, REITs and REOCs have an opportunity to tunnel through the financial challenges to scale like lumpy returns, varied access to capital, and long-lead times between payoffs from development. While entrepreneurial development is a small piece of the revenue of these firms, their access to capital and frequent integration with property management allows them to reach a scale where they can operate in many markets at once, something that has been predicted in other research (Egan 1998; Pauly 2005). While such a larger-scale development firm would have no particular advantage with respect to local regulation, this challenge points towards a particular organizational structure already contemplated by Williamson (1975). His M-shaped Enterprise involves a central office that provides strategy, back-office services, and access to capital while semi-autonomous satellite offices could operate in a similar fashion to traditional real estate development firms, including the navigation of a localized regulatory process. In effect, firms with access to public capital markets should be in better position to integrate, given the pressures to do so within development (i.e. it is a unique, very durable product that requires significant capital investment), and they should be uniquely positioned to overcome the financial challenges to scale. This should give them an advantage over smaller firms in the long run, and one would expect to see REITs and REOCs both growing in firm size and market share over time. This should also give them an additional advantage to other more localized firms, the ability to diversify across real estate markets, which should help them weather the boom and bust cycles of the industry. This will only increase their market dominance in the long run.

There are several dominant assumptions in this analysis that deserve mentioning. 1) Development firms are organized in order to make money. In this initial attempt at understanding the structure and nature of the development firm, this is the single motivating force – a desire for profit. 2) The norms and standards of practice are critical in the industry

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because of the reliance on standard contract forms to lessen transaction costs between different actors in the development process. This need for contracts is the result of a central tension in the development industry: the product of development pushes firms towards integration, but long lead times, lumpy returns, lack of scale economies due to the fractured nature of the regulatory environment, and the strategic advantages of inside contracting prevents significant integration from occurring in the industry, at least within smaller, localized firms. My theory is that this ability to contract easily has replaced the need for full vertical integration on an inter-project basis and has evolved to a situation where the legal, financial, and functional relationships between parties to a development project are so well understood and well litigated that the assembly, dissolution, and re-assembly of the team can happen very easily.  

**Why green development is hard**

Environmental innovation in development or green development is defined for this study as double-bottom line in its approach, meaning that the developer is working towards goals for financial and ecological performance. This is considerably different than what we saw in the conventional model of development where nothing other than financial performance mattered. In practice, ecological performance may take on several forms. The most common forms reflect an approach that has been described as eco-efficient (McDonough and Braungart 2002), meaning that the approach focuses on minimizing ecological damage throughout the building’s life cycle (from construction through operation and demolition). This would include things like using energy-star appliances, replacing your incandescent bulbs with CFLs, buying materials from near the construction site, and other things intended to do less harm than standard practice. Another approach has been labeled eco-effective (McDonough and Braungart 2002), meaning that the approach is intended to repair previous damage and do more things that grow the stock of resources available to building users. The eco-effective approach eliminates the concept of waste by making the output of any process an input for another, by breaking the world into biological (compostable) and technical (very long-lasting – think steel) nutrients, and by removing mutagens, carcinogens, and other harmful materials from the supply chain altogether. Such an approach would include developing buildings that produce all of their own energy, that purify water and air, or that grow food for their users. There are many rating systems that have been developed which attempt to measure the performance of buildings in one or both of these ways. Eco-efficient systems include the Leadership in Energy and

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9 As discussed above, it may be that REITs and REOCs have a structure that allows them to overcome these obstacles to scale.

10 This is not intended to imply that the characteristics of individual firms don’t matter, in the sense of quality versus price competition which will be discussed later in this study. I am simply trying to point out that contracting for development team members is a remarkably easy thing to do given the level of complexity involved in the ultimate development product, and this is a critical aspect of the industry structure.

11 Many green developers, including myself, are self-consciously triple-bottom line, meaning that they also have goals around social equity and community, but this definition does not preclude the triple-bottom line developer from being green.
Environmental Design program (LEED) promulgated by the US Green Building Council, the Green Building Standard promulgated by the National Association of Homebuilders, Energy Star promulgated by the US Environmental Protection Agency, Building America promulgated by the US Department of Energy, and scores of local and state programs. Eco-effective systems include Cradle to Cradle™ promulgated by William McDonough and Partners, and McDonough Braungart Design Chemistry and the Living Building Challenge.

Environmental innovation, which will be used interchangeably with the term green development throughout, presents problems for the conventional real estate development firm. Rather than an entrepreneurial team organized solely around making money, green development projects are organized around making money and meeting goals for environmental betterment. These environmental goals require a rethinking of the product of development (a building), but more than that they point towards a reorganization of the development process that cuts against established norms in the field, and changes well-trod contractual relationships between firms that are constantly being assembled, dissolved, and reassembled in the development process. This reordering of relationships is significantly problematic because it causes friction at every level of the development process. To understand more about how this may work, we will start by looking at research on innovation in construction, despite the important caveat that a real estate development firm and a construction firm are distinct, but related businesses. In particular, innovations in construction are likely to be sustaining in nature, meaning that they are a variation on an already established idea (doing something better). In contrast, innovations in development are likely to be disruptive or transformative in nature (doing something different altogether) as a way of pushing the industry towards a new path. This rule is certainly not hard and fast, and we will return to it later, but one should keep that in mind as we discuss the literature on innovation in construction.

C. Theodore Koebel carried out a national survey of construction firms (Koebel, Papadakis et al. 2004) and later wrote about the influence that planning practice can have on innovation in homebuilding (Koebel 2008). He finds that residential construction firms bear significant risk from building product innovations, while receiving little reward (Koebel 2008). Beyond this, he supports much of the accepted knowledge about the structure of construction firms, ideas that are transferable to development firms. Those characteristics include:

1) Construction firms are characterized as a small, fragmented group (Oster and Quigley 1977; Egan 1998; Pauly 2005)
2) Construction firms lag other building-related industries (design, engineering, etc) in the adoption of technological innovations, and under-invest in research and development (Oster and Quigley 1977; Koebel 1999)
3) The fragmented regulatory environment around construction and development (where local jurisdictions are responsible for setting and enforcing rules) further restricts

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12 The use of sustaining and disruptive in this context borrow from the work of Christenson and Raynor.
innovation adoption by decreasing the market reach of innovations (Oster and Quigley 1977).

4) The builder receives little benefit when innovation improves performance (Koebel, Papadakis et al. 2004).

Koebel has also looked at the characteristics that motivate innovation in construction and found that increased profit, decreased construction costs, and reduced build time are the three least important benefits driving innovation in construction for both large and small builders. To state this another way, builders don’t try to innovate because they see it as a short-term cost savings (in time or money) or because they believe their profits will go up in the short run, and this sensibility is independent of size (i.e. small builders and large builders have the same results). The three most important reasons for innovating, among builders in Koebel’s survey, did vary between small and large builders. For large builders, the three most important drivers were increased quality of homes built (64% of respondents), helped meet customers’ expectations (46% of respondents), and increased competitiveness (45% of respondents). For small builders, the three most important drivers for innovation are: increased quality of homes built (74% of respondents), created image as an innovative builder (41%), and helped meet customers’ expectations (38%). Despite the variation in their answers, both small and large builders were adopting innovation as a way of making themselves more competitive in the long-run and improving their reputation as a company.

This result implies a long-run view for both small and large construction firms when making decisions about innovation adoption. Both small and large firms innovate for long-run benefits that have to do with a continued presence in a market, rather than short-run benefits that are related to the maximization of profits on a particular job. Construction firms that have chosen to innovate have done so not because it makes them more profitable in the short run, but because they expect it makes them more competitive in the long-run.

These ideas echo a point made earlier in the discussion of cost-benefit studies about green development. Most of these studies treat the costs and benefits of a particular approach as if they are certainties. A different (and likely more accurate) kind of evaluation would involve simulating the costs and benefits of an innovative project and a standard project multiple times, like one might simulate the performance of a stock portfolio, including the uncertainties attached to the various stages of production in each project. Comparing these simulations might show that while the innovative project performed better on average (which is what the standard cost-benefit study is saying), it also has a higher chance of losing money. Over multiple simulations, this would be offset by higher chances of big gains but an undercapitalized development firm may have a primary focus not on maximizing return but on getting acceptable return while minimizing downside risk. In that case, they would stay away from

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innovation. The results of Koebel’s work may be telling us something similar to that in reverse. Here, we are seeing firms that have taken a long-run view and therefore invested in innovation. In other words, they believe they will survive to see the bigger (albeit more volatile) payoffs from an innovative approach.

Despite the significant corollaries between Koebel’s work and this research, there are significant differences. This thesis is not focused on general innovation in construction firms, but rather environmental innovation in development firms and so confronts two critical gaps in the literature on innovation in construction. First, environmental innovation is a particular type of innovation, and lessons about innovation generally may not apply to environmental innovation specifically. Second, as we have already mentioned, a construction firm is not a development firm. Both of these gaps start to be addressed by thinking about the difference between a sustaining innovation and a disruptive innovation as discussed by Christensen and Raynor (2003).

Innovation in construction, as we have discussed it so far, is largely a series of sustaining innovations that are incremental in nature, and do not fundamentally transform the process of construction. In effect, you build green by selecting a series of alternative products that replace other products used in the building process (an eco-efficient approach). Adoption of green building practices may never reach beyond a sustaining innovation for a builder. You take widget A and replace it with widget B in your construction process. However, the rub that green building puts in the theory of the development firm we were building earlier cuts right to the core of how development happens in the United States. For a development company, green building is a disruptive innovation that requires a rethinking of all the processes of development and forces significant changes in practice. In order to create real estate projects that are green in the most cost-effective and repeatable manner, one must fundamentally change the set of relationships on which the conventional development process is based. These changes reach into the structure of the team, the nature of financing for the project, who bears ongoing performance risk, the tenure of ownership, and the timing of when certain types of consultants are used in the development process. In particular there are three critical challenges created by green development.

1. The norms for the assembly/disassembly of a team are upset. That team is no longer trying to deliver the best building it can for everyone to make money. The team now has to concern itself with the realm of environmental innovation, and this will reduce the possible universe of partners that a developer could use on a project, possibly upsetting Eccles notion that the market for development-related services is large (i.e. there may only be one general contractor in a particular market with the experience one needs in green commercial construction).

2. The greening of the building may create a bigger upfront investment in the structure. This leads to changes in the temporal nature of payoffs, and means that financing relationships will be different. Some developers (REITs and other big players) may be better suited than others to take on these challenges, and some development team structures may also work better than others in delivering such projects.
3. The developer needs to invest in inter-project learning in order to deliver the best green building possible. This is especially true when you start doing things like making buildings that purify water and air. How does one begin to do that? This investment in learning over the long-term causes more changes in relationships and also spreads risk in new ways.

To be more specific, based on these challenges developers must have a different relationship with investors because the temporal payoff from double-bottom line projects is frequently longer, the contractor needs to participate in a different phase of the design/development process with different responsibilities whose risks aren’t well understood, the design firm has to give up some control over design decisions without knowing what that does to their liability for performance, the contractor has to use materials and systems that may be unfamiliar, and the relationship between suppliers, materialmen, subcontractors, and the contractor is likely to be different with unclear impacts on pricing, long-term product liability, and how rewards are shared for successful innovation. In short, green development requires closer coordination of various processes that heretofore were much more independent of each other. This likely requires a greater degree of developer control.

Beyond this, green innovation makes inter-project relationships more valuable, and price competition in the letting of contracts less important. In effect, there are at least four areas where the disruptive nature of environmental innovations creates significant problems in the development process.

1) Investment – By taking on a green project, the developer has changed the temporal nature of the payoff from development. Green development may create super-normal returns over the long-term for a variety of reasons, as Miller, Spivey, and Florance, and Eicholtz, Kok, and Quigley have claimed, but there is much debate over that idea. Where there is wide agreement between proponents and opponents of green development is the idea that greening creates at least some up-front increases in cost (through having a larger development team working for a longer period of the development process and/or through an increased first cost for the building). An increase in up-front cost means that the financing and investment structure of the project needs to be nudged in some ways. Many early green projects utilized developer cash or guarantees to satisfy these up-front premiums, but to institutionalize the process of green development in a way that makes it easy would require a rethinking of how investment flows into a project, and when returns are expected. In addition, this idea of higher (on average) but more volatile returns points out an interesting possibility that may restrict any individual company’s appetite for green innovation because they worry that increased volatility puts them at higher risk of any particular project failing (and possibly taking the company with it).

2) Design and Construction expertise – We discussed the adversarial relationship that can develop between contractor and design professional as one of the drawbacks of the conventional OPC relationship earlier in this study, but the process innovation of green development makes a strong design professional – contractor relationship even more
critical. Green buildings do not have typical pieces and parts, and they do not utilize typical methods for assembly. This means that without excellent communication between Owner, Design Professional, and Contractor, the project could very easily miss its performance targets or spiral out of budget. In addition, a team approach becomes critical for incorporating the knowledge and experience of everyone on the team in a way that improves overall performance. For that reason, I would expect to see that green developers are starting to adopt organizational structures that lead to a more team-based approach to the OPC relationship and that involve the contractor earlier and with greater authority than a conventional, linear bid process.

3) Developer control – I would expect that green projects will result in developers taking a much more active role in the delivery of their projects, especially the design and construction of their buildings. In contrast to the conventional OPC relationship described earlier, it is difficult to imagine a green developer entrusting so much responsibility to her architect or requiring so little thinking from her contractor. To deliver a project that incorporates environmental innovation will require the best efforts of everyone involved, and those efforts will be coordinated more directly by the developer.

4) Industrial construction and CAD/CAM techniques – As we discussed earlier, most construction happens by having suppliers ship a bunch of materials to a site where they are exposed to the elements, and then installed by a series of sub-contractors acting with limited oversight. This is a difficult scenario for a developer interested in improving the environmental performance of her development because too much is left to chance. The right system or material may get installed wrong. Unnecessary amounts of material may get thrown away. Certain materials may become toxic through exposure on site while they are waiting to be installed. Industrial construction and CAD/CAM technologies present a solution that provides a greater level of control in green development. By building everything off site in a factory, the developer can retain more control in a centralized facility that is protected from the elements and where waste streams can be more effectively managed and controlled.

Based on this analysis, my hypotheses are that development firms who have been leading adopters of environmental innovation share some characteristics.

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. ¹⁵

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-

¹⁵ One way of testing this idea will be to investigate whether products that lend themselves to long-term investment (rental housing and office space) are more frequently greened than for sale housing. Unfortunately, my sample does not allow me to test this particular point.
project learning, and negotiated bid arrangements whereby the providers of design and construction services in particular 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.

4) Early adopters of environmental innovation have moved aggressively towards industrial construction and CAD/CAM construction techniques because it gives the developer more control over the installation of products and the ability to reduce waste.

I test these hypotheses by asking developers how they have adopted and failed to adopt environmental innovation in development. This survey occurs in 3 parts. First, I carried out an original, web-based, large N survey of mostly green developers. In doing this, I collected critical demographic information about 102 unique development firms, and got a glimpse of the changes they made and did not make in their development process as a result of greening. Second, I carried out interviews with three leading adopters of green development, one firm whose first green project went bankrupt, and one firm that has rejected green development as a practice. These analyses capture the story of how and why these firms adopted or rejected green development practices and processes. Third, I carried out a participant observation of my own firm, Green Coast Enterprises, which has become a regional expert in green development for hot-humid coastal climates.
Chapter III. The Why and How of Green Development

In the last two chapters, I laid out a working model of the development industry that predicted specific ways in which green practices would disrupt the processes of traditional development firms. I also showed how we would expect conventional developers to behave, and was able to juxtapose that against the expected behavior of green development adopters. In doing this, I predicted that green development adopters would take certain approaches to address these challenges.

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.

4) Early adopters of environmental innovation have moved aggressively towards industrial construction and CAD/CAM construction techniques because it gives the developer more control over the installation of products and the ability to reduce waste.

To test these hypotheses I carried out an original large N survey with development firms. That survey provides a broad-based understanding of how frequently firms engaged in green development also engaged in these practices. This chapter will describe how that survey was carried out and analyze the survey results.

Finding Respondents
I assembled a list of 1,085 firms involved in the real estate development industry largely from two websites: 1) Five hundred and thirty-six (536) firms came from the US Green Building Council’s (USGBC) member list for groups classified as Real Estate Service Providers (they have no category for developers), and 2) Four hundred and ninety-three (493) firms came from the participants in the Builder’s Challenge program of the US Department of Energy (DOE). The additional fifty-six (56) firms were organizations involved in real estate development to which I had a personal connection. In addition, I asked friends and family involved in the industry to fill out my survey during a pilot phase which helped me to revise the survey instrument. I received 12 responses during this pilot phase. I have included these responses in my results. It is

\[1\] By I, I mean that my research assistant, Marda Lugar, assembled this list, for which I am overwhelmingly grateful.
important to point out that 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. I cannot say much about why firms chose not to develop green buildings), but also creates an interesting perspective for interpretation, especially as it relates to my hypotheses.

I sent every potential respondent firm a personal email beginning on February 14th, 2010 asking that they participate in the survey. I sent this note with a read receipt from my Massachusetts Institute of Technology (MIT) webmail account, and confirmed that two-hundred and ninety of these emails were read by the intended recipient, and forty-seven survey responses were received from this group. Another sixty-three email requests were deleted without ever having been opened. Seven hundred and thirty-two emails generated no read receipt response. Of these, forty-three 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. This note also came from my MIT webmail account, and included instructions for checking my identity to ensure I was an MIT student. I closed the survey on March 20th. All results were compiled on SurveyMonkey, where the survey was designed and disseminated.

There were significant data problems with my list of potential respondents. First, neither is a list 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 policy-makers, 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 my study population. Third, the real estate industry has struggled during this financial downturn, and fifty-nine firms no longer had working email addresses. In addition, some of the firms where I got no read receipt response may have gone out of business or terminated the position of my company contact. Fourth, these lists are heavily slanted towards firms who are interested in green building and energy efficiency. I tried to address these shortcomings in the following ways:

1) I attempted to remove groups who were not development firms from my 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, I did not find a single respondent who doesn’t seem to undertake some development activity.

2) I removed firms from my participant list if they had an international phone number. I received no responses from firms who did all of their work overseas, though several

---

17 Text of letter available as an appendix.
18 Text of second letter available as an appendix
19 I received several responses to the first email doubting my purpose and student status.

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respondent firms were international with a US headquarters. I kept these US-based firms in my respondent list.

3) I removed firms if my email was undeliverable. In two cases, respondents had started new firms under a different name than what was in my list but retained the same email address. I accepted those responses into my results.

4) I included a non-adopter of green building practices in my follow-up interviews, as well as a firm who had a negative experience with green development.

Once groups who are not developers, groups who have an international phone number, and undeliverable email addresses were removed from my list of potential respondents, I was left with a population of 955 potential respondent firms. From this group, I received 102 unique responses, 90 not including the pilot responses, for a total response rate of around 10% (9.4% not including pilot, 10.6% including pilot). The respondent firms were geographically distributed as follows:

Table 1. Region where company is headquartered

<table>
<thead>
<tr>
<th>Region</th>
<th>Unique responses</th>
<th>Percentage</th>
<th>Unique excluding pilot</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northeast</td>
<td>28</td>
<td>27.5%</td>
<td>27</td>
<td>30.0%</td>
</tr>
<tr>
<td>Midwest</td>
<td>8</td>
<td>7.8%</td>
<td>7</td>
<td>7.8%</td>
</tr>
<tr>
<td>South</td>
<td>45</td>
<td>44.1%</td>
<td>35</td>
<td>38.9%</td>
</tr>
<tr>
<td>West</td>
<td>21</td>
<td>20.6%</td>
<td>21</td>
<td>23.3%</td>
</tr>
<tr>
<td>Total</td>
<td>102</td>
<td>100.0%</td>
<td>90</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Characteristics of the respondent firms

The median respondent firm in my study 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 as shown in Table 2 below. Many firms did not specialize in one of these areas, but developed several types of projects. The tables below show some of the basic demographics of the firms who responded and their leadership.

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20 This result is not representative of the development industry and it alone indicates that my 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.
Table 2. Type of Development Projects Undertaken (94 responses)

<table>
<thead>
<tr>
<th>Type of Project</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-Family</td>
<td>52.1% (49)</td>
<td></td>
</tr>
<tr>
<td>Multi-Family</td>
<td>52.1% (49)</td>
<td></td>
</tr>
<tr>
<td>Mixed-Use</td>
<td>50.0% (47)</td>
<td></td>
</tr>
<tr>
<td>Industrial</td>
<td>29.8% (28)</td>
<td></td>
</tr>
<tr>
<td>Retail</td>
<td>23.4% (22)</td>
<td></td>
</tr>
<tr>
<td>Other (please describe)</td>
<td>20.2% (19)</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Size of Respondent Firms (Total respondents for each question in last column)

<table>
<thead>
<tr>
<th>Metric</th>
<th>&lt; $1 million</th>
<th>$1 to $5 million</th>
<th>$5 to $10 million</th>
<th>$10 to $20 million</th>
<th>over $20 million</th>
<th>Total Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Revenue</td>
<td>39%</td>
<td>31%</td>
<td>10%</td>
<td>3%</td>
<td>16%</td>
<td>87</td>
</tr>
<tr>
<td>Residential Units Annually</td>
<td>77%</td>
<td>14%</td>
<td>7%</td>
<td>0%</td>
<td>3%</td>
<td>74</td>
</tr>
<tr>
<td>Commercial/Industrial SF annually</td>
<td>71%</td>
<td>14%</td>
<td>3%</td>
<td>2%</td>
<td>10%</td>
<td>63</td>
</tr>
<tr>
<td>Number of Employees</td>
<td>57%</td>
<td>19%</td>
<td>4%</td>
<td>7%</td>
<td>13%</td>
<td>90</td>
</tr>
<tr>
<td>Firm Capitalization</td>
<td>71%</td>
<td>5%</td>
<td>8%</td>
<td>6%</td>
<td>10%</td>
<td>78</td>
</tr>
</tbody>
</table>

Table 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.
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 Pauly, Egan, and others and that we discussed in previous chapters.

Table 4. Age of Top Five Executives (Total respondents in last column)

<table>
<thead>
<tr>
<th>Age</th>
<th>Under 40</th>
<th>40-50</th>
<th>50-60</th>
<th>60-70</th>
<th>70+</th>
<th>Total Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person 1:</td>
<td>16%</td>
<td>37%</td>
<td>34%</td>
<td>10%</td>
<td>3%</td>
<td>98</td>
</tr>
<tr>
<td>Person 2:</td>
<td>21%</td>
<td>45%</td>
<td>28%</td>
<td>6%</td>
<td>0%</td>
<td>47</td>
</tr>
<tr>
<td>Person 3:</td>
<td>27%</td>
<td>37%</td>
<td>30%</td>
<td>7%</td>
<td>0%</td>
<td>30</td>
</tr>
<tr>
<td>Person 4:</td>
<td>36%</td>
<td>50%</td>
<td>14%</td>
<td>0%</td>
<td>0%</td>
<td>14</td>
</tr>
<tr>
<td>Person 5:</td>
<td>11%</td>
<td>33%</td>
<td>22%</td>
<td>22%</td>
<td>11%</td>
<td>9</td>
</tr>
</tbody>
</table>

Table 4 shows that the top executives in my respondent firms tend to be between the ages of forty and sixty with some significant representation from people under forty.

Table 5. Gender of Top Five Executives (Total respondents in last column)

<table>
<thead>
<tr>
<th>Gender</th>
<th>Male</th>
<th>Female</th>
<th>Total Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person 1:</td>
<td>84%</td>
<td>16%</td>
<td>98</td>
</tr>
<tr>
<td>Person 2:</td>
<td>79%</td>
<td>21%</td>
<td>47</td>
</tr>
<tr>
<td>Person 3:</td>
<td>77%</td>
<td>23%</td>
<td>30</td>
</tr>
<tr>
<td>Person 4:</td>
<td>71%</td>
<td>29%</td>
<td>14</td>
</tr>
<tr>
<td>Person 5:</td>
<td>67%</td>
<td>33%</td>
<td>9</td>
</tr>
</tbody>
</table>

Executives in my respondent firms were overwhelming male, as seen in Table 5.

Table 6. Education level of Top Five Executives (Total respondents in last column)

<table>
<thead>
<tr>
<th>Highest level of education achieved</th>
<th>High School Diploma</th>
<th>Some College</th>
<th>Associates Degree</th>
<th>Bachelors Degree</th>
<th>Some Graduate School</th>
<th>Graduate Degree</th>
<th>Total Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person 1:</td>
<td>5%</td>
<td>8%</td>
<td>5%</td>
<td>34%</td>
<td>7%</td>
<td>40%</td>
<td>99</td>
</tr>
<tr>
<td>Person 2:</td>
<td>4%</td>
<td>2%</td>
<td>4%</td>
<td>32%</td>
<td>6%</td>
<td>51%</td>
<td>47</td>
</tr>
<tr>
<td>Person 3:</td>
<td>6%</td>
<td>6%</td>
<td>3%</td>
<td>48%</td>
<td>3%</td>
<td>32%</td>
<td>31</td>
</tr>
<tr>
<td>Person 4:</td>
<td>0%</td>
<td>7%</td>
<td>0%</td>
<td>43%</td>
<td>14%</td>
<td>36%</td>
<td>14</td>
</tr>
<tr>
<td>Person 5:</td>
<td>0%</td>
<td>22%</td>
<td>0%</td>
<td>44%</td>
<td>22%</td>
<td>11%</td>
<td>9</td>
</tr>
</tbody>
</table>

The table above shows that nearly half of the top level executives in my respondent firms had a graduate degree or had pursued some graduate school. Over eighty percent 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.
Table 7. Development experience of Executives (Total respondents in last column)

<table>
<thead>
<tr>
<th>Years of Development Experience</th>
<th>Less than 5</th>
<th>5 - 10</th>
<th>10 - 20</th>
<th>20 - 30</th>
<th>over 30</th>
<th>Total Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person 1:</td>
<td>13%</td>
<td>18%</td>
<td>23%</td>
<td>25%</td>
<td>22%</td>
<td>97</td>
</tr>
<tr>
<td>Person 2:</td>
<td>15%</td>
<td>9%</td>
<td>37%</td>
<td>33%</td>
<td>7%</td>
<td>46</td>
</tr>
<tr>
<td>Person 3:</td>
<td>17%</td>
<td>17%</td>
<td>27%</td>
<td>27%</td>
<td>13%</td>
<td>30</td>
</tr>
<tr>
<td>Person 4:</td>
<td>14%</td>
<td>29%</td>
<td>36%</td>
<td>21%</td>
<td>0%</td>
<td>14</td>
</tr>
<tr>
<td>Person 5:</td>
<td>0%</td>
<td>10%</td>
<td>40%</td>
<td>20%</td>
<td>30%</td>
<td>10</td>
</tr>
</tbody>
</table>

In Table 7, we see that experience in the green development industry was fairly evenly spread between people with less than five years experience and those with over thirty. Most executives had between ten and thirty years of experience, but it was more likely that an executive had less than ten years of experience than it was that they had more than thirty.

Table 8. Professional Background of Executives (Total respondents in last column)

<table>
<thead>
<tr>
<th>Background</th>
<th>Construction</th>
<th>Design</th>
<th>Finance</th>
<th>Non-profit</th>
<th>Public Sector</th>
<th>Other</th>
<th>Total Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person 1:</td>
<td>39%</td>
<td>9%</td>
<td>17%</td>
<td>7%</td>
<td>3%</td>
<td>26%</td>
<td>90</td>
</tr>
<tr>
<td>Person 2:</td>
<td>26%</td>
<td>7%</td>
<td>31%</td>
<td>0%</td>
<td>5%</td>
<td>31%</td>
<td>42</td>
</tr>
<tr>
<td>Person 3:</td>
<td>22%</td>
<td>7%</td>
<td>33%</td>
<td>4%</td>
<td>4%</td>
<td>30%</td>
<td>27</td>
</tr>
<tr>
<td>Person 4:</td>
<td>27%</td>
<td>9%</td>
<td>36%</td>
<td>18%</td>
<td>0%</td>
<td>9%</td>
<td>11</td>
</tr>
<tr>
<td>Person 5:</td>
<td>13%</td>
<td>13%</td>
<td>63%</td>
<td>0%</td>
<td>13%</td>
<td>0%</td>
<td>8</td>
</tr>
</tbody>
</table>

The most prevalent background for executives was in construction, followed by finance and design. 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).
As Table 9 shows, 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 my respondent firms, which was the membership list for the largest green building advocacy organization in the country, the US Green Building Council, and the participant list for the flagship residential energy efficiency program of the US Department of Energy, the Building America Program. 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 my 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 in this study to determine how green a given project was.
Table 10. Current and Expected Green Projects (82 responses, 71 responses respectively)

Table 10, above, adds some interesting detail to this picture of green building experience, showing the percentage of current projects that are green and the expected future percentage of green projects. This chart shows that slightly more than half of the respondent firms do more than half of their work on green development projects at the moment, and the most prevalent response is groups that do less than 25% of their work on green projects. However, in the next five years people generally expect that trend to shift, where the median firm expects to be doing 75% plus of their work on green projects and fewer than 10% of respondent firms expect to be doing less than one quarter of their work on green projects. In short, respondent firms expect this sector of the market to grow and to become an increasingly large share of their company’s business.

**Why did people develop green**

The respondent firms had a wide range of experience with various green building standards, with LEED and Energy Star being the most prevalent. In addition, there was significant use of the DOE Builder’s Challenge criteria and the National Association of Homebuilder’s Standard both before and after it was adopted as the National Green Building Standard by the American National Standards Institute (ANSI) in 2008. The table below gives a picture of this experience.
Table 11. Green Building Rating Systems Used (89 responses)

<table>
<thead>
<tr>
<th>System</th>
<th>Percentage (Respondents)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Star</td>
<td>62.9% (56)</td>
</tr>
<tr>
<td>Other (Green precedents)</td>
<td>44.9% (40)</td>
</tr>
<tr>
<td>LEED-Homes</td>
<td>29.2% (26)</td>
</tr>
<tr>
<td>DOE-Building Challenge</td>
<td>27.0% (24)</td>
</tr>
<tr>
<td>LEED-Cone and Shell</td>
<td>22.5% (20)</td>
</tr>
<tr>
<td>LEED-Commercial/Institution</td>
<td>19.1% (17)</td>
</tr>
<tr>
<td>NAHB-Green Building</td>
<td>19.1% (17)</td>
</tr>
<tr>
<td>LEED-Medical</td>
<td>14.5% (13)</td>
</tr>
<tr>
<td>LEED-Residential</td>
<td>14.6% (13)</td>
</tr>
<tr>
<td>LEED-Homes</td>
<td>13.5% (12)</td>
</tr>
<tr>
<td>Energy Star</td>
<td>7.9% (7)</td>
</tr>
</tbody>
</table>

Much as predicted by Koebel’s survey on innovation in the construction industry, my respondent firms have adopted green practices as a way of improving their long-term competitiveness and because they have a personal commitment to developing in this way. Table 12, below, shows why people adopted green practices. The two most prevalent responses of the 92 firms who answered this question were: 1) we believe green projects are the right thing to do (84%) and 2) green building is part of the firm’s commitment to high quality spaces (77%). When asked to choose the single largest motivating reason (see Table 13), these two stayed at the top of the list with forty-three percent of respondents saying green development was the right thing to do and 19% of respondents saying it was part of their commitment to high quality spaces. In addition, 10% of respondents said they built green principally because it was more profitable.
Motivation for Taking on Green Projects (92 responses)

Table 12.

<table>
<thead>
<tr>
<th>Motivation</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>We believe green projects are the right thing to do</td>
<td>63.7% (77)</td>
</tr>
<tr>
<td>Green building is part of our commitment to high quality spaces</td>
<td>77.2% (71)</td>
</tr>
<tr>
<td>One of our principals wanted to develop green projects</td>
<td>45.7% (42)</td>
</tr>
<tr>
<td>We believe green projects are more profitable</td>
<td>32.6% (30)</td>
</tr>
<tr>
<td>Our customers demand green projects</td>
<td>26.1% (24)</td>
</tr>
<tr>
<td>Other (please specify)</td>
<td>19.6% (18)</td>
</tr>
<tr>
<td>A green approach was required by a public agency</td>
<td>18.5% (17)</td>
</tr>
<tr>
<td>An investment partner wanted to develop green projects</td>
<td>5.4% (5)</td>
</tr>
<tr>
<td>My firm has not developed green projects</td>
<td>3.3% (3)</td>
</tr>
</tbody>
</table>

Table 13. The Single Largest Motivating Factor to Develop Green Projects (91 responses)

<table>
<thead>
<tr>
<th>Motivation</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.9% (9) We believe green projects are the right thing to do</td>
<td></td>
</tr>
<tr>
<td>18.7% (17) Green building is part of our commitment to high quality spaces</td>
<td></td>
</tr>
<tr>
<td>9.9% (9) We believe green projects are more profitable</td>
<td></td>
</tr>
<tr>
<td>6.6% (6) Other (please specify)</td>
<td></td>
</tr>
<tr>
<td>5.5% (5) One of our principals wanted to develop green projects</td>
<td></td>
</tr>
<tr>
<td>4.4% (4) A green approach was required by a public agency</td>
<td></td>
</tr>
<tr>
<td>2.2% (2) Our customers demand green projects</td>
<td></td>
</tr>
<tr>
<td>42.9% (39) My firm has not developed green projects</td>
<td></td>
</tr>
<tr>
<td>44.4% (35) An investment partner wanted to develop green projects</td>
<td></td>
</tr>
</tbody>
</table>
When asked to specify the single largest obstacle to their firm adopting green building practices: 1) construction cost, 2) consumers who won’t pay for green, and 3) long-term uncertainty about performance were the three most prevalent responses. Again, many people selected “other” in response to this question, but their comments partially reinforced the three areas already discussed in addition to highlighting challenges in the public review process, and general difficulty in navigating green building certification.

Table 14. Obstacles Faced in Green Projects (91 responses)
Table 15. Single Largest Obstacle to Green Projects (90 responses)

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. All of 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. My hypotheses state 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 model of real estate development firms that I laid out in the previous chapter made four assumptions about firms aggressively adopting green practices. As stated above, I predict that these adopter firms will:

1) Utilize alternative financing arrangements with at least some investors that give the developer or the investor a longer-term stake in the project. In addition, I expect that large firms with better access to capital will be better positioned to adopt these innovations.

2) 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 for the providers of design and construction services, partner firms are familiar with the requirements and the past projects of the developer.

3) Exert greater control throughout the entire development process, especially in the provision of design and construction services.
4) Have moved aggressively towards industrial construction and CAD/CAM construction techniques because it gives the developer more control over the installation of products and the ability to reduce waste.

My survey responses show mixed results across these four areas.

Finding Investors for the Long-term

Table 16. Funding sources for green developments (70 responses)

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 ninety-four firms that responded to another question said they had created their own equity or financing practice, independent of their development work. Table 16 shows the breakdown of the types of investments that were made in projects.

Even more instructive than the tabulation of responses to this question were the comments that people made in response to it. Sixteen respondent firms made comments in their answer to this question, and fifteen of those comments 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 of them referred to public investments of some type that pushed the project forward, and the final one referred to small grants and donations provided to the project. This level of response leads me to believe that there may be more investment of this type going in to projects than my 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 corporation. For private firms, both closely held and widely held, conventional debt (74%) is far and away 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 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 from the cross-tabulation 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 seems to imply that non-profit organizations may also be well positioned (at least with respect to access to patient capital) to adopt environmental innovations.

In summary, we found that patient sources of capital are not frequently used when looking at the full sample, but when we parse that sample into various types of owners, we see some more interesting results. Our 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. Beyond this, 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 may indicate
that they are another group that has some financing advantages around greening. 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. As part of my more in-depth analysis, I spoke to an investment firm that is also a large owner of real estate projects, and teased out the reasons for this to see if they lend support for or against my sub-hypothesis that green development firms are likely to identify longer term investors and/or vertically integrate with equity investment. In addition, I have asked each of the firms who participated in follow-up interviews to 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.

**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, Miller, and Gordon all claim that the most common way of organizing a development team is through the conventional OPC relationship we described earlier. While we don’t have good comparative data, and these studies are somewhat dated (they are between 10 and 20 years old) the author’s recent experience supports that claim. However, of the ninety-four firms, predominantly firms engaged in green development, who answered questions about their services shown in table 9, forty-seven included construction, fifty-two included project management and construction management, and forty-two included design and design/build. Twenty-five firms engaged in two of these services, and twenty engaged in all three meaning that seventy-six of the ninety-four respondents to this question had vertically integrated design or construction services on some level. When I crosstab the data to look at firms who have developed green projects versus those who have not the results are intriguing though not statistically significant. Only 1 in 4 firms in my sample who have not completed a green project provide construction/general contracting in-house, 1 in 4 provide design/design-build, and 2 in 4 provide construction management. In addition, one company performs construction/general contracting, construction management, and design/design-build, meaning that 3 out of the 4 firms provide no design or construction services in house, and 2 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 my 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. Of the sixty-five respondents to a question about the contract form used for project delivery, twenty-eight said they used a conventional contract (think

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21 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.
conventional OPC or the GMP-FP from Gordon here), the single largest number. However, eighteen 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, twenty-eight owners say they used a conventional contract form while forty-three 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.

The comments in this section of the survey were also enlightening. 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,

Table 17. Contract Form Used for Project Delivery (65 responses)²²

<table>
<thead>
<tr>
<th>Contract Form Used</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner-contractor</td>
<td>28</td>
</tr>
<tr>
<td>Other</td>
<td>18</td>
</tr>
<tr>
<td>Construction manager</td>
<td>11</td>
</tr>
</tbody>
</table>
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 have started to think through 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 six 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.

Beyond this, Table 18, below, shows 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 (in fact 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 at the table and someone will need to coordinate their energy and activities. That said, this is another area where more specific research would be helpful, including the in-depth case studies in the chapters that follow, which lend even greater support to this idea.
Table 18. Possible Changes in the Development Process (61 responses)

<table>
<thead>
<tr>
<th>Change Description</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hire builder or construction manager before the design was complete...</td>
<td>46</td>
</tr>
<tr>
<td>Commission an energy model on the existing building or proposed design</td>
<td></td>
</tr>
<tr>
<td>A post-occupancy evaluation of the building</td>
<td>36</td>
</tr>
<tr>
<td>Contracts with development team members that include clearly delineated...</td>
<td>31</td>
</tr>
<tr>
<td>Obtain performance guarantees from your general contractor that extend beyond...</td>
<td>17</td>
</tr>
<tr>
<td>Contract with any development team members for multiple projects rather...</td>
<td>10</td>
</tr>
<tr>
<td>Obtain performance guarantees from someone else on the development team...</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

**Industrial construction**

Though the significant majority of green projects referred to in this study were site-built (nearly 83%), thirty-one of sixty-nine projects (45%) used some type of industrial construction technique, whether it was panelized, modular, or computer-assisted design and manufacturing. This statistic points out several things. First, site-built and industrial construction techniques are not mutually exclusive. In fact, the construction industry is generally moving towards the use of pre-manufactured assemblies for many building components, especially roof systems, floor systems, and wall systems that can be shipped to the site and installed there. In addition, the motivation behind the prediction that industrial construction would be widely adopted by green development professionals arose from a sense that a green developer must simultaneously control cost and quality in the building process. Industrial construction is one way among many that this goal can be achieved. Other ways might include having very rigorous field controls in the on-site construction process, having a very involved owner, and/or requiring specific performance goals of the general contractor and sub-contractors. We have already seen that owners engaged in green projects are much more likely to be heavily involved in all phases of design and construction, and that performance guarantees are used in a small,
but non-trivial number of cases. In addition, as discussed at the end of the last section, performance goals may also be established through the use of energy models and post-occupancy evaluations that are not true guarantees and therefore may not have been captured by this survey. In addition, this has an incremental flavor to it that is reminiscent of the experience that Leith Sharp had at Harvard. A transition to industrial construction may be one way, among many, that green development adopters may begin to transition their practice to a different operating focus. In some ways this partial use of industrial construction techniques could be seen as an incremental step towards a more fully green practice in the future.

Table 19. Project Delivery Approach (69 responses)

<table>
<thead>
<tr>
<th>Project Delivery Approach</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site-built</td>
<td>57</td>
</tr>
<tr>
<td>Panelized (including structural insulated panels)</td>
<td>17</td>
</tr>
<tr>
<td>Computer assisted design/computer assisted manufacturing</td>
<td>9</td>
</tr>
<tr>
<td>Modular</td>
<td>5</td>
</tr>
<tr>
<td>Other (please describe below in comments section)</td>
<td>4</td>
</tr>
</tbody>
</table>

In summary, there are also mixed-results about the adoption of industrial construction. We need to know how frequently we would have expected industrial construction techniques to be utilized on any project before we can say more about its adoption by green development firms. In addition, setting up a foil between a site-built project and an industrially constructed one is a false dichotomy. Only modular homes would be widely considered to not be site-built, where panelized and CAD/CAM systems might be used in a site-built development process. Finally, the real crux of this prediction is that the owner/developer will want to exert more control on construction quality than would be typical while still controlling price. Other approaches to achieve these ends may have been utilized by developers who are unfamiliar or unwilling to change their project delivery model, but who still want to oversee construction decision-making in a more direct way than would be conventional. In fact, we have seen throughout these
responses that the green owner/developer is significantly more involved in design and construction, and they exert super-normal control over every aspect of the process.

**Follow-up Cases**
In summary, green development firms are moving away from price competition in procuring design and construction contracts, there is some evidence that publicly-traded firms and their greater access to capital provide significant financing advantages over private firms interested in greening, and the developer of green projects generally takes a more involved role in the design and construction process. Beyond this, there is some evidence that patient capital and industrial construction techniques are utilized by green development firms, but this evidence is inconclusive.

The final chapters of this study will investigate these findings in more detail through the analysis of six development firms who are active throughout the country. These firms are intended to approximate the basic demographics of my study population, and to highlight specific areas of interest for further investigation. These areas include:

- Firms who have adopted green development practices and those who have not, as well as at least one firm who had a negative experience with green development.
- Firms focused on the South with some representation from the West and Northeast.
- Firms led predominantly by men with graduate level educations, with at least one firm led by a woman.
- Firms that are mostly small, with at least one that is large.
- Firms that work on multi-family, single-family, office, retail, industrial, and mixed-use developments.
- Firms that have integrated additional services into their company, especially construction, design, construction management, and/or property management.
- Firms which are mostly private and closely held, with at least one publicly traded firm.
- Firms with experience in a variety of green building rating systems, but especially with Energy Star and LEED in one of its many forms.
- Firms with experience in both site built and industrial construction techniques.

As you can see in Table 20, I have achieved those goals with the follow-up interviews completed for this study. Those firms will be described in more detail in the chapters that follow.
Table 20. Follow-up Interviews

<table>
<thead>
<tr>
<th>Respondent Number</th>
<th>GCE</th>
<th>Liberty</th>
<th>Goggin</th>
<th>Zocalo</th>
<th>Schlosser</th>
<th>Cherokee</th>
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<tr>
<td>Green Building Adoption</td>
<td>Adopter</td>
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<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>Non-Adopter</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Region</td>
<td>NE</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>S</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>MW</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Firm Size</td>
<td>Small</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
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<td>Big</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
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<tr>
<td>Gender of Leader</td>
<td>Male</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
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<tr>
<td>Education of Leader</td>
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<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>College</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Less Ed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of Projects</td>
<td>Single-fam</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Multi-fam</td>
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<tr>
<td></td>
<td>Office</td>
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<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td></td>
<td>Mixed-use</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td></td>
<td>Retail</td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Industrial</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other services</td>
<td>Construction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>Prop Management</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>CM</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Design/Design-Build</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Ownership structure</td>
<td>Private Closely held</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>Public</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Green Rating System Used</td>
<td>LEED</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Energy Star</td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Builder’s Challenge</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Delivery Method</td>
<td>Site Built</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>Panelized</td>
<td>x</td>
<td></td>
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</tbody>
</table>
Chapter IV. Green Coast Enterprises

Green Coast Enterprises first green project

Green Coast Founders Will Bradshaw and Reuben Teague met at a wedding, and then again at Jean Lafitte’s Blacksmith Shop (a New Orleans bar) once both had relocated to New Orleans. Bradshaw had been working on a business plan for a triple-bottom line development company for the better part of a decade, and Teague was finishing up a clerkship for a Federal Judge on the 5th Circuit Court. Both had decided to live semi-permanently in New Orleans and wanted to be involved in the rebuilding of the city after Hurricanes Katrina and Rita and the associated levee failures had left so much of the area decimated. They decided to team up to start Green Coast Enterprises (GCE) and incorporated in April of 2007. Teague still had 3 months left in his clerkship, and the company began operation out of Bradshaw’s living room.

They wanted to use alternative development products that would not only stand up better to the triple threat of building in the Gulf Coast – challenges from wind, water, and termites – but to design a development process that would build broad-based wealth and new relationships in vulnerable communities, making those communities less vulnerable over time. Theirs was a broad-based strategy that stretched from the environmental performance of the materials and systems that went into the building, to the manner in which labor was identified and employed, to the financing structure and where benefits accrued from a successful development project.

Several possible deals fell through, but Green Coast ultimately began negotiating on a vacant parcel in Fauborg Saint John. After an initial negotiation with the owner fell apart, they ended up reaching an agreement, and Green Coast was able to finance a four-unit condominium project with First NBC Bank who provided an acquisition and construction loan on the strength of a guarantee from Bradshaw’s parents. The guarantee promised that Bradshaw’s parents would buy two of the condominiums upon completion, and with that the first Green Coast project was up and going.

Bradshaw and Teague wanted the project to be a demonstration of green building and storm resilience, especially to show that buildings made from non-traditional materials could fit in an old, traditionally designed New Orleans neighborhood. The design they chose, the Arabella, was vaguely Greek Revival in its aesthetic, but with less detail. It was a two-story, double gallery design where the front porch stretched across the whole 24-foot wide front of the house. The site sat across the street from the New Orleans Fairgrounds, which for about six months a year is a horse racing venue, and is the site of Jazz Fest for the last weekend of April and first weekend of May. The plan for the homes also incorporated a number of high efficiency, disaster resilient features.

As discussed earlier, triple-bottom line refers to measuring the financial, ecological, and social impacts of a development project, and working to increase the stock of resources in each bottom line through that development.
This project was intended from the beginning as a flagship for Green Coast, something that signaled their intentions about development and built their brand as they worked to expand the scale and scope of their activities. Beyond the environmental components listed above, Green Coast was also very interested in job creation through this investment, and worked with the AFL-CIO in part because of their commitment to hire and train a local workforce through their Gulf Coast Construction Careers Center, part of Green Coast’s social bottom line.

**Struggling to find the right partners**

Green Coast acquired a plan book home developed by the design firm, FutureProof, LLC. This firm focused on consulting services around green construction and development, but did not have a licensed architect within their company. As a result, the designer of record for this home was a local structural engineer, Walter Zehner. The contracting responsibilities on the job were split between two firms, Housing International Gulf Coast (HIGC) and PAR Construction (PAR). HIGC specialized in light-gauge steel framing for residential purposes and was an investment of the AFL-CIO Gulf Coast Revitalization Program. They operated out of a factory in Reserve, LA, about 20 miles west of New Orleans, where they created open-frame wall panels, closed-frame wall panels, and modular buildings, all industrial construction approaches as outlined in the previous chapter. In addition to the manufacturing process, they also had an installation crew that consisted largely of trainees from the Gulf Coast Construction Career Center, another program of the AFL-CIO. HIGC was the local branch of a California-based company building steel-framed buildings along the coast. PAR had been started in Louisiana by a group of Texas-based contractors right after Katrina. They operated out of an office in the Mid-City neighborhood in New Orleans, and specialized in residential construction. They were one of the few companies with experience in SIP panel construction, one method of industrial construction, which they used as a default option, and included a number of other sensible energy performance measures in each home they built. In addition, their local principal was part owner of a solar energy company in Houston. Other project consultants included Wade Byrd of Byrd Energy (who did energy modeling on the home), Joe Ryan and Phil Voss of the US Department of Energy and National Renewable Energy Laboratory, respectively (who also did energy modeling on the home), and Stephen Shelton who designed and installed sensors in the walls and roof of one building to measure temperature differentials and the effectiveness of the systems used.

GCE wanted to create an integrated design process where representatives from HIGC, FutureProof, Zehner, PAR, and Green Coast would all work together to meet the end goal of building a high performance steel framed structure that would be affordable to live in and operate. Green Coast coordinated a series of regular development team meetings to identify and work through any issues that would arise, and they bid the job off of a planbook design rather than a fully specified construction set, relying on the participation of team members to come up with appropriate details. The use of this unspecified planbook design meant that final construction price and material quality was always a negotiation between the contractor and the owner, and Green Coast, particularly at this time, had limited knowledge about the available material palette in the region, at least in comparison to the experience of any practicing residential architect. In addition, GCE worked to arrange material donations and
reduced price materials to go into the building as part of showcasing some building material alternatives. The products installed in this way included, recycled glass counters, bathroom floors, and showerwrap; recycled plastic trim for crown moulding and baseboards; the steel wall panels themselves; and some of the plumbing fixtures. GCE had a deal with the builder where any savings from reduced price or donated materials would accrue to Green Coast, based on the line item cost included in the contract from the builder.

![Diagram of project roles]

**Figure 1:** Dotted line represents that principal of drafting firm was also employed part-time by the structural engineer. He worked on this project in both capacities.

Figure 2 shows a very different OPC structure than what we saw in the conventional OPC relationship. Here, all decisions ultimately rest with the owner, and the design professionals are not responsible for administering the owner’s agreement with the contractor(s). In addition, they had multiple builders, and the designer of record had limited input into the aesthetic and functional nature of the design. He designed the foundation system and stamped the rest, without providing any significant expertise about how the project could be carried out.

Overall, this integrated design process was a failure. The contracts did not fully delineate the relationships between players and many development team members tried to overcharge for green materials, limit their involvement in the process in ways that created gaps in expertise, or other actions that protected their own interests rather than work effectively as part of a team. In addition, having 2 contractors involved worked terribly. The arguments and finger-pointing
as a result of the relationship caused significant delay and hardship throughout the process. Green Coast had to take control of the project and will it to completion against the roadblocks created by the other parties involved. In fairness, the dysfunctional nature of this situation was also created by Green Coast, so they were responsible for many of the problems they later had to solve in order to get the project completed in budget and with many of its other goals met.

One problem arose because Futureproof staffed the project with a very young architect who had never had one of his designs actually built prior to this effort, and there were a number of livability issues that were missed in the design review first by the designer, then by the firm’s principals, then by the builder, several material suppliers, and ultimately the developer. These mistakes included things like the location of the HVAC system, awkward bathroom spaces, and the size of the opening for the refrigerator. But more importantly, the architect was a taciturn and not particularly confident team member who did not have the experience or personality to object to inappropriate or counter-productive changes that the builders wanted to make to the plans. Combined with Green Coast’s relative inexperience and goodwill towards other team members, this combination was problematic. It wasn’t until late in the project that Green Coast assumed this role and started rejecting work, when a more experienced architect or developer probably would have done so sooner.

A second issue had to do with the HIGC capacity to use their design software and the translation of this to speed in assembly. The principals were so interested in getting their product in the field, that they did not allow their draftsman to complete his training on their software package. As a result, their precision-cut, computer-assisted manufacturing system for the creation of their wall panels did not work. The computer did not recognize when walls were supposed to join (as the draftsman had not been trained on how to indicate a wall connection rather than a place where two walls were very close), and this carried over into problems with the roofing system. Beyond this, their installation team had very little experience working in steel, and did not understand how to put their framing package together. HIGC had a 7-day contract that they took 114 days to complete. This delay caused significant costs, most of which the owner successfully charged back to HIGC.

A third issue was the relative inability of PAR to control their subcontractors, and the revolving door that they had with site supervision. Green Coast had four different site superintendents on the building of this project, and the subcontractors ran the show for large portions of it. During transitions with limited site superintendent oversight, Green Coast had to supervise the subcontractors, and there were other points where this continued because particular site superintendents exercised so little control. In the worst of cases, the subcontractors would refuse to come to work for long stretches and provided no explanation. Many also left trash, food, and other items on site, creating a problem for neighbors.

But the largest problem with the team was that they didn’t work together, particularly the two builders. Every time there was a handover in the project, it was fraught with bickering about the quality of the previous teams’ work, even though the contractor taking control of the site had a chance to inspect the site and require the other to fix any problems. Neither contractor

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mentioned a single problem prior to accepting the site from the other, but as soon as they started doing work, they both had a litany of complaints about the shoddy nature of the other’s work and all the money they were spending to fix the other one’s work.

All in all, this was a long, convoluted, and difficult process where the contracts were not fully specified, the team worked poorly together, the development team did not have the professional expertise and support that GCE needed, and GCE was forced into a construction administration role which was uncomfortable at the time and they were ill-trained to handle. Because of all the delays, GCE finished the project at the beginning of the 2008 hurricane season, and right before the economy collapsed and the New Orleans condo market became soft. So the significant initial interest they had in the condos eroded, and they were not able to sell the remaining 2 units. Instead, they rented them at a nearly break-even level, and are maintaining them for future sale once the market is better.

A number of these problems are not specific to the green nature of the project (i.e. having two contractors on a job where they keep handing off control of the site will likely result in similar bickering on a green or conventional job). However, all of these challenges arose from GCE’s intention to develop a green project. The choice of designer came from a desire to support a local sustainable design consultancy that had a series of planbook homes that could fit GCE’s needs with some adaptation. So GCE brought them in despite their inability to stamp their own drawings and their use of a neophyte designer to staff the project. Beyond this, GCE’s insistence on creating an integrated design team is a central tenet of green development, and one of the common practices we saw in Table 18 in the previous chapter. This integrated design team pointed out how hard it is to select the right partners and create a team atmosphere, not so much that the general approach was wrong.

Despite all these challenges, the end product met many of the goals GCE had for the condo units at the outset. GCE finished the project, they paid off the construction loan, and they refinanced the remaining units as rentals. The building is functioning very well, and they were able to successfully integrate a number of new technologies in a way that is reminiscent of surrounding architecture. The energy bills of the project are exceedingly low, and the steel frame should provide added protection against any future storm or periodic flooding event. In addition, it cannot be eaten by termites. So at the end of the day, this fledgling company developed 4 beautiful homes in a great location, and each Green Coast partner bought one of the units to make his home in the city. Both Bradshaw and Teague agree that living there is an excellent lesson for everything they did wrong and everything they did right. In addition, the company has over $170k in equity in the final 2 condo units, and they stand to make up to $200k in profit from the total project whenever they sell the remaining units.

Learning from their mistakes
GCE had a different role in their second project, Project Home Again (PHA), acting as the Construction Manager/Owner’s Representative rather than as the owner/developer. In this role, GCE designed and managed a process to hire the architect, designed and managed a process to hire the builder, led regular development team meetings, created and managed the
budget and project timeline, and provided regular quality control on the construction, visiting the site twice weekly and documenting progress and problems through a photographic record posted online. GCE advocated to retain FutureProof, who, by this time, had brought in a licensed architect, John Schackai. John became a partner in a spinoff entity, Sustainable Architecture, and now FutureProof could be the designer of record on a project because they had an architectural stamp. GCE also identified and helped PHA acquire a piece of property in the Gentilly neighborhood of New Orleans, a 3.5 acre parcel.

Futureproof and Sustainable Architecture prepared a set of bid documents for contractors that included fully specified site plans and schematic level homes. The housing specification information included a range of very high-end products that were not suitable for the homes, and a large argument ensued between GCE and FutureProof that threatened the relationship of the principals of each firm. Ultimately, the landscape plan for the site was scrapped, getting rid of a very expensive underground water storage system and significant planting that would have made site work cost over $80,000 per finished lot. PHA decreased that down to what was necessary to get the project built.

Once PHA had final approval on the subdivision and on some preliminary house designs, they selected a builder. The team interviewed 5 different building firms to determine pre-qualified bidders. Three companies decided to bid, and they selected TKTMJ for the combination of their price for site work, their financial strength, the fact that they were small and family owned, their experience with new construction techniques, and the quality of the work they had done. This was an excellent choice.

TKTMJ has been a valued and trusted partner in PHA, building homes well, rapidly, and under budget. In this initial phase, PHA used a Guaranteed Maximum Price contract with a reimbursable price, and GCE structured the reimbursements so that the builder got more than his markup for every dollar he saved the owner. This structure, along with an early interaction between the builder and designer, helped to ensure a team approach on this job that was lacking on the Arabella. This early interaction occurred when the construction team realized in the middle of laying block for foundations that the carport on one of the designs would not allow a passenger to open his door when the car was parked. Rather than create a change order for the project, which would have been well within his right as a builder, TKTMJ called Sustainable Architecture and Green Coast and brought them out to discuss potential solutions. Ultimately, they found a way to fix the problem and reduce the cost, and a strong working relationship was created.

As of this writing, the team has completed the first 3 phases of the project (45 homes in total), several months ahead of schedule each time. TKTMJ has also maintained clean and presentable work sites, has helped with moving an office trailer, has provided lot maintenance on lots not under construction, and been available for events as needed. They have developed a strong relationship with the Riggio Family and garnered their trust, which is critical.
GCE has built on the knowledge and experience from the Arabella project to continue to expand their operational capacity and improve their company performance. Based largely on GCE’s efforts, PHA is the largest Building America partner project ever in Louisiana. Building America is the flagship energy efficiency effort of the US Department of Energy, with a goal of making production-built homes energy neutral by 2030. Through a partnership with the Department of Energy and Building Science Corporation, GCE has made sure that every PHA home has been certified to meet these guidelines. Building Science Corporation, a Somerville, MA based consulting firm retained by the Department of Energy, has provided guidance on a number of construction issues. They have: helped push advanced framing techniques (decreasing the amount of wood in the project and improving the quality of insulation), helped design the enclosure, provided a base energy model, helped locate manufacturers and suppliers of key materials and systems, and helped design an appropriate mechanical system. But their support has not been without tension. The relationship between TKTMJ and BSC has periodically been strained, largely around mechanical system design. For the first 2 phases, the mechanical system included whole-house dehumidification, and the BSC recommended dehumidifier had an unacceptably high failure rate. In addition, the company which had manufactured the system was reluctant to service it. Finally, a company representative did come out, largely due to the persuasion of BSC, but PHA ultimately decided to remove dehumidification from the system going forward. So in Phase III the project has a more efficient A/C system with a variable speed air handler to provide some base dehumidification while it is running. These particular changes in the products used in green building underscore the importance of having clear lines of responsibility and assumption of risk if a particular green component (like the dehumidifiers) doesn’t work as planned. In this case, the supplier of the component was unresponsive to requests for servicing or correcting the problem, and the system designer (BSC) had no liability for it working, so the owner, owner’s rep, and contractor were left figuring out how to deal with this piece of equipment that was not functioning appropriately.

GCE made some basic structural changes in the way Project Home Again progressed based on their experience on the Arabella. Specifically, this resulted in two important changes for the PHA process. First, they insisted on a single general contractor that would be responsible for all horizontal (infrastructure, sidewalks, streets, etc) and vertical (houses) construction on-site. Second, after the first phase, PHA did away with a direct relationship with the architect and transitioned to a design-build relationship with TKTMJ, where TKTMJ retained Sustainable Architecture to provide plan sets as part of their home construction cost.

Other things remained the same and were expanded upon during the PHA process. The team continued to have regular development team meetings, led by GCE, which created a written record of progress and decisions. GCE continued to provide twice weekly site visits, and incorporated a web-based project management software, Basecamp, into their construction oversight process. This web-based system allows GCE to provide real-time, visual feedback on any problems occurring in a specific property, while also helping the team to recognize and address recurring issues that could degrade the quality of construction on many properties.
Figure 2: The dotted line represents that the architect signed off on work completed and approved payment requests from the general contractor.

After Phase I of PHA, this development team structure changed slightly to streamline the process even more. Green Coast took over the construction administration role, and the architect became a sub-contractor of the builder. These changes are reflected in the diagram below.
One of the interesting aspects of Green Coast’s development process is that they have become less innovative over time about the structure of their team. GCE still: 1) puts a great deal of emphasis on cooperation between team members, 2) carries out an extended value-engineering process to get builder input on the final design, and 3) provides a great deal of design review and some estimation on the front-end to simulate an integrated design framework, but they are more conventional in the legal relationships between team members than they were in their initial green project.

In other words, the company started with a non-traditional development team and non-traditional roles, especially with regard to the relationship between architect and builder. In the Arabella project, GCE blurred the lines on those two roles and tried to get everyone to work together. This did not work well. In PHA, a more traditional process was used in the first phase, and then the team adjusted slightly to use a design-build relationship (or more appropriately build-design, since the architect is in the employ of the builder) for the second and future phases. In the large-scale commercial work to date, GCE has moved towards a more traditional relationship where the designer creates a set of plans, the builder prices those plans and is retained to build a structure based on them. However, GCE will generally use a design-assist type relationship where the selected builder, when possible, participates up front in the design process, pricing options as they are created and integrating value engineering earlier into the process. In addition, GCE tends to use the same set of partners multiple times, building a
rapport and understanding with a given team. All this supports several of the hypotheses laid out earlier:

1) GCE is integrating construction management and construction administration into its suite of services, and they seek out long-term partnerships with design professionals and contractors.
2) GCE takes greater control over projects than would be typical in a conventional development scenario,
3) GCE has aggressively adopted industrial construction techniques, though with mixed results.
4) The company has actively worked to change its relationship to capital investment, and the details of this will be discussed in the next section.

Specialized financing
Green Coast has sought out a number of relationships that provide patient capital in support of their green building goals.

First, with the Arabella, they didn’t receive any specialized financing per se, but they did receive some significant benefit from organizations and companies who wanted to be part of a green project in New Orleans so soon after Hurricane Katrina. As a result, they got a lot of building materials and finish materials at much lower costs than they would have been able to get otherwise. This included the steel framing package. HIGC was a start-up that was envisioned as a way for the AFL-CIO to break into the residential construction market in New Orleans with trained labor providing higher quality building products. So HIGC dramatically reduced the pricing on this job, using it as a loss-leader. But beyond the steel framing, Green Coast also received free or discounted material for bathroom flooring, shower surrounds, kitchen and bathroom countertops, trim, plumbing fixtures, and lighting packages. These discounts came as a result of Green Coast’s interest in green building in New Orleans, as well as the decision of the National Association of Homebuilders to hold their 2008 green building conference in New Orleans. The Arabella was one of the pilot projects for the NAHB Green Building Rating System that was being promulgated at that conference, and one of the first projects built with the support of the local green building program, Crescent City Green. By virtue of being on the conference’s green building tour, the company was able to attract significant amounts of product at a lower cost. Beyond this, the family guarantee unlocked the debt financing needed to make this project work, and was offered in part because of the green building vision that the company espoused.

Second, much of their work to date has been development services for clients who have a good real estate development idea, but don’t have the team in place to carry it out. Project Home Again was the first example of this. In this case, Len and Louise Riggio wanted to rebuild homes in New Orleans for homeowners displaced by the levee failure and resulting flood. GCE helped them put a team in place to do that, and then proceeded to manage the construction aspects of
that team and make sure the project is delivered on time and in budget. But this entire program represents specialized financing that would not be investing in New Orleans but for Hurricane Katrina in 2005. They work with a number of other non-profit clients and neighborhood groups that are in a similar situation. But for the need to rebuild after Katrina and the levee failure, the entire program would not exist. As a response to that need, the entire program has a green development approach that includes the resilience of the homes in the face of some future disaster.

Finally, Green Coast has been a pioneer in seeking out more patient sources of capital through innovative structures using public and philanthropic dollars. Two GCE projects not discussed here would pioneer a financing concept where existing tax incentives, direct project subsidies, and guarantee structures would be utilized in order to create a building that would become a permanent community-based grantmaker as other calls on cash flow are retired. This approach is wholly unique and furthers the vision that GCE has as a green development entity.

**How Green Coast Enterprises would make green building easier**

Two of Green Coast’s three principals have slightly different ideas on how to make green building easier.

Lex Kelso says, “the thing that would really make it easier is if the people who did green building certification (the USGBC, etc.) could figure out how to do it in a less bureaucratic way. There are at least three things about buildings that are especially difficult to do, where you get people who go ‘sigh’ when they hear about them. One is LEED-accreditation. One is Davis-Bacon compliance. One is using the New Markets Tax Credit. The reason for the sigh is that each comes with a big administrative overhead. Probably all three are worth figuring it out. But you do have to figure it out. There was a vogue fifteen years ago for re-engineering the corporation. We were supposed to reinvent everything we do. There was a lot of nonsense in there because you can screw up a lot of things by doing it that way. One of the mantras was to build control into the system. It’s easier to do this with information technology. I don’t know the way the LEED people do that, but I’m sure there is a way to do it. There has been a major advance in green building, and if the overhead on certification shrunk to one quarter of its current level, lots more people would be willing to do it” (Kelso 2010).

On the other hand, I believe that people need to start thinking differently about their relationship to money and the way that they invest. The thinking that has gone into metrics for double and triple-bottom line funds, things that measure the environmental and social impact of investments, has helped to push this forward, but it has not gone far enough yet. It’s clear that investments can support and expand on resilience, opportunity, health, and beauty. Investments can also detract from these types of values or goals. By developing new ways of measuring the impact of investments on the well being of the planet’s ecosystems and all of our neighbors, economic actions can be steered towards things that are both profitable and good. The social investment world is starting to do this, though most of their work has focused on things that are less bad rather than those that are profoundly good. Bradshaw believes that foundation endowments and public investments have a growing opportunity to pioneer new
types of investments that make a quantum leap in the realm of doing right while doing well. I
see sustainable real estate development as one of the critical areas where this can happen in
unique and interesting ways. In short, I would make green development easier by finding the
foundation and public actors who would like to invest in regenerative development projects
that restore and bring hope to the communities in which they are placed.

What the future holds
Green Coast envisions itself becoming the leading provider of real estate development and
development services in the Southeastern United States. They have deep relationships with
several major non-profit organizations, providing them development services to deliver on
projects those non-profits have envisioned. They also have three path-breaking developments
in the planning stages that could help reposition the New Orleans economy to be more broadly
competitive.

They are also working to expand beyond the New Orleans area. They are scouting projects in
Baton Rouge and South Texas, and actively working to develop opportunities in Mississippi,
North Carolina, and South Carolina. They plan to grow to a level that will generate $20 million in
annual revenue within the next ten years.

Green Coast and my green development hypotheses
Green Coast provides strong support for three of the four hypotheses presented earlier. To
review, those hypotheses are that development firms who have been leading adopters of
environmental innovation are likely to share certain characteristics.

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.

4) Early adopters of environmental innovation have moved aggressively towards industrial
construction and CAD/CAM construction techniques because it gives the developer
more control over the installation of products and the ability to reduce waste.

Green Coast has made small steps towards changing their relationship with some investors to
support the temporal payoff of green development. Much of this to date has been through
attracting and steering capital to projects that are explicitly green, but they are now engaged in
working with public agencies and major philanthropic partners to develop new types of financial instruments that would support their vision for regenerative development.

On the design and construction end they have included construction management and construction administration as core parts of their services, and they explicitly seek out long-term relationships based on quality rather than just cost. They have also created development teams that are intended to decrease the adversarial nature of the relationship between design professional and contractor, though they have not always been successful on this point.

They do exert significantly more control than would be typical of a conventional developer in their projects, and have built significant capacity and expertise around construction administration (usually the purview of the Design Professional) and quality control (usually the purview of the contractor). They provide both of these services in all of their projects.

They have embraced industrial construction techniques as a way to get higher quality at the same price, but have also been disappointed by the performance of this approach in an early project. They have moved away from it in the intervening time period, but during that same time, they have dramatically expanded their ability to provide on-site supervision and quality control ensuring that high quality work is being done.
Chapter V. Liberty Property Trust

Liberty's first green project
Liberty Property Trust is the largest industrial Real Estate Investment Trust in the United States and 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.

Lutz says that they had two things going on simultaneously that led them towards green projects. One is that John Gatusso was paying attention to the forefront of architecture and design. He saw and believed in the tenets of sustainable development. Gatusso was also responsible for the Pennsylvania Power and Light (PP&L) project that they started in 2001. PP&L is based out of Allentown. Gatusso was in charge of this project from the leasing side. He identified the need that PP&L had for a building in Allentown, and managed the relationship with PP&L which led to a contract to develop the building for them. They started designing the project in 2001, went into construction in 2002, and it was occupied in 2003. That building was the first private LEED Gold building done in Pennsylvania.

Then there was Lutz. He’s in charge of all development for Liberty, and he was just getting involved in starting up the Delaware Valley Green Building Council. Even with this dual interest what pushed them to start on this particular building was that they had a client that said “we want this (green building).” They were the only client that year that asked about green building according to Lutz (Lutz 2010).

The PP&L project was $58 million in total development costs, 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 built into the building. Beyond providing space that PP&L needed, both companies wanted to stimulate the real estate market in downtown Allentown. Liberty retained ownership of the whole 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 office. PP&L had one and a half floors for energy trading, but it was otherwise office.

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 got it Energy Star Certified in 2005. Over the last several years, this experience has evolved into an even stronger commitment. “Now even if we do a speculative building, we will do it LEED,” Lutz said. “We’ve done many LEED buildings. We’ve even done it in places where if we survey the market place a lot of people would say what is LEED? And yet we absolutely believe it is the right way to go.”
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 what their requirements are. “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.

Lutz continued, saying that he’s asking their construction partners to be conceptual builders. He wants the builder to think through what’s needed to build this building. The other way is more “government work.” Lutz says, “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 us 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 know 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.”

Even with that philosophy of having the whole team on board early and working together as a team, Lutz says that they had a more complete team earlier on during the PP&L job. This underscores the idea that they were already pre-disposed to green building through their approach, and making a corporate commitment to green (first on the PP&L project and then more fully through all their work) just enhanced the practices that they were already using. For example, the general contractor was on board during design to look at various alternatives. They worked with the mechanical engineer, structural engineer, and the architect for selecting glass, designing the exterior solar shading, and the impact on the HVAC and heating and cooling load for the building. They worked with the civil engineer around storm drainage, and all team members were on board early on. Lutz says this is important because “the impact of one person’s decision can be taken into account with everyone else’s particular area of expertise.”

For this project, they hired Robert AM Stearn out of NYC to be the design architect and Kendall Heaton who was the architect of record and did the working drawings. The structural engineer was Thornton Tomasetti. The Mechancial Engineers were PHY. For the General Contractor, they had 2 or 3 bidders. Ultimately they chose LF Driscoll. They used standard AIA documents for the architect. AIA 111 Cost of work plus fee with a guaranteed maximum price for the general contractor. This was a pretty standard set up using AIA documents. Liberty has since adapted AIA documents to accommodate certain requirements around greening, but their agreements with people are fairly standard. However, as Lutz stressed earlier, they want their partners to “protect them in all sorts of ways that they could never contract.”

“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.
The PP&L project also introduced a new team member for Liberty, the LEED consultant. Lutz says that they are very particular about the qualities in their LEED consultants, now looking particularly for people who are good teachers. “If someone says, ‘I’m a LEED AP,’ this doesn’t make him fully knowledgeable and qualified to design a LEED project. We have focused on hiring LEED consultants who are very good educators. They teach my leasing people so they understand the benefits of green. They help teach contractors and architects, even though architect might have LEED AP after their name. They lead the education process for the whole team. Our LEED consultants tend to be educators. Now, more architects are getting more experience. We have allowed some architectural firms with experience to do the LEED consulting piece. Eventually green will be the way things are done. You won’t need a separate LEED consultant.” This emphasis on LEED consultants who are teachers reinforces the theme that Liberty is building a development team, where team is the operative word. They want leasing, design, construction, and engineering to work seamlessly together to give them the best possible product for the long-term in the markets where they invest. And because of their access to liquidity through public capital markets, they can take a patient approach to investing, the sort of thing that Green Coast (and other development groups we will discuss later) has to convince an equity or debt partner to do.

Liberty’s green makeover

As mentioned above, Liberty was already well positioned to become the largest owner of LEED certified buildings in the world. They had a capital structure that allowed them to be their own patient investor. They were predisposed to develop high quality buildings that would position them well in the marketplace as long-term property owners with high quality assets. They already were committed to long-term relationships with designers, contractors, and other team members, provided that those groups worked well together and protected the interests of the project and Liberty through their own efforts. But before the PP&L project in 2001, they had never tried to certify a project as green and had never made a series of small moves to more fully integrate their development team. For example, they had never used a LEED consultant before. Often, they would bring in a general contractor to look at value versus costs on various designs. But they normally didn’t have mechanical engineering folks on board as early. On PP&L they had more collaboration on HVAC and lighting control systems than was typical in previous buildings.

This was less challenging for them in some ways, because as a REIT they can finance development off of their line of credit and place corporate debt on the project at the appropriate time. In that way, there was no questioning of this particular project, and Lutz wouldn’t expect greening would be a significant issue for them unless the costs were significantly higher. There were some additional costs, but they weren’t that significant, Lutz believes they were roughly 2%. Since, they have found that cost increases range from a half a percent to two percent. This is a number that is widely quoted by green building advocates in the cost and benefit research that is done on this topic (Wilson A 1998; Kats, Alevantis et al. 2003; Bradshaw, Connelly et al. 2005), but it is significantly lower than the numbers frequently
quoted by skeptical construction and development professionals, like Toni Wendell, who, in the author’s experience frequently expect the increment to be 15-20%.

The biggest cost increases that they had on this job were related to the site, and some of their approaches to greening the building. For example, they had part of the roof as a vegetative roof. The 8th story was not as big as the 7th story, which meant that part of the 7th floor roof was exposed. That 7th floor roof was vegetative. Even though it was more expensive than a conventional roof, on an 8-story building Lutz said it ended up not being particularly significant.

Greening is now a part of their decision process. They don’t build an office building that is not LEED. They have built a number of warehouse buildings that are LEED. They believe it will keep their buildings from being obsolete, and that they can get higher rental rates and occupancies with energy savings. Lutz also says that as people become more familiar with healthier buildings, HR departments will put more pressure on corporate decision-makers to rent LEED buildings. This will generate additional demand for LEED buildings. “When we’re long-term owners we see that value. It is more difficult as a merchant developer or builder where you sell the building immediately on its completion. You have to ask, ‘will I be able to get that value out day 1?’ If you can’t get it out, why would you put the money in?” This discussion further highlights their green building advantages as a self-financed, long-term owner of properties. Unlike Andrew Schlosser (whose company will be discussed later), they see green building as a value generator and not a loss. But they also recognize that part of their ability to adopt this approach is particular to their legal structure, their liquidity, and their scale. And these characteristics seem to support each other, at least in the sense that Liberty is arguably the most successful green developer in the world, as measured by square footage developed.

Lutz also notes that this attitude of wanting high quality carries over into things that have nothing to do with LEED. They probably do a little better job with the sprinkler system, structure, etc, as opposed to doing the minimum allowed by code. They are more concerned with long-term maintenance and the operations of the building. “I look at it if it only costs one penny more to do per square foot, let’s do it,” Lutz says. “But if you’re selling right away, it’s reasonable to ask why should I spend a penny of mine?”

**Obstacles encountered**

Unlike most of the companies encountered in this survey and these case studies, Liberty faced a material availability problem in 2001. They had specified no formaldehyde doors, and couldn’t find anyone to produce them. So they went to a long-time supplier, and asked him to make a no formaldehyde door for the project. He agreed to do it, and then ended up marketing that door as a new green option. So their material availability problem became a business development opportunity for a partner. Over time, Lutz also thinks that product availability has grown significantly. There is much more quality, quantity, and cost-competitiveness. When material availability was a problem, Liberty was able to solve it because of the strength of their relationship with an interested supplier. It also supports the opinion of the other organizations interviewed in this study, namely that the problem of access to materials is minimal and shrinking.
They used several other products that their staff had to get used to, including waterless urinals and the vegetative roof. With the waterless urinals, they had to do some education with maintenance people about how to maintain them so there wouldn’t be a problem. Once maintained properly, they functioned excellently. On the green roof, there were issues about plant selection and the maintenance of the vegetative roof. Lutz said “there is some looking after it (the vegetative roof) that they weren’t initially aware of.” But now that they have done enough of them, they have become quite good at knowing what plants do well and how to maintain them, according to Lutz.

Interestingly, they did not see any obstacle around price, an increment which they believe is relatively small. “Our experience is somewhere between half a percent and two percent. This ties in very closely to studies they have seen. Probably to this day, if you ask people if they want a green building, they will say they don’t know if they can afford it. They will estimate that it costs probably 10-20% more. And you can spend more depending on what your choices are.”

It is important to note here that Liberty only develops office, industrial, and retail facilities, and it is reasonable to assume that the residential story would be somewhat different. While there are certainly variations on residential cost, this same principal applies. A number of studies have found 0-5% cost increases on multi-family and single-family residential structures (Wilson A 1998; Kats, Alevantis et al. 2003; Bradshaw, Connelly et al. 2005; Bradshaw 2006), and the National Association of Homebuilders own data (as mentioned in the introduction) shows a roughly 1% cost increase when meeting the minimum level of certification. Even so, cost estimates as high as 20% greater are not uncommon to hear when construction and development professionals unfamiliar with green estimate the increased costs.

Lutz mentions that Liberty has not yet done any buildings under the new LEED version 3. He thinks that system is going to change the cost answer, but doesn’t know for sure right now. But he believes that LEED has been under pressure about being too lax on energy issues. He sees them becoming much more stringent on energy, partly due to that criticism and partly due to global warming. With that shift, it’s going to require people to improve their HVAC systems to the point that it will probably cost some real money. That’s more his prediction. He’s working with some trusted designers and consultants right now to try to get a handle on options and cost impacts.

As they started doing green projects, they have also spent much more time around orientation of the building. Lutz finds this entertaining because the Greeks were doing this 2000 years ago. In addition, there are sites in an urban environment where you don’t have much of a choice. In a suburban site there are some orientations that might be obvious for building presence on street and marketing, but you should still take into account the energy efficiency of the orientation. At times Lutz says they got creative and laid out the building for energy efficiency while also getting the visual from the street. “It can’t be the same old same old. We need to get a little more creative with our thinking. We have heard you get about 10% savings from
orientation alone. Think about that. It would almost be crazy not to pay attention to this. There are always ways to think through other issues and how to get curb appeal.”

**Development team structure**

The diagram below shows the development team on this first project.

Lutz says, “we have a person that does the lease, heads the team. He is the customer contact and puts the deal together. For this (the PP&L) deal, that was John Gattuso. He is the deal person.” They also assign a project manager for development/construction management. He leads the construction and design team. The deal person is also involved with design early on, mainly to make sure the customer is getting what they want. As the deal moves from concept to construction, there is a hand-off at some point where the leasing person comes in as necessary and construction is managed by the project manager. Underneath the project manager there is a general contractor and architect who report directly to Liberty. The LEED
Consultant reports directly to Liberty. The Architect usually has mechanical, structural, and possibly civil, though in some cases the civil reports directly to Liberty. The civil may report directly to Liberty because sometimes we get them on board early for looking at a site. The mechanical, electrical, and structural engineer all report to the architect and architect reports to Liberty. The LEED consultant reports directly to Liberty.

Since that first green project, they have made a few minor changes in their structure. Those have centered around several issues. First, they give the general contractor slightly more responsibility, largely for tracking items that they need in order to score LEED points. Lutz explains, “even if you did the work a certain way, you won’t get points because you can’t prove it. For guys who have done it, it’s generally easy. Often it’s the same submission they would have given on doors. They just need to make an extra copy that goes in the book. Hopefully there is not a lot of backtracking for things that should have been in a submission anyway. In this particular project, the general contractor was a particularly good one. They hired a person on staff to make sure they were LEED compliant. They did that again for the Comcast building they built for us in downtown Philly.”

Second, they have changed some of the ways that materials are delivered. One example is that they now get sealed duct work on site, so they don’t have water, dirt, debris in the duct work before it goes up. They now put in drywall a little later than they might have done previously because they are waiting for the building to be water tight. “On several occasions we took a risk and it got wet and we had to cut it out. This is all related to trying to keep materials dry, mold and mildew free. “

Beyond those changes, the development team structure has remained mostly the same.
The biggest shift in team structure is that now sometimes they don't have the LEED consultant. The architect has it in house.

**Liberty and my green building hypotheses**

The Liberty Property Trust story provides strong support for three of the four hypotheses presented earlier, the same three as Green Coast. To review, those hypotheses are that development firms who have been leading adopters of environmental innovation share certain characteristics.

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 for the providers of
design and construction services, partner firms 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.

4) Early adopters of environmental innovation have moved aggressively towards industrial
construction and CAD/CAM construction techniques because it gives the developer
more control over the installation of products and the ability to reduce waste.

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 five, ten, and fifteen year holding patterns in particular
markets with their buildings, and they were 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 that 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 than
many of the other firms we will consider, 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.

The one place where Liberty provides little to no support for my hypotheses is around
CAD/CAM construction techniques. Liberty did not discuss any use of these techniques, and the
PP&L project was site built. However, they do show a significant interest in serving as a very
involved owner/developer, and providing rigorous quality control. They have been able to
achieve that through their contracts and oversight process, and therefore may have less need
for industrial construction. Also, many of industrially constructed systems are less useful in high
and mid-rises, like PP&L, than in buildings that are less than five stories tall.
Goggin Enterprises

Goggin’s first green project

Goggin Enterprises is a woman-owned development and development services business based in Massachusetts. Ann Goggin, the principal, runs the company. Her interest in green development was evolutionary. When Greenbuild was in Denver, she started attending. She had been looking at green projects for about two years before that, starting sometime around 2005. She wasn’t completely sure that she wanted to certify her projects, but was much more interested in “walking the walk” as opposed to getting a stamp of approval (Goggin 2010). At the time that she bought this property, her intention was to develop it in as green a manner as was reasonable. She was not trying to be a demonstration, to be LEED-Gold, etc. She decided to take on green projects as part of a personal value system, saying: “This is the only way I want to develop anymore.”

She bought a piece of property in July of 2006. It was 280,000 square feet in three buildings, a former manufacturing facility, and it was a brownfield. When she acquired it, the property had been remediated for mercury, asbestos, and other issues. It was in an in-fill location, and her plan was for mixed-use. Two of the three buildings were for multi-tenant office space. The third was to be distribution and light manufacturing. Her projected total development cost was $24 million.

From a green building perspective, she was particularly focused on indoor air quality and energy efficiency. She wanted to encourage carpooling and/or driving high gas mileage vehicles. She wanted to get good use from natural daylight, and incorporate water efficiency. She saw these things as common-sense, pocketbook issues and she wanted the development to be responsive to them.

Finding the right partners

When it came to choosing her team, Goggin knew she was a “one-woman band,” and that everything would need to go through vendors. She interviewed architects, construction management companies, electricians, HVAC people, etc. “Because the building existed we needed a lot of vendors right away, both for maintenance and to be part of the development team. We were looking to emphasize local vendors, so we would eliminate a vendor from Cape Cod if we could find one on the Northshore (of Boston).”

She started out working with a bigger design firm, based in Boston. She ended up using a small firm based in North Hanover. “The larger firm just didn’t have the same level of efficiency as the smaller firm,” she said. In addition, the big firm was going up a learning curve on green building in exactly the same way that Goggin Enterprises was. She spent “a ridiculous quantity of time” with a group that wanted to use under-floor, radiant HVAC. “This doesn’t really work in a retrofit, but since the design team was on a learning curve with the developer, we did not get the benefit of that knowledge on the front end.”
They used AIA documents as the base for their contracts, and they looked to infuse all the agreements with environmental language. She added a standard environmental attachment to the construction manager’s contract and other contracts with project partners. Even the lease documents included environmental requirements for the tenants. She had to convince the architects to get certified as LEED Accredited Professionals. “I didn’t care if they were LEED-AP, but I wanted them to have the necessary knowledge base.” The construction manager, Architect, and two of the project managers got that knowledge base, but Goggin felt like it “would have been helpful if they had it when we started.” She also felt that there were additional requirements beyond the standard riders that they should have put in their contracts that would have made things easier. “I didn’t care if we were certified in the building. I really wanted the substance of the environmentally friendly actions.”

She selected the architect first, because she needed their expertise during the due diligence on the building. She had a contractor at that time as well, though she ended up not using them for construction work. About thirty days into the project, she switched builders. She needed an HVAC contractor, an electrician, and a plumber right after buying the building. She ended up interviewing those, something that might generally be left to the contractor/construction manager but she did in this case because of how critical they were for the existing building, and most or all ended up becoming the prime subs through the construction manager. She also changed architects, as previously mentioned, about one-year into the project. She made the second change out of frustration. “The big firm had big fees,” she said. “We were paying for their education.”

Much like the original Green Coast project, Goggin was trying to do what she thought was best for the green intentions of her project: build an integrated design team, exercise significant control in the selection of team members, get everyone to work together, but she was frustrated with those outcomes. For her this frustration revolved around her sense that people didn’t have the necessary experience to carry out green projects, so her development team spent a significant amount of time spinning its wheels, as with the investigation of under-floor air distribution. She also seemed to suffer from a lack of strong relationships with her design and construction team members. In part as a result of not having a go-to set of partners that she knew she could trust, she ended up churning through various groups who weren’t able to provide the level of service she wanted.

What makes a green project

Before this project, Goggin had never cared about specifying paints. But her team specified a low-VOC paint and about halfway through the first tenant improvement, they changed to a zero-VOC paint at the suggestion of their painting sub. He realized what they were trying to do and thought another product was a better quality. They also used waterless urinals and sensored faucets, which were new. And other sensored items like an occupancy sensor, a light sensor, solatubes with matching light sensors so they would go on or off based on light coming in. They put in a building energy management system. This was worth every penny. She estimates that it paid for itself within six months. She also put a lot more emphasis on the content of materials. They used CRI plus carpets. They specified things not necessarily for their...
color, design, or price, but for their manufacturing process. She used different materials for cabinets, going with a zero formaldehyde cabinet. She used different floor coverings including Forbo, Armstrong bio-tiles, and a few others. “As we did each Tenant Improvement, we would try a new product,” she said.

In the bathrooms, they would have traditionally used granite, but they used a greener hard surface product instead. “We started with a supplier in Texas. The product was more green, more expensive, and difficult to handle. So we switched to a similar hard surface product that was a better value and had a better service.” They used recycled steel in toilet partitions. They used dual flush toilets. There was a lot of learning in the process. They spent a ton of time figuring out how to insulate the envelope. She had never paid attention to insulation strategies before, and they spent a lot of time on it.

They also really liked the way several other items functioned, including their recycling room and the waterless urinals. According to Goggin, the “waterless urinals helped hugely in permitting. We got our permit in record time.” They also had a novel approach to trash collection. “We don’t pick up your trash, but we will do your recycling. If you insist on throwing something away, then you pay. If you recycle, then we take care of it as part of the building cost.”

Goggin did feel that her hands were tied on what they could do based on the condition the building already was in. “Ultimately, the big, big decisions had been made by the previous developer. Windows, roof, HVAC were all there and new,” she said. Goggin did some modifications, but didn’t change out items in which the previous owner had invested.

Again, she forms an interesting counterpoint to the two cases we have already seen and the ones that will come later. She was able to drill significantly into the product and material details of green building, with intricate knowledge of where and how they obtained various preferable products and what was specified in certain places and why. However, the whole process left her dissatisfied, as the team members she relied on the most, the construction manager and designer, did not have the expertise that she needed to start.

**Obstacles encountered**

Going up the learning curve was much more difficult than she expected. She didn’t realize the extent to which people are “talking about green, but they don’t really know what it means.” Goggin states that “Lots of people say they have a good value proposition, but it’s not always there. The learning curve cost us money in terms of consultants. It cost us time in terms of getting the story and basic costs together. It really hit us hard in terms of knowing what we had to do with tenants and what we didn’t. The increased cost didn’t come from products we decided to use. I can’t honestly say it costs more to build green than conventional. We had a real inability to find vendors who could provide good guidance. You are paying for their learning curve as well as your own.”

Goggin cited several examples of areas where their learning curve ended up costing them time and money:
1) They selected an EcoVator. “This elevator held us up about three months,” Goggin said. “That was one decision we made that we could have gone conventional and it wouldn’t have been a problem. This one cost us some money.”

2) They investigated under-floor air, when it should have been clear from the beginning that this wouldn’t work. Goggin stresses, “we spent tens of thousands of dollars investigating it.”

3) They decided to use two water-saving features that functioned badly, a well and a rain sensor for irrigation. The well hit a dry hole, which was “disappointing.” The rain sensor was even less successful. “We spent a spectacular amount of money (on these items).”

She also found that rent premiums did not exist for a green product, saying “tenants won’t pay you a penny more for being green. They just won’t. They might lease from you because you’re green rather than somewhere else, but it doesn’t translate to higher rents.” This stands in direct juxtaposition to the sense that Jim Lutz has about Liberty’s buildings, where he believes they do see a premium for greening and other improvements that they make.

She also grew disenchanted with the United States Green Building Council’s Leadership in Energy and Environmental Design (LEED) system through the development process. “We had a building that was neither fish nor fowl. It didn’t meet new construction guidelines, because roof was on, windows were in, HVAC was there. We didn’t meet Existing Building guidelines because that is more about operations.” Beyond this, she thought their point weighting was strange. “Does it make sense to give me a point for a bike rack and give me a point for being on a brownfield,” she asks. “It’s way more difficult to develop a brownfield than to deal with bikes. They’ve done a fantastic thing. They are a market transformer, but the system is designed for them to be the leader. It is not designed to get people to a minimal base standard. It’s just not the nature of what they’re trying to do to have a standard that everyone can meet. They always want to raise the bar to the point that some people don’t try to meet it.”

She felt that other obstacles were typical for this type of retrofit project. There were no really good plans. They found pipes that were in plans, but not in the building. The sewer lines that were indicated were not there. The previous owner had put roof drains on the roof, but didn’t connect them to the ground. Some of those things are challenges that come with buying an existing building and retrofitting.

The project went into foreclosure in August of 2009. “We couldn’t meet the leasing milestones. Rents were falling and construction costs were higher than anticipated. The green story helped us survive as long as we did. There are not a lot of suburban buildings going green, certainly not mid-size ones. So being green helped, but not enough to offset the typhoon.”

**Development team structure**

The diagram below shows the structure that Goggin used for this project.
Figure 3: The dotted lines represent relationships that changed during construction. MEP means Mechanical, Electrical, and Plumbing.

This diagram is another significant departure from the traditional OPC relationship that we saw in Chapter 1, and it reflects a common theme from our earlier cases. Here the owner is much more involved than would be conventional, and the construction manager and architect both report directly to Goggin, as do some of the prime subs. Hiring and firing decisions all rest with the owner/developer (rather than with the construction manager or architect). The details of how this relationship worked can be seen more clearly through the balance of this section.

Goggin states that “the architect did do construction administration, but didn’t do it in the classical sense of getting a 15% markup.” The architect would approve the work, but she approved the payment requests and reviewed them directly. The construction manager and the architect worked as peers. The construction manager didn’t report to the architect or vice versa.

She used a construction manager as opposed to a general contractor. “We wanted to use a construction manager because we needed all the data available to us. We didn’t know what we’d be paying for and what we wouldn’t. So we wanted to see every bid and see feedback from subs. The painting contractor came back and said use zero VOC paints. If the architect could hear them talking about the Building Energy Management System, then he thought ‘we need to do this differently over here.’ We needed to hear that discussion.”

The final material choices, change orders, etc. were all signed off through Goggin. Change orders were real costs. There was a real fast-tracking process to get some of the tenants in the
building. Goggin says, “there is no way we could have used a traditional GC (general contractor). It wouldn’t have worked.” This reflects some of the scheduling concerns that Gordon raised in his paper that were also discussed in Chapter 1. In order to hit her deadlines and targets, Goggin had to use a non-traditional relationship through the development process, and this is the one she chose.

They had an open-book, cost-plus deal with the construction manager. As they moved forward, Goggin felt that the construction manager was lazy. They started using the same subs from earlier in the job. “In the end we were overpaying for some stuff. We forced them to go to bid a couple times.”

One of her key takeaways was that you needed your team to have the right expertise from the beginning of the project. “If I were doing it again, I would require at least 1 LEED AP on both the architectural team and the construction manager from the get-go. And preferably they’d have more than one, and preferably this person would be a principal.”

In addition, Goggin said she would not use a construction management consultant again. “In the end, I discharged her because she was slowing things down. It was good in the beginning when we didn’t know where we were going. As we got going it impaired communication. We terminated her about halfway through.”

Goggin also noticed that this job required her to be more hands-on than she had ever been. “I have never gotten so involved in construction or construction decisions as I did on this job. The project was better off for me doing it. It will be more leasable going forward. It will function better as a building. I just won’t be around to see it.”

**What the future holds**

Goggin is currently in a career transition, as she has decided to leave “building by building development” to focus on energy efficiency and green building consulting. “It’s not related to green. We’re no longer interested in building by building real estate projects. I have become more committed to energy efficiency and green principles of real estate development. One of the problems we faced was how rapidly we had to go up the learning curve. Manufacturers are rapidly coming out with new stuff. They are way ahead of tenants, development teams, etc. We want to help people get up that learning curve.”

**Goggin and my green building hypotheses**

The Goggin story provides strong support for two of the four hypotheses presented earlier, and an interesting commentary on some of the others. To review, those hypotheses are that development firms who have been leading adopters of environmental innovation share some characteristics.

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 for the providers of design and construction services, partner firms 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.

4) Early adopters of environmental innovation have moved aggressively towards industrial construction and CAD/CAM construction techniques because it gives the developer more control over the installation of products and the ability to reduce waste.

Goggin’s project ultimately failed because her bank foreclosed. In that light, it is reasonable to ask if a more patient investor could have helped her avoid foreclosure, and gotten the project into a workout. However, from Goggin’s own description of the reasons for foreclosure, and an understanding of the real estate market in 2008 and 2009, it is also safe to assume that the project would have been in trouble regardless of how patient the investor was. In fact, she felt like the “green story helped us survive as long as we did.” But ultimately, the project failed as a result of timing, and not necessarily poor execution.

Goggin did seek out design and construction relationships based on quality rather than price competition, but ultimately was extremely dissatisfied with her options. She fired her first design firm, fired her construction management consultant, and described her construction manager as having become lazy in the midst of the project. So while she took the steps she needed to take in order to create a team relationship that could lead to improved performance, she felt much like Green Coast on the Arabella project, namely that her team members did not live up to their end of the deal.

She took significant control over many aspects of the project, and even mentioned that she was never more involved with a development than she was with this one, as a result of its being green. That control involved direct lines of communication with team members that were uncommon, including subcontractors, and taking a much more active role in design and construction than she normally would have.

She did not discuss use of CAD/CAM or other industrial construction techniques, but the role of those systems would have been limited anyway in a rehab project of this type. But, like Liberty Property Trust, she did utilize a more hands-on approach than would be conventional in the delivery of the building. This control over quality can be seen as a substitute for the need to use industrial construction approaches.
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. On the process side, he had his office in a construction trailer for 1.5-2 years during the construction of one of their condo projects, and he watched first-hand the waste stream associated with a 42-unit condo project.

“There were 42 30-yard roll-out dumpsters filled with material that was by and large reusable,” Zucker said. “Every week brought a new offense. Whether it was tons of 2x4s and 2x6s, sheetrock that could have been used to amend soils, later on tons of cardboard just tossed. These things were already refined and highly reusable. I was cautioned by the profligacy of the process.”

They made the decision to research LEED, Green Globes, and a couple other standards to see if they could incorporate sustainability principles into their next project. Through that research, they decided to pursue their next condo project as LEED, as it had become obvious to them that LEED would be the most expeditious standard to pursue.

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 was new construction and it took 14 months to build.

They wanted to meet the LEED-New Construction guidelines, and they focused on energy conservation. They spent a good chunk of time discussing whether they should be LEED-certified or LEED-certifiable. Ultimately, they decided on certified, and that became the first goal. Their subsequent goal was to achieve energy conservation better than 30% of code, based on the EPA guideline. They wanted to match “the downward sloping line that is described by the 2030 challenge.” That became the guiding principle. At first, Zucker did not think they’d be able to achieve it, 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. They have the same architect for every one of their projects. He 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) worked together at a design-build firm. That gave them comfort with a development process where they are their own general contractor and architect. However, the way this design-build firm did business was a bit too loose for Zucker’s taste. They made things work in the design-build arrangement by being a little bit loose with the numbers. If they were able to save on one thing, they could shift it to another item that was running over budget. Their drawings didn’t need to be tight. They didn’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 felt 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. If there is a fuck-up it is our fuck-up. There is never a mistake that is John’s. It is a miss of the team’s and we deal with it.”

This structure directly supports my 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 the Liberty story here, 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 deciding to adopt green building. Zucker will return to this point later.

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” or a “set of neurons and synapses that become broader in their network with every project.” This iterative learning means that every project is smarter in its design than the last. They 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 don’t have the same team that stuff can easily be lost, and because of these relationships they are able to learn faster and better than their competition. This commitment to learning echoes the words of Leith Sharp paraphrased in the introduction as one of the ways to influence behavior and motivate change.

Beyond this, 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’s 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.”

At one point, they did decide to venture out of this structure to respond to a request for proposals that the Housing Authority put out. “It was less than satisfying,” Zucker said. “Things got fucked up and it was their fault.” This has reinforced his 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.”

The meritorious tinkering of green

On this first green project, they also hired consultants. They brought in a sustainability consultant and an energy modeler to support them in their “hunting and gathering” with respect to LEED. They were balancing every means and method as general contractor, designer, and developer, and attempting to view every decision through a lens that weighed the relative impacts of materials, sustainability, and LEED points. Discussions came down to things like how to do wall framing to reduce thermal bridging. They’d ask questions about how to balance structural needs and thermal needs, all the while pushing on whether or not there were other ways to do something? Sometimes they missed. Zucker was upset with the engineer as they realized on completion that they had huge pockets of air in every corner of the building that they can’t insulate. But at the same time it showed the strength of their team, and carrying the same people from project to project, which allowed them to say, “We’ve screwed up there, we won’t do that for the next project.”

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 couldn’t really check. Zocalo paid off the Seedco investment as scheduled.

In addition, they had about fifty kilowatts of photovoltaic panels on the roof. Ten kilowatts powered the common areas. Each of the 36 owners received one thousand two-hundred and sixty 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.

Zucker was also frustrated by his inability to access a specialized government program because of the classification of his project. Zocalo estimates that LEED costs, both soft and hard, were about $350,000 or two percent of the total $17 million budget. Two thirds of that incremental cost could have been paid for by the energy efficiency tax credit of $240k. But because the building was taller than three stories, and it was not commercial by ownership, Zocalo did not qualify for the credit. “I’m frustrated that there is no streamlining or reconciliation of energy efficiency measures through the federal government. If the goal is to create more energy efficient buildings, then who the fuck cares (how tall your building is or how it is classified). I’m duly pissed for the track record we have.”

Beyond this, 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. We will return to this challenge later in this chapter.

Obstacles encountered

They experienced some difficulty with a few materials in this first project. Those problems revolved largely around their wood floor and the compact fluorescent lights (CFLs) that they used. They tried a wood laminate that they hadn’t used before, and had some problems with it. This reinforced the importance of their standard practice of testing a product in their office or somewhere else before they put it in their building. The CFL issues were two-fold. First, some residents complained about the quality of light. Second, their bulbs were all plug-in varietals that were Chinese made. As Zucker said, “one burns out and you go back to the lighting house and that manufacturer in China has gone out of business.” Because of problems like this, Zucker views CFLs as “an unfortunate way stop on the way to LED lighting,” but it’s still an expensive stop. “We have $150,000 of CFLs in 1 project and a lot more coming.”
They also felt like there was a learning curve for their sustainability consultants, because projects like theirs are rare. Zucker says that the LEED-New Construction book anticipates this, but it is still expensive to grow knowledge from this early point. As a case in point, they had a plan for upsizing the existing boiler to get domestic hot water, which cost $650 per unit, or replacing it with a unit that was much more efficient. The Energy modeler kept saying that the two options were not very different with respect to price. When they finally quoted it, replacing the unit was $2,200 per unit. Over 62 units this is a major difference in cost. As a result of this incident and others like it, they now pay a lot of attention to mechanical systems and bring in the mechanical contractor during the design phase. The three principals have also built up their experience and now have more practical views to temper the sense of experimentation that consultants sometimes bring.

**Development team structure**

The diagram below shows the development team structure that Zocalo used for this first project.

![Diagram of development team structure](image)

This is probably the most similar diagram to the traditional OPC model that one will find in this study. Here, the development company allows the contractor to hire all subcontractors, and the Architect hires all engineering, etc. with the exception of the LEED consultant. The big difference is that all these relationships are internal to a couple of firms. One could collapse property management, development, and construction into one box. And the Architect, while legally a third-party, does 100% of his work for Zocalo, and Zocalo gives 100% of their contracts to him. So they are captive to each other.

In later projects, Zocalo started to bring in a mechanical contractor on a design-assist basis. They are also continuing to search for better and more educated mechanical contractors. In
multi-family, they don’t have the HVAC budget that they would in an office project, so it is important to them that they have a qualified and efficient team.

They have also started taking a lot more time developing the Owners Project Requirements, and they are adding more and more aspirational goals that speak more broadly to community sustainability. As a component of that, they have started to bring in pre-development facilitators, using Rocky Mountain Institute on their most recent project. Through this process, they select the three things that they want to include in their future projects that go beyond LEED. Often, these are more of a spiritual, community-based set of goals. For instance, they want to change hiring practices/subcontractor practices before during and after construction. In the case of 2020 Lawrence, they made the commitment to figure out how to use the waste heat from the building, and they are putting a rooftop greenhouse that will hopefully allow year-round growing. The staff from the greenhouse will come from a nearby homeless shelter that does job training.

On this same project, they had an unwelcome change in their structure forced on them by the HUD loan they are pursuing. They must have a third-party contractor who can meet bonding requirements. So they changed their team for financing, but not because they sought out such a change.

**How Zocalo would make green building easier**

Zucker wants to see more belief on the part of investors that a more sustainable project is of higher value, and that despite the caution about building new construction that successful developers would have regular access to investors who are willing to put pre-development funds into an experienced and successful development entity like Zocalo.
“We are like TS Eliots’ concept of practical cats,” Zucker says. “Developers are a pretty practical group. We are good at self-advocating. We can figure out everything else. We can figure out how to push for policy. We can figure out how to motivate others to create better supply chains. But, the gears are entirely frozen without cash. Nothing else matters for me.”

This point reiterates Zucker’s need for long-term patient financing. With a changed relationship with his investors, Zucker believes that Zocalo could grow significantly and replicate their early successes on a larger scale in the Denver area, and in other areas as well.

**What the future holds**

Zucker hopes that this rooftop greenhouse run by homeless shelter trainees and using waste heat from the building can be something that catches on. He says the idea has grown out of watching Detroit and other cities facing deindustrialization, decay and the detritus that results. Throughout the country, minority populations have become majority populations for generations if they come from Eastern Europe, Asia, Europe. But that process has stopped with African-Americans and Latinos. Zucker sees this problem compounding with any number of other issues like foreclosures, blight, decreasing opportunities for employment, severing relationships with land, and decreasing opportunities for green/fresh produce. He has been watching with a lot of interest as some community-supported agriculture is starting to take off in Detroit. As a result, he started thinking about how that could be interpreted in the downtown. All those aspects are present, though maybe not the decay and blight.

Zucker is unimpressed with the common approach to growing plants on rooftops, the green roof, calling this trend a “tremendous folly that takes huge amounts of water, with very few benefits.” Instead, they use the waste heat from the building for changing conditioned air and shedding it. They have budgeted $350,000 for a 3,000 square foot greenhouse with direct air to air heat exchange. They have focused all excess heat where venting out of the building is located.

They are currently trying to get the project capitalized. They currently estimate that the greenhouse could produce $50-75,000 worth of produce annually, exclusively from plants that are growing from the same set of roots, things like herbs, mesculin, and salad mixes. The homeless shelter would be the financial beneficiary of the program. Zucker also mentioned the idea to a friend who owns a popular restaurant near this project. He’s interested in organics. He wants to source locally. Zucker started talking to him about purchasing shares that benefit the homeless coalition.

Zucker likes the potential of this idea to become a model. “There could be a protocol for this. It’s similar to how we deal with distributed energy. We grow food with the energy we’ve already used. It’s easier to see what we’re talking about if we’re growing produce. It’s so palpable, and a great stimulant of local community sustainability. It could help reconnect urban populations to the land when they have been so cut off from the green miracle.”

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Zocalo and my green development hypotheses

Zocalo provides strong support for three of the four hypotheses presented earlier. To review, those hypotheses are that development firms who have been leading adopters of environmental innovation share some characteristics.

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 for the providers of design and construction services, partner firms 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.

4) Early adopters of environmental innovation have moved aggressively towards industrial construction and CAD/CAM construction techniques because it gives the developer more control over the installation of products and the ability to reduce waste.

With respect to investment, 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. As noted in the chapter, this relationship pre-dates their commitment to green building, and, like Liberty, I believe 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 towards greater involvement. In addition, Zucker is clearly quite involved in the design and construction processes in a way that would be atypical.
Zocalo has some experience with industrial construction, but it is not critical to the way they manage their process. However, like many other firms interviewed for this study, they control for quality and price in other ways through the oversight of their work on-site, and through the fact that the contractor is also an owner of the building.
Chapter VIII. Cherokee Partners

Cherokee Investment Partners

Cherokee Investment Partners is a private equity firm that is one of the largest, if not the largest, owners of contaminated land in the United States. They are based in Raleigh, North Carolina. Cherokee began when Tom Darden, founder and CEO, was working on energy at Bain and Company in Boston. They were looking a lot at energy cost reductions, particularly around energy efficiency in heavy industry. At that time, the EPA had just started regulating sawdust because it releases methane and sawdust is a good fuel. Darden knew a little about the brick manufacturing business, which uses a lot of energy. Manufacturers at the time were powering their plants largely with coal and natural gas, and prices spiked. As a result, brick manufacturers were hurting.

At the same time, the EPA started making people haul wood waste to landfills when previously they had dumped it out back. “I thought this was stupid,” Darden said (Darden 2010). “I went to landfills run by the county, and asked them to tell me where that wood was coming from. Then I would call the saw mills and tell them that if you bring your sawdust to me, we won’t charge you for dumping and we’ll pay for transportation. In this way I could get almost free fuel for making bricks. So I went on a tear buying brick plants in the southeast.”

Brick plants tended to be very contaminated. So now Darden owned a bunch of highly contaminated land in the Southeast, and they went into the business of growing bacteria for soil remediation. They developed new methods for clean up, and became a soil remediation contractor.

“People would bring us dirt,” Darden said. “We grew bacteria for ourselves and grew bacteria for other people. We were also watching site cleanup regulation. We realized you could buy properties cheap if they were contaminated, and we had some knowledge about how to clean them up.”

They bought three sites in California, and then bought some additional contaminated sites in Massachusetts and Connecticut. They didn’t work as the soil remediation contractor on their own sites, because they were too far away. But they would tell the contractor what to do. Darden says, “We were taking lots of responsibility on legal and technical issues. We would tell people how to clean things up. As time passed, we realized we could add value by getting entitlements. We could do the planning work. We also realized that urbanization was an increasingly important trend. So we focused on cities and urban sites.”

According to Darden, they developed a philosophy that location is the single most important environmental variable that you can implement or take action on. He believes this is contrary to the common view. “A green building built in suburbia has a much worse impact than a non-green one downtown,” Darden said. “Our first green projects were redeveloping urban infill
and bringing development back to the cities. We weren’t really thinking about building attributes. We weren’t really doing any building. But we didn’t like what people were doing, and we wanted the ability to influence later development.”

With that in mind, they began looking for new opportunities and ways that their values could be applied to the projects they invested in.

**Cherokee’s First Two Green Projects**

In the mid-2000s, they hired a new staff member. He was a lawyer with little to no environmental background, but he was going to build a new house. So they asked him if Cherokee could make his house a demonstration project on green building, and they would pay the incremental costs to do this. The new employee agreed.

“We accomplished our green building objectives by adding stuff,” Darden said. “If it existed on the planet then we bought one. We duplicated systems. Icynene, closed attics, solar water panels to heat floors, geothermal heat pump, pv shingles to generate electricity. There was a long list. This was Mid-2005, and the contractor owned the lot he was building on. That contractor had us by the throat. He opposed everything throughout the whole process. If you’re entertained by engineering phenomena, then this may not have been so painful. But if you’re a lawyer and you don’t understand why there is a pump over there or how that switch works, then it’s very painful.”
This diagram shows the somewhat convoluted series of players involved on the green home project. To carry out their objectives, Cherokee ended up creating a whole additional development team that worked alongside and in order to influence the decisions of the project development team. If you look just at the right side of this diagram, it is fairly conventional. You have an owner (the employee) who hires a homebuilder, who hires the subcontractors. But overlaid on this whole process was an external project manager (answering to the home owner), and series of consultants and vendors related to the external project manager, and a home design and construction team (answering to Cherokee and the homeowner) that was developing a series of new green approaches. These approaches were influenced by Cherokee’s green expert employee who was also directly supervising the external project manager and that project manager’s consultants and vendors. All this was supposed to influence the conventional homebuilder (who owned the land the homeowner wanted to build on) and the subs that regularly did work for this homebuilder. This process did not go well.

Chris Wedding, a Cherokee staff member and the owner of Iron Oak, put it slightly differently. “The green home project had way too many bosses,” he said (Wedding 2010). “The rationalization was that it was a test case for how you convince national homebuilders to build at scale on Cherokee projects. We never aim to repeat this again.”

After this project, Cherokee started work on a new office building for themselves. They also started pursuing LEED-ND certification for nearly all of their projects. Darden says, “We were always sort of selling.” Part of the issue is that Cherokee is principally an investment firm, so they don’t control the process of vertical development. Instead, they bring someone else in who is an expert on vertical development. When this process begins, they send in a team member, like Chris Wedding, to interact with technical people and take the process through certification. “This is slightly less necessary than it was,” Darden said. “They (developers) know how to spell LEED now.” But the process remains enlightening given the investigation of the other firms in this study. Cherokee takes on a very limited development role, namely they buy property, clean it up, entitle it, and then sell it or partner with someone local who carries out vertical development. As a result, they have the least control of any of the groups investigated thus far on the actual construction process, and they also seem to have the highest level of frustration with realizing their goals for influencing vertical development. Even in their new office, they didn’t control the development process.

Their new office was a conversion of an old warehouse that had been minimally upfitted when they acquired it. “It was just toilets and an HVAC system so they could get the CO (certificate of occupancy) and get tax credits,” Darden said. “We came along and said we want the space and want LEED-platinum certification. So get out of the way. The redeveloper ran a varnish paint shop underneath the first floor. We couldn’t get him to not use oil-based paint in everything he does. This was painful.”

According to Darden, they were “fairly mercilessly” chasing LEED points. As an example, they had 3-year old refrigerator from another office they were closing. It wasn’t an energy star refrigerator, but it was perfectly serviceable. But they got rid of it and bought an energy star...
model to get that LEED point. “This is the bad thing about LEED,” Darden said. “It causes you to chase points. The engineer types need the system because it tells them what to do, and you’ve got to tell them what to do.”

Early on they faced criticisms about LEED, and whether or not it makes any sense to pursue. They also considered meeting green building guidelines, but not pursuing the certification. Darden believes these are all “relevant criticisms,” but that there also has to be a third-party standard and “LEED is going to win.”

Neither of these projects went particularly well from Cherokee’s perspective. Darden believes that is largely because in both cases someone else really controlled the projects. Now they push a lot harder on getting language into the contracts with their development partners that forces the partners to make an effort towards greening. This idea reflects the author’s concern that Cherokee will be limited in their success towards greening because they don’t control the process and relationships responsible for delivering the project. They only control part of the capital.

**Finding the right partners**

Cherokee Partners is an investment firm, and they see this as one of the obstacles they have to overcome to achieve their goals around green development. As Darden says, “investment firms don’t do this stuff. We are out of bounds from the minute we start. Our development partners are used to dealing with investment firms on Park Avenue or something. The Park Avenue guys have no opinions about it. The developer is driving all these decisions, and he may be doing a good job of it. Suddenly we come in and say ‘let us offer all this wonderful advice about how all this goes over.’”

As a result, they have noticed over the years that the amount of attention that their development partners pay to their green building goals is usually proportional to the amount of the project Cherokee still owns. According to Darden, “it could be a situation where all we have is the right to run our mouths, and it could be a situation where we have a little more than that. Either way, we feel like we’re on the outside making these impertinent dorky comments. But how much they roll their eyes depends on how much we own.”

Darden also sees the long-standing relationships between development teams as one of the obstacles to the sort of innovation they push at Cherokee. “You’ll see contractual relationships that last for a long time. They built 10 projects exactly like this before, and now they’ll build another one. That team won’t have a single member that will change. Unbelievable how affiliated these teams end up being. It’s bad because it prevents evolution of thought. It’s good because they share values. That’s the whole problem here. We’re trying to push people to work together on something when they don’t share the same values or knowledge base.” This comment points out an interesting alternative to the idea that vertical integration of the OPC relationship supports environmental innovation. Darden has seen that cut the opposite way. This distinction of values versus approach is a critical one given this critique. It may be that the real benefit of vertical integration around design and construction services is the sort of
institutionalized learning that is only possible through repetition. However, if that group starts with a set of values that does not include environmental innovation, learning can serve to more fully entrench an antithetical approach to green.

But these relationships do not always work out so negatively for Cherokee, and they have had a few bright spots as they try to get their development partners to adopt green building standards.

One of those bright spots happened in Canada, where they were working with an older, traditional developer named John Stavies. In the beginning, he was someone who had never heard of LEED, according to Darden. “He completely opposed all this stuff, but we owned 100%.” So Stavies listened. Together they did a green building study, and Stavies completely converted. Darden believes his was the first LEED-ND project in Canada.

Another bright spot project occurred in Newport Beach. This was a large project with a traditional developer. Cherokee only bought half the site, and the other half was owned by an oil company. The developer didn’t know anyone involved in green development, but they got really interested and motivated. They are working through the entitlements right now, and they are addressing environmental issues in conjunction with that.

In both cases, Darden believes part of their success on these two projects was that Cherokee, “got in the wave, and we weren’t out in front of it. After a while, we were right in the middle of the wave. We weren’t pushing people to the point of being uncomfortable.” This idea further reinforces this sense of values or intention we were discussing above with respect to the makeup of the team. One major lesson of the Cherokee story may be that green development is not particularly doable without patient investment, a unified team, and alignment around mission and values. It is not that having any one of these that makes green innovation doable, but the confluence of all of them that support this transition in the end.

**Obstacles encountered**

The biggest obstacle that Cherokee has faced in investing in green development projects has been their experience with contractors, who Darden describes as “idiots or liars that need to be fired.”

“Every contractor and every subcontractor opposed every decision we make,” he said. “There are people who now crow about having worked on the first LEED platinum project, and it sticks in your craw because they so aggressively opposed all the changes.”

Another major obstacle for Cherokee has been material suppliers. At times they have had only one choice for buying a given product. For example, foam insulation is very expensive in buildings Cherokee has financed. The first time they tried to use sprayfoam, no one had heard of it. Even now, it frequently costs around $15k per house. Cherokee has been unique among the firms investigated in this lack of access to material suppliers, and it is interesting that this overlaps with their preferred structure, where they are one remove from any construction
process, but trying to influence that construction through the manner that they invest. It is possible that the combination of unwilling contractors and subcontractors overlaps with their lack of access to material suppliers, where if they had more willing contractors and subcontractors, those people would be able to find better pricing for specific jobs.

They have also faced large obstacles around cost. Darden says that he and his wife started building a little beach house during this whole transition, that was “sort of like a little Make it Right house (referencing the Cherokee Gives Back project built in New Orleans in partnership with the Jolie-Pitt Foundation and William McDonough + Partners). If you’re really maxing out on these projects, the cost is just staggering. That doesn’t mean if you build a LEED silver commercial building that the cost will go through the roof. That’s not a science experiment. For LEED silver, you are making a few minor changes, and the increased cost is minimal.”

**Development team structure**

They used their experience on these first few projects to invest in a project called Kanawha, a 400-acre planned community outside Charlotte. This was a complicated deal involving a non-profit partner who was going to use their proceeds from the project to build a museum of life and environment along the river. The project was slated to include 800-1,300 homes, 200,000 square feet of non-residential uses, and a wide mix of property types. Cherokee was interested in building a repeatable model for large-scale green communities, and the equity tranche was quite small. The non-profit had been given the land, and charged with building the museum. The model for the deal was that the non-profit would contribute the land to a partnership, and get a percentage of the profit. Those profits would kickstart construction of the museum.

Bill McDonough was involved for a large part of the project. He worked on coming up with guidelines throughout the process. Cherokee also crafted some. But until they had builders signed on to start building there were questions about who was going to build and when the building would start. There were also questions about what was field tested enough to be reasonable to include. Wedding himself wrote 10-11 pages of mostly strategic but some tactical ideas that all the stakeholders had signed on to. This included guidelines for all homes to follow Earthcraft, and all non-residential buildings to meet LEED commercial.

Wedding said they tried LEED-ND but the system didn’t work. “It’s a great standard in so many ways, but there will be projects that don’t have density and don’t have mass transit as a pre-requisite.”

Beyond the issue of how to certify the greenness of the project, there was also a culture clash between Cherokee and the non-profit partner. In the beginning, even getting the operating agreement signed between the non-profit and Cherokee was considerably prolonged. Wedding said, “they (the non-profit) had a lack of experience in doing deals like this. We were some investment firm that Bill McDonough wanted to bring into the project. The NGO is looking at basically an investment fund and having to set terms. They were not quite sure whether they trusted our intentions. To be more specific their legal counsel didn’t trust our intentions.”
Ultimately, that initial agreement was signed and Cherokee tried to partner up with a major homebuilder. The idea was that the homebuilder would take down 300-400 homes in that community and Cherokee would help them build greener than they normally do. Wedding described the relationship this way. “Our expertise helps make green more affordable for them, and we would help that major national homebuilder get over the learning curve and build green on non-Cherokee projects. After months of working with this group, their supervisor finally said we’re fine with you pursuing this green opportunity, but don’t do it during normal business hours. It is not core. In the end, they weren’t in the running to execute.”

The projected development cost was about $300 million, but ultimately the project fell apart. In Wedding’s estimation, this was partly due to trials in the planning process where delays caused them to miss some good windows. The deal began in late 2005, and by early 2008 the development partner (the non-profit) had a deteriorating relationship with the deal partner that Cherokee had brought on. The table below shows the structure of the team.

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The deal partner shown above (Project Manager) had 20 years of experience. He was internal to Cherokee, and had been working for a couple years hunting for deals. When this opportunity came about he led the due diligence and spun out a new company, teamed up with a couple other similarly minded partners. They formed a captive deal partner for Cherokee that consisted of these three or four guys plus back office. They were running point on three or four projects, and they were supposed to do the on-the-ground stuff that Cherokee doesn’t do. But after a while, the relationship between the deal partner and the non-profit started to fray.
“All of a sudden, our external JV partner starts to not trust our deal partner,” Wedding said. “They think they’re not managing money properly, and not involving them (the non-profit) appropriately in decisions. So we changed out our deal partner and tried to re-do things. The new guy wasn’t quite sure of the old guy’s development plan, and then there was an issue with planning. One of the early estimates in our master plan was that the site would yield about 1300 units. All of a sudden we were told that it would only yield 800 homes.”

Wedding continued. “This was kind of an R&D project for us. Ultimately, it didn’t work out so well. We like to think that we’re not dumb passive money. But with some money comes principles, values, differentiators, etc. Part of this value could be with our environmental management system or the sustainability guidelines we have in place. We are strongly considering 4 projects to become LEED-ND pilot projects. This is atypical for an equity fund.”

“We were more involved then than we would be now. Part of our learning was that we should restrict our role and do it much more effectively. Wearing the master developer hat is a much different structure. To some degree we played the master developer role, but we still had a deal partner. The deal partner was more involved with details in terms of sustainability. Cherokee was interested because there were lots of ways an R&D project like this could apply to other the $1 Billion plus we were going to invest at the time.”

At the end, Wedding believes they had third party appraisals, liquidated their interest, and split up proceeds accordingly, but he was not completely sure how the deal was unwound. Either way, once again it echoes a point made earlier in this chapter. Cherokee has had the most frustrating time trying to influence behavior in vertical development, and they also exercise the least control over that process. In fact, one gets the sense that simply brokering a deal between groups like Zocalo or Green Coast and Cherokee would immediately solve each group’s biggest problem. In such a case, the whole team would share vision and values, and the need for capital to reach scale which limits Zocalo and Green Coast, would be matched with capital that seeks environmental innovation but is often thwarted by disinterested development partners.

**Cherokee and my green development hypotheses**

Cherokee provides strong support for two of the four hypotheses presented earlier. To review, those hypotheses are that development firms who have been leading adopters of environmental innovation share some characteristics.

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.

4) Early adopters of environmental innovation have moved aggressively towards industrial construction and CAD/CAM construction techniques because it gives the developer more control over the installation of products and the ability to reduce waste.

Cherokee is a developer that is limited in scope (they only buy property, clean up contamination, and entitle property), and they think of themselves exclusively as a private equity firm, not a developer at all. In this sense, they are an investor who is interested in the temporal payoff of green development, and they have built some significant portion of the wealth of the company through arbitrage in the contaminated property markets. So they are comfortable, as an investor, with the idea that you can get a higher value product by investing in something better on the front end. But their significant frustration is that most of the time, their deal partners and contractors don’t care about doing things their way, and they fight this type of thinking at every step of the process. This has become such an issue for them that Darden believes that the only way to generate wide adoption of environmental innovation in development is through building codes. While he is generally a “private sector type of guy,” in this instance he wants to see tougher regulation that just makes that argument moot.

They generally don’t have direct relationships with design or construction firms, because this is the responsibility of their deal partners. They do have some long-standing relationships with environmental remediation and planning contractors that they would maintain because of shared vision and values, but for the most part the Cherokee story sheds little light on this hypothesis.

While they exercise much greater control (influence is probably a better word here) than most investment firms over the development process, they still exercise relatively little control in comparison to a conventional developer. And there is a strong correlation, repeated throughout this story between their lack of control over development and their frustration with reaching their green development goals.

Cherokee does not do any vertical development, and is therefore not involved in decisions about using industrial construction versus site built options, and they don’t have any particular process (at least that we discussed) to enhance quality control on site during construction as a way of getting the additional control over the installation of the project.
Schlosser Development

Schlosser is a small development company based in Austin, Texas. Schlosser is led by brothers Andrew and Bradley Schlosser. Their firm has less than 10 people, generates $5-10 million in annual revenue, and develops less than 100,000 square feet of commercial and industrial space annually. They have a regional focus, with projects opened or planned in three states, and they develop, manage property, and have an in-house leasing team. Schlosser has developed green projects, but only to the extent that they are required to do so by either a governmental authority or a client.

“For a small company in an especially difficult economic environment, I think it’s very difficult if not impossible for my partners or me to develop any type of green improvements that exceed requirements set forth by criteria established either by governmental authority or by private tenants.” Andrew Schlosser says. “Historically, there is simply no ability for us to assimilate the cost of green-like improvements into a budget for which we receive no economic return.” This is an interesting viewpoint which stands in stark contrast to the approach espoused by Liberty, Zocalo, and Green Coast, all of which believe there is super-normal value in a green approach to development. Liberty, in particular, is not pursuing green projects because it is the right thing to do, or because it is the right thing to do alone. They pursue green projects because they see a significant opportunity for value creation, but this is an opportunity that Schlosser doesn’t see.

That said, Schlosser believes that they have had the opportunity to develop certain projects because he understands the green vocabulary and is willing to work with communities and governmental authorities to understand their vision for a property and deliver that vision to the community.

“The Corvallis project is instructive on that point,” Schlosser said, speaking of the project to be investigated in this chapter. “I do not think we would have been allowed to do the project if we had not indicated a willingness from the first time we met with the Corvallis community development staff to abide with Corvallis’ notions for the site. These notions included requirements that we develop green type amenities -- bike paths, pedestrian paths, energy economies, and adhere to stringent urban edge guidelines, aesthetics, and parking ratios that are unorthodox. The very fact that we followed Corvallis rules and never contested their vision is what led to the ultimate product. If we had not followed Corvallis prescriptions for the site, the project would not have been built; at least, not by us.”

“It’s not a question of if a certain project will get developed,” Schlosser continues. “It’s a question of who gets to do it. It’s a privilege to obtain the legal right to acquire real property from private land sellers at a time in the development life cycle when a governmental authority will green light a project. Ultimately for me, abiding with strenuous green guidelines has been legal and political as much as it is religious. Following the ‘green’ prerogatives of a

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governmental authority is often the only way we get projects approved. Some developers derive psychic benefits from developing ‘green’ improvements from which little or no financial yield is borne. Early on, when our company was very financially constrained, we probably avoided projects with a strong ‘green’ agenda. However, as our company has matured, I’m sure that we’ve become more attuned to recognizing the social benefits of building ‘green’. Unfortunately, however, development often boils down to raw economics, and we have been very careful to avoid involvement with projects that are ‘green’ for ‘green’-sake only.”

The Corvallis Opportunity

In 2001, Schlosser got involved with a site in Corvallis, Oregon that it developed over a seven-year time period. Corvallis is south of Portland. Local development regulations required and continue to require ‘green’-like development. Schlosser followed every stipulation required by the governmental authority, but did not develop improvements that exceeded Corvallis requirements. The development includes mostly national retailers, including Staples, Safeway, a movie theater, Home Depot, Applebees, Radio Shack, Supercuts, Blockbuster, Curves, and others.

Schlosser was responsible for site development and entitlements. Some of the tenants ground-leased sites improved by Schlosser with utilities. Schlosser performed build-to-suits for other tenants. All together the cost of the project was approximately $35-$50 million. Schlosser brought approximately 300,000 square feet of new retail and office/commercial space to this market.

Schlosser described the difficulty of getting such a project entitled: “Things don’t move fast in Corvallis. Every box was a challenge. Almost every improvement was appealed by a stakeholder. Sometimes the stakeholder was a rival. Other times, a stakeholder-neighbor ostensibly had issues with traffic or noise or some other matter that they could legally contest. Technically, pursuant to Oregon land use law, appeals are filed with the Land Use Board of Appeals (LUBA), an extension of the State of Oregon. This appeal process is to be distinguished from appeals of land use actions (in most other states) that are typically filed with district courts. Appeals are essentially challenges of whether (or not) a local government has or previously had authority pursuant to state law or local code to approve a certain application for development. The local government, in this case the City of Corvallis, as a defendant in the appeal action, typically defends appeals on the grounds that improvements previously approved were legally entitled and that the process which led to an approval was explicitly followed. It’s not unusual for commercial projects of almost all sizes to be contested in Oregon. That’s the nature of the process in Oregon. Many land use experts believe that state-wide land governance has provided Oregon with a very enlightened, compact development pattern.”

In Oregon, every major city and town has an urban growth boundary surrounding it. That urban growth boundary is approved at a statewide level. All land outside of the urban growth boundary is classified as farm or forest. As a result, Oregon has one large city (Portland) and many middle size cities surrounded by virgin farms and forest. Schlosser believes that the imposition of urban growth boundaries by governmental authority is the principal reason that
Oregon has not been sullied by the type of sprawl development you see in other places. As a result, Schlosser contends that the urban growth boundary framework has resulted in high urban land and housing prices relative to average income levels prior to the 2008 meltdown.

The Schlosser site is anchored by Hewlett-Packard (HP) on the east. (Oregon State University is to the south.) The Schlosser site shares a property line with HP property -- a multi-million square foot research and development facility for ink-jet technology. The HP site was developed in the 1970s. Schlosser says that HP elected to locate in Corvallis because Corvallis: 1) is close to their headquarters in Palo Alto, 2) has a relatively inexpensive pool of engineering talent from a Pac-10 University, Oregon State University, and 3) is a left of center political environment that is similar to the political environment in Northern California where HP is based.

Schlosser elaborated. “There is a good quality of life in Corvallis. It’s just a beautiful oasis. Corvallis means core of the valley. The area around Corvallis is a very rich, lush area for all kinds of micro-farming. It is beautifully scenic, as is most of the state of Oregon. The region’s economy is driven by activity from OSU, HP, medical care, and Linn-Benton County Community College. Our company had the good fortune to get involved with the Corvallis project right around 9/11. We were in the right place at the right time, and we locked up control of approximately 30 acres from 5 different land-owners. We convinced Corvallis to not only allow the development of typical retail space, but also to allow the building of a multi-screen theater on the tract as an anchor. Based on the zoning code in Corvallis, we believed that this site would be one of only a few sites on the north side of Benton County that would be feasible for a large 12-screen stadium-seated movie theater. In order to perfect a so-called ‘PD’ (a Planned Development) from the City of Corvallis, we explicitly followed a road map set forth by the Corvallis Community Development department, other related Corvallis departments, and state of Oregon departments including the Oregon Department of Transportation. Corvallis has always had a number of green prerogatives, and we followed them precisely. After we obtained agreements binding the theater circuit to become part of our development, we got involved with a number of other box-users including a high-end Safeway, Staples, Home Depot, restaurants, shop space, and high tech flex space that we built immediately adjacent to HP.”

Corvallis had very specific aesthetic preferences. For instance, Corvallis required that parking spaces be inconspicuous from the street. Unlike most shopping centers where vast expanses of parking are very visible from motorists driving on major arterials, Corvallis considered it critical that the site plan contemplate big-box development immediately adjacent to street sidewalks thereby creating a so-called ‘urban edge’. The City also capped the total number of parking spaces --- allowing far fewer parking spaces than what most other cities would require in accordance with generally accepted parking engineering standards. This decrease in parking was coupled with a desire for multi-modal ways to access the site, including pedestrian paths and bicycle paths that would connect the project to the urban core. Beyond this, Schlosser built a traffic signal, did some wetlands mitigation, removed underground storage tanks, remediated some asbestos conditions, and converted what was a quasi-industrial property into a commercial shopping center.
“Our primary mission as a development company was not to develop a green project. Indeed, at that time we were not really sure how ‘green’ was even defined. We are not LEED compliant. However, I’m enlightened enough personally to want to leave the site in better shape than we found it. It’s kind of like leaving a boy-scout camp site in better shape than when you arrive. Our mission was to get involved in a project with socially redeeming value to the community,” Schlosser said. “We wanted the project to be profitable, and of course did not want to be called for personal liability. The project, almost 10 years later, has worked on all accounts. HP and the community in general are pleased with the project – even if at times it was controversial. Much of this controversy was because competing proposed projects sponsored by rival developers dueled with us to develop similar projects at different locations with some of the same tenants. Our willingness to follow the city’s vision and roadmap especially regarding impervious cover (i.e. less parking), urban edge, bike and pedestrian paths, and conformance with extraordinary architectural and environmental standards -- probably gave us an advantage over our rivals. That, in and of itself, is a valid reason to make a commercial/suburban shopping center more ‘green’ and architecturally compatible with the surroundings and dictates of the community.”

Schlosser continued. “We followed the City of Corvallis plan, and their green building guidelines. In a middle market like Corvallis -- there is a very easily determined and predictable level of retail sales. Relating that predictable level of retail sales to existing retail square footage in an urban growth bounded market defines the amount of density that a middle market can absorb. In markets like Corvallis, we’re dealing with relatively low rents, fixed hard costs, fixed soft costs, and certain fees that are mandated by the city council. As a developer, you are always stuck in a box. Our principal objective is to meet private criteria set forth by tenants, and public criteria set forth by City of Corvallis, ODOT, and other agencies of the state of Oregon. Hopefully, we are able to satisfy everyone’s criteria and not bust project budgets. All of the sums lined-out in our budgets are discharged to meet public and private criteria. Our willingness from the very beginning of the project to follow the vision of the community gave us a political edge vis-à-vis rival developers. We followed the community vision laid down 20 years before we found the site – a very explicit vision that was well-defined long before we ever started construction.”

While Schlosser is quick to point out that they don’t develop green projects, he also has a deep and abiding appreciation for the natural beauty of the Corvallis area.

“We made a decision early-on that it was a privilege to work in Corvallis – a place with an educated, affluent community. Outsiders in general and Texans in particular were suspect. We always felt obliged to follow the Corvallis roadmap,” he said. “We realized early on that we were in a pretty special place environmentally. Who were we to come in to a community like Corvallis – with a strong tradition of abiding with certain ecological sensitivities -- and dictate our vision for their property? They live there. Our role in the development was to channel their vision for the site and to introduce national retailers into a market that was incredibly under-retailed. That’s the mission we abided from the beginning to the end. That’s why we were never in conflict with the community, planning department, planning commission, city council,
or with inspectors that proctored every aspect of the project. From the very beginning, Corvallis had a very crystal-clear vision for this large then-undeveloped tract. Their vision was far superior to anything we could have come up with. In fact, because Corvallis had a well-defined vision it was possible for us, given the scarcity of retail space in the community, to mandate the nature, design, shape and form of every building feature to every retailer that we engaged contractually. We told the retailers how they would do their deal. We were blessed with an ideal leasing situation: Because there was only one parcel in the development for each retail category, we could dictate design terms to the two or three retailers that comprise each retail oligopoly category. If a prospective box-user would not accede to Corvallis land-use stipulations, they would not be awarded with a lease or sale contract. For example, if Staples wouldn’t have followed our design stipulations, then we believed (and more importantly, Staples believed) that Office Depot or Office Max would. Every tenant had to ultimately conform with the city’s vision. The ultimate retail store brand -- that would eventually operate upon the site -- was irrelevant to the city (and to us). We were blessed with multiple rivals for every location within the development.”

**Building a Team**

Because Schlosser was developing across the country in Oregon – and not in Austin where they had a group of design and construction talent they were familiar with and who had worked with Schlosser before - Schlosser set out to find architects, engineers, contractors, suppliers, and sub-contractors who would be able to help them develop and construct this project. Generally, Schlosser initiated informal discussions with professionals, suppliers, and contractors. Those informal discussions ripened into more formal contract discussions that culminated with the parties endorsing an AIA-type standard agreement.

The site plan was produced through collaboration between an Austin site planner that Schlosser had worked with before and the City’s Community Development Department (CDD). The CDD had a vision of how the site would work. Originally, the site was planned for a regional mall. Several mall proposals were brought to the City in the 1970s and 80s, but a regional mall was rejected by the Corvallis community, and therefore a regional mall in Corvallis was never approved.

“By the time we arrived in Corvallis, we knew what the site was not going to be. We gave our site planner an idea of how the CDD wanted the land developed. Once we had a rudimentary site plan, we engaged the first of two civil engineering firms that got on board. The first was a large civil firm out of Portland. They converted the site plan into civil engineering plans. We reached an accord with the city on public improvements, specifically the dedication of easements -- sanitary sewer, storm sewer and water easements. The civil engineering firm also designed, and supervised the establishment (at our sole cost) of a traffic signal. Pursuant to that design, the engineer provided assurance that the number of trips leading into the project and leaving would not overburden Circle Blvd (loop road) or Highway 99 (major arterial running from southern Oregon into Portland). Sanitary sewer, water, and storm utility lines were already in the street. So there was no offsite development of sanitary sewer, storm sewer, or water facilities. However, extensive onsite storm sewer detention and retention facilities were
designed and built by us. Transportation engineering was much more complicated. The engineer had to be very involved to get the traffic signal approved and to satisfy the conditions set forth in the PD (Planned Development). The civil engineer also represented us with every traffic and transportation state and local agency.”

Schlosser’s approach, as shown in their team diagram above, mirrors many of the early traits of Zocalo and Liberty Property Trust. They intend to be long-term owners and managers of property in heavily regulated markets throughout the country. They generally pursue design/build type relationships as a way of reducing the adversarial nature of the relationship between design professional and contractor, and they like to work with the same design and construction teams over and over, because they find that this learning and comfort level is useful in decision-making. Their one significant difference is that they do not see the same opportunity for extraordinary growth in green development that Liberty, Zocalo, and Green Coast see. As a result, Schlosser takes an approach where they do only what is required, while these other groups push the envelope on what is allowed.
“Once we had a civil engineer involved as CE of record, our designers collaborated with each of the retail box developer architects,” Schlosser said. “We endeavored to marry façade requirements stipulated in the planned development approval set forth by City of Corvallis with the preferences of each of the retailers’ architects. Staples criteria plans, for example, were inconsistent with the City of Corvallis’ elevation requirements and conditions which had been previously approved by the planning commission and Counsel when the PD was approved. We had to resolve and reconcile with Staples a non-prototype elevation that would have an impact on the way Staples would operate. Staples strenuously resisted incorporating elevations that were dissimilar with almost every other Staples store built on the west coast and incompatible with the standard Staples trademark, signage, and brand. The Corvallis Staples is one of the few Staples in the US that has an urban edge. Parking is on the side and behind. It is a very nice store. Immediately adjacent to the urban edge is a sidewalk that is less than 15 feet from the Circle Boulevard arterial. Pedestrians see the Staples as a streetside retail front, not a typical suburban big box, though that is how it functions.”

Most of the actual construction performed by Schlosser was site work. They obtained approvals, building permits, plans, and offered a ground lease to tenants (though Staples was a build to suit.) They used a design-build format for negotiating with one construction company, one master civil engineer (which included the traffic engineer), and one proctor for geo-technical work who also proctored installation of the site-utilities and site-improvements.

They did not use any new or unfamiliar construction techniques. The building was mostly CMU block. There was some variation of planning resulting from geo-technical requirements related to earthquake codes. The buildings also had to meet stringent façade requirements and elevated energy requirements due to what Schlosser calls “the environmental soul of the community.” The facades were based on architectural guidelines in the PD. Schlosser said it included a narrative description of how vestibules, corners, colors, materials, and even landscaping.

Design-build relationships between construction contractor, designer, and owner are standard for Schlosser. “We always use design-build. It may just be habit at this point. We’re not set up to institutionally churn out projects. Everything we get involved with is a collaboration of talent that we generally have worked with before. My personal philosophy is that what you save when you bid out a project is what you spend in change orders after you start construction with a low bidder. The nature of the bidding process leaves an owner/developer with gaps in design. Those gaps almost always result in change orders. So we choose when we want to fight the cost battles-- and we elect to fight them on the front end. By establishing criteria with an architect/contractor on the front-end, we don’t have to get involved with the physiology of construction. We have never been involved in a contentious situation with a general contractor. Design-build just seems to go a lot smoother. Contractors and architects prefer design-build also. In the end, I don't think it makes much difference economically. I don’t think our numbers would be any better if we bid anything out. However, when you bid - you invariably become adversarial with the contractor. Projects that start off adversarial, end up being litigious. Litigation—we always avoid.”
Drawing a line at Green

“it would be disingenuous to pretend that my mission in Corvallis was based on making the Corvallis site a greener site,” Schlosser says. “To wit-- most developers find themselves in the same place that we are -- trapped by economic pressures from every direction, and trying to find a little bit of dry land..... a little bit of high ground where you can protect your margins and not fail financially. That is probably the main reason that as I’ve gotten older, I’ve become less opportunistic in terms of pursuing projects. I know how hard it is to build successfully and still pay bills and not leave stakeholders with a bad feeling about my company and me. If development was easy, everyone would be doing it.”

Schlosser goes on to say that governmental authorities that stringently regulate and govern projects not only result in more successful projects for the community that must live with the finished product – but also actually protect the value of those projects in the long run.

“People are very critical of local authorities, because they feel that they are heavy-handed. However, governmental restrictions and requirements are ultimately more your friend than your enemy. The more restrictive governmental regulations and land-use laws are, the better chance there is for scarcity. It is the scarcity—the shortage-- that saves everyone in the end. That notion is lost on many developers that are more anxious to get a project going than to end up with a well economically-grounded project. Judicious land-use enforcement by land use governmental authority not only creates better community design but also results in less supply. Over-supply of buildings in almost any market invariably results in the financial failure of perhaps all of the projects in that market. In the US, factors of development production are immense. Until 2007-2008, easy access to capital supplies drove way too much development. Therefore, historically, we go through booms and then busts, when everything has become overbuilt. Oversupply breeds lower rent, and it is lower rents that result in projects failing. By design, therefore, we have sought out projects that are in heavily regulated areas.”

Schlosser and my green development hypotheses

Schlosser does not directly support my hypotheses, but actually rounds out some of the arguments in interesting ways. To review, those hypotheses are that green developers share certain characteristics.

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 for the providers of design and construction services, partner firms 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.

4) Early adopters of environmental innovation have moved aggressively towards industrial construction and CAD/CAM construction techniques because it gives the developer more control over the installation of products and the ability to reduce waste.

In the case of Schlosser, we have a development firm who believes that green projects, by definition, spend money on environmental improvements that result in no economic gain. This is something that he cannot afford to do because every project is so tightly constrained that all you can ever really do as a developer is meet public and private requirements. However, in his approach to development, Schlosser has adopted at least two of the same practices that we have associated with green development firms, and used them to his advantage to develop in highly restricted markets like Corvallis, Oregon. These approaches include:

1) Changing the nature of the OPC relationship to utilize design-build as a matter of course, especially as a way of reducing the adversarial tension between contractor and design professional.

2) Creating long-term relationships with certain builders, designers, and other development team members, as a way of building up familiarity and carrying learning from project to project.

This recognition presents an interesting counter-point for this study. Schlosser, who represents developers who have not adopted green innovation, seems to vary most significantly in practice from the other groups interviewed here by his analysis of the market for green buildings. He sees this as an increased cost with no added benefit. In that case, he is right to point that no one should ever do it. However, the other adopters who have aggressively entered this market see the opposite. If any arbiter is needed in that debate, time will probably do the trick.
Chapter X. Analyzing the Cases

The chart below shows the extent to which each case supports my general hypotheses.

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This simple chart shows that there is strong support for the first three hypotheses that green developers have access to public capital markets or would like to change their relationships with investors to make the adoption of environmental innovation easier, that they have sought out long-term relationships with design and construction partners that allow for something like vertical integration, even when that integration has not been complete, and that developers have taken more control over their projects. This also matches well with the results from my large N, web-based survey presented in Chapter 3. Finally, while there is minimal adoption of industrial construction (even the two firms who have used industrial construction have done so sparingly and not as a dominant strategy) in practice, there is wide adoption of quality control practices that have the developer much more involved throughout construction as a way of ensuring that environmental goals and quality goals are being met. This can be considered a substitute for industrial construction.

As a way of further exploring this analysis, the balance of this chapter will utilize an alternative way for parsing this research, exploring three themes that shed light on my questions about whether development firms are structured in a way that hampers environmental innovation. I describe these three themes as green as better business, integrating for green, and green as mission. Each is described below.

1. Green as Better Business – The central argument of the cost-benefit literature that I discussed in the first chapter is that green development is better for the bottom line. However, it seems like very few developers and investors believe this, and a desire for short-term returns is typically not the thing that motivates adoption of environmental innovation in adopters. In looking at the themes around “Green as Better Business,” I will explore the extent to which green being better business is a driving motivation for the organizations involved in this work.

2. Integrating for Green – The integrating for green themes are at the core of my hypotheses for how development firms restructure their development teams to adopt green practices. These are the disruptive process innovations that I referred to earlier.
and in this section, I will measure how frequently they are done and compare the experience of the multiple green developers interviewed with the experience of my conventional developer.

3. Green as Mission – Many of the firms that I interviewed structured themselves to deliver green projects. In other words, they are committed, ex ante, to doing projects that are mission-driven. In looking at the themes that reflect a green as mission approach, I will explore whether my hypotheses on firm structure can predict the level of success that mission-driven companies have in meeting their green goals.

Green as Better Business

To set a framework for a discussion of the green as better business concept, I want to recall two critical ideas that were introduced earlier in this work. First, in the introduction to this research, I discuss an interaction I had with the President of the Greater New Orleans Homebuilders Association, Toni Wendell. In that interaction, Toni put forward a common critique of green development, namely that it doesn't make economic sense. This critique is gently restated by Andrew Schlosser in his comments about why Schlosser Development does not take on green projects, except to the extent that they are required to do so by private (tenant/client) or public requirements. This idea seems to be the dominant perception about green building in the development and investment communities, and it cuts counter to the idea that green is better business. Second, the work of Koebel, who was trying to understand the adoption of innovation in the homebuilding industry, implies 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 my web-based survey results.

Taken together, these two ideas point at a critical conflict in the world of green development; we may be dealing with a system where there are at least two optimal points. One might be thought of as the market optimum. This market optimum would be sought by the Toni Wendell’s and Andrew Schlosser’s of the world who are trying to figure out what their customers will pay for, and exactly 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 socially optimum point 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 power on the rooftop.

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

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. So they have found that 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 into the future, 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 operator and they function in a particular geographic area. Though they have not said this directly, the author believes that 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, including designer, developer, contractor, and property management, 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 really Zucker’s central frustration with his development practice – namely that they don’t have access to the equity they need to make their deals happen. This lack of access to capital (the reverse of Liberty’s situation) is the most difficult obstacle for Zocalo to overcome, and it underscores my hypotheses about what green developers will do to make their work easier. Zucker has vertically integrated around design and construction, he has utilized some industrial construction techniques (though not on the project discussed most frequently in Chapter 7), he has taken greater control of his projects to create greener results, but he lacks access to patient equity. He believes that with such access he could grow the company significantly and provide strong returns to his investors, in fact he has a track record of doing this. However, he still struggles to get the needed equity into his deals.

Cherokee provides another interesting angle on this discussion. Their entire business was founded on an arbitrage opportunity that they recognized, almost by accident to hear Tom Darden tell it, when buying brick plants in the Southeast. This recognition that environmentally challenged land in urban areas was undervalued, led them in a particular investment direction that was very lucrative for a long time. But as they have become more interested in green building, and influencing the behavior of their deal partners to take on green building

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24 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.
approaches, they have experienced some level of frustration. They have struggled to profoundly influence the practices of their development partners in many cases, and while they have pushed very hard on the boundaries of what is possible in common practice in a number of their projects, these projects have not always gone well.

The Green Coast case is the most nuanced in the Green as Better Business category. They firmly believe that their triple-bottom line development approach will generate greater long-term returns, and this belief springs from several things that they think are true.

1) They believe that they will get project opportunities on the basis of their triple-bottom line experience and reputation. For example, their work on Project Home Again has helped propel them into a significant relationship with the Salvation Army that is wholly unique for the Salvation Army. Without their experience on Project Home Again, and particularly without the built product to show, this relationship would not have been possible.

2) They believe that they will attract investment from patient equity providers in unique ways that will enhance the value of their projects and significantly expand their ability to achieve their triple-bottom line goals. One of these concepts, to be deployed with a project that involves a community-health center and other non-profit office space, seeks a city investment that would allow Green Coast to donate the buildings to these two organizations, permanently supporting public education and the provision of healthcare through the transfer of building equity to these two non-profit partners. While this may sound like a bad business practice, the donation of these buildings is the driving force behind the city investment, which will unlock a significant developer fee and create value for investors.

3) They believe that the litigious nature of the relationship that many developers have with community and environmental advocates is counter-productive and expensive, and that there is a value proposition in building a long-term and mutually beneficial relationship with neighborhood groups and environmental advocacy organizations. They also believe that such relationships are transferable by reputation, and that acting in this way will get them jobs that no other developer would ever get, in the long run.

That said, they are the youngest company of the ones interviewed, their track record to date is short, and their current profitability is marginal. While they have garnered significant interest in their initial three years of operation, and they have translated this interest into a number of significant contracts, they are poorly capitalized and struggle with the same problems Zocalo has with access to cash. To state this another way, Green Coast makes a strong argument for why they will be more profitable in the long-run as a result of their adoption of environmental innovation, but they have yet to translate this to high profitability in actual practice.

Several key lessons can be distilled from these cases, as it relates to questions about whether green is better business:

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1) Easy access to patient capital is a critical component of success for developers who adopt environmental innovation. Liberty has this, which gives them a great deal of latitude in developing their projects, and they have translated this into the successful development of more square footage and dollar value of green projects than any development firm in the world. Zocalo and Green Coast both struggle with this, and it is a major obstacle to expanding on their initial, small scale successes.

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 or not. If Liberty, Zocalo, and Green Coast are right and people start to demand more green spaces, then their buildings will extract an increasingly large premium. If Schlosser and Wendell are right and they do not, then this investment in moving towards the social optimum may hurt them vis-à-vis their competitors who only invested at a market optimum level.

3) Reputational issues are paramount and can be a driver of long-term value and access to projects or customers over the long-term. The green development strategies of each of these firms are driven in large part by reputation, and have to do with positioning Liberty, Green Coast, and Zocalo individually in a particular geography and product. In short, they each believe there is value in being the best at something, and they work to build a brand that is able to extract that value.

In the end, these firms believe that green is better business, and they have organized themselves in ways that allow for the firms to seamlessly transition to a greener practice. In investigating the next category of themes – integrating for green – we will explore the extent to which that organizational structure for greening is predictable based on the hypotheses laid out in chapter 2. But from these cases alone, access to patient equity is valuable for scaling success, but not necessary or sufficient as a condition for success.

**Integrating for Green**

Three of the four hypotheses about how green developers would organize themselves to better adopt environmental innovations are central to the idea of integrating for green. They include:

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) Green developers 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 for the providers of design and construction services, partner firms 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.
The fourth, green development adopters will pursue industrial construction techniques like modular, panelized, and precision cut, CAD/CAM construction, is also in some ways a story about integration between design, construction administration, and product fabrication.

One of the interesting parts of these six case studies, is that it seems to indicate two things about vertical integration in green development. First, it does not seem to happen that much. Only one of six firms selected for long interviews had their own design or construction shop (in contrast to the web-based survey results), and only two of six firms had integrated with equity (and one of those firms, Cherokee Investment Partners, does not think of itself as a developer at all, though it does engage in some development activities based on our definition of development from Chapter 1). Second, 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.

Every one of the firms interviewed that had adopted a green development approach said that they took on an expanded role in the process as developer, especially with respect to design and construction. In addition, many of them had started to seek out multi-project relationships with particular designers and contractors in order 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, in Zucker’s eyes. He 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. “If there is a fuck-up,” Zucker says, “it is our fuck-up. It is a miss of the team’s, and we deal with it. The best of it is an institutional memory. 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.” In this statement Zucker really highlights the Zocalo strategy around vertical integration, namely that they began to work as one, and through that long-term partnership can begin to 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 case of Cherokee, we see another interesting approach, where they have tried to use their investment dollars to incentivize interest in green development in others. This has been largely frustrating for the team at Cherokee. Darden describes a number of projects where the interest of project partners in meeting Cherokee’s environmental goals is directly related to how much of the project Cherokee controls. Wedding discusses the amount of resistance they received from various builders and developers to adopting environmental standards, and how in certain cases that helped stall projects that eventually died. One of the interesting observations about Cherokee’s frustration is that they have never controlled the vertical
development process. They always bring in a deal partner to do that work. In effect, this severing of the vertical development from equity investment and cleanup of contamination may cut against the green development goals that Cherokee espouses.

In the case of Goggin, vertical integration was not part of the way she managed her project at all, and she had significant trouble getting over a learning curve. She changed her contractor and her designer part of the way through the project. She fired her green building consultant before the project was complete, and she felt like the other team members were all “getting an education on her nickel.” She did utilize an integrated design process, and she exercised much greater control than she usually does, but integrated design is not the same as the sort of long-standing relationship that Zucker has with his design and construction partners. Goggin certainly did not feel the same level of trust that Zucker does with his architect and builder.

In the case of Green Coast, their Arabella project tried to use an integrated design process without the focus on relationships and trust that is present with Zocalo. This is fairly similar to the approach that Goggin took, and Green Coast had a similarly unsatisfying experience. On later jobs, they have started to rely more on long-standing relationships with their builders and designers, to get a sense of what is needed and where. This really begins to approach the Liberty Property Trust approach, where they may use a number of different people, but they always want protection from those people in ways that go beyond the contract. Green Coast gets that from the contractor on Project Home Again, and from the designer on Washington and Broad. By cultivating those types of long-term relationships, they may be able to reach a similar level of learning and feedback that Zocalo achieves without the same level of commitment to particular firms.

In the Liberty case, their focus on long-term relationships with suppliers, design firms and contractors, as well as their integration with equity, has pre-dated 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, and he means better in almost every sense of the word. 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. In fact, one might hypothesize that it is not an accident that Liberty has become the largest green developer in the world. They had several natural advantages over their big and small competition:

1) They are a Real Estate Investment Trust and have access to public capital markets which allows them to expand in scale and scope in ways that most developers could not.
2) They were already predisposed towards being long-term owners of quality products, and they were engaged in differentiating partners by quality, not just price.

25 Where the full team, including the contractor, is brought on prior to the completion of plans and specs.
3) They had two executives who were knowledgeable in green building, and had the authority to steer the company in this direction.

4) They had a client who wanted to do a major green project at a time period where most institutional investors and large-scale developers thought green was just a color.

In the case of Schlosser development, we see a developer who has taken a similar approach to being a long-term property owner. They seek out long-term relationships with design and construction talent. They utilize design-build to reduce the adversarial nature of the OPC relationships and they take a significant interest in the places where they are developing. They even go so far as to only develop in markets that they see as being supply-constrained because of long approval processes, because they believe that these markets will protect the long-term value of their projects. In many ways, they look like the other firms interviewed here who have adopted green development. However, they do not see a means to achieve extraordinary value from green development projects, so they have chosen not to exceed what is required of them, or in other words, they choose to meet the market optimum.

Taken together, these interviews indicate that some level of vertical integration is desirable for development firms taking on green projects. Firms have been most successful to date in integrating their operations with contractors and designers, and more often than not this integration occurs through using the same contractor or designer over and over again, rather than performing the service from within the developer’s shop. 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, whose integration with equity is a creature of their status as a REIT. Cherokee is an equity firm that does not directly perform development activities beyond property ownership, cleanup of contaminants, and securing entitlements. In the cases of both Green Coast and Zocalo, greater access to patient equity and closer integration with those sources would greatly expand their ability to deliver on projects. But those relationships have mostly eluded both companies to date.

**Green as Mission**

Critics of green development often claim that people undertake green development projects because they are motivated by something other than profit (Wendell 2008). This sense of mission is characteristic of many firms involved in green development, and is reflected in the results of my web-based survey and would be predicted by the work of Koebel. The predominant reason that respondent firms had taken on green projects was that they believed it was the right thing to do. Of the six firms that I investigated in more depth, at least four could be described as mission-driven: Goggin Companies, Green Coast Enterprises, Zocalo Community Development, and Cherokee Investment Partners. Their stories highlight a number of important characteristics of the mission-driven company involved in green development. To better understand these characteristics, it is important to note that all four of these companies are for-profit. So while they all have motivating factors beyond profit, these four firms all must organize themselves 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) Successful mission developers integrate design, construction, and investment in a way that creates cooperation between team members for the benefit of the project.
2) Successful mission developers are more hands-on in the whole process, participating actively in design, engineering, construction, finance, and marketing discussions and making sure that insights from each of these areas impacts the decision-making in others.

The company’s stories all reflect 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. This insight did not come just from stories of successful projects. Goggin, Cherokee, and Green Coast all express skepticism about whether they had the right team and team structure on their green projects. In Goggin’s case, she felt like her designer, construction manager, and other consultants were getting a green building education on her nickel, and that they did not have the necessary expertise when the project began. This ended up costing her money, but more importantly time. Ultimately, the Goggin project failed. In Cherokee’s case, their investment role ends before vertical development, and their development partners are frequently not interested in sustainability. In Green Coast’s case, they had a team structure that was counter-productive, and the Green Coast principals had to take on significantly more responsibility just to get their first project over the finish line.

All of these firms are reliant on their development team to meet their goals, and there is a huge emphasis on getting everyone to transition the same way at the same time. The group that was probably least successful in getting the green building outcomes they have wanted is Cherokee, and they also exercise the least amount of control over the development team. The group that has been most successful is Zocalo. They have exerted the most control over their development team, and have the closest knit and longest-standing project delivery unit in this group of four companies.
Conclusion
The methodology employed in this study has provided some critical insights, but also run headlong against some significant limitations. Most critical among them is a difficulty describing the nature of the real estate development industry writ large. We don’t count developers as a single group within our economy, and the trade associations who could most accurately represent the opinions of this nebulous collection of entrepreneurs, namely the Urban Land Institute (ULI), the National Association of Industrial and Office Properties (NAIOP), and the National Association of Homebuilders (NAHB), declined to openly share information that could have colored some of the assumptions made in this dissertation. This is reflective of the moment of transition that I believe we are in as an industry, a moment defined by the inadequacy of the conventional OPC structure (the way the industry has traditionally done business) to respond to the pressures of contemporary projects. A need for greater environmental innovation in real estate development is an abiding part of this pressure, but coupled with it is a financial crisis fueled in part by real estate speculation and an increase in the complexity, time pressure, and performance demands placed on projects more generally. As is often true of periods marked by significant volatility, I think these pressures have the industry on the defensive, as firms and industry advocates are trying to sort out what these new tensions, pressures, and public requirements mean for them and the way they will do business going forward. One of the most critical next steps in this line of inquiry would be to engage at least one, if not all, of these three membership organizations in a shared research agenda to better understand how developers structure their teams independently of whether or not they are pursuing green projects. As a way of building towards such an agenda, we should take stock of where we have been.

Revisiting my hypotheses
My green development hypotheses, as presented in the second chapter, are that development firms who have been leading adopters of environmental innovation are likely to share several characteristics:

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 for the providers of design and construction services, partner firms 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.

4) Early adopters of environmental innovation have moved aggressively towards industrial construction and CAD/CAM construction techniques because it gives the developer more control over the installation of products and the ability to reduce waste.
This study has found notable and significant support for the first three hypotheses, and inconclusive results on the fourth hypothesis relating to industrial construction. The six firms I talked to most in-depth have not been aggressive adopters of industrial construction techniques. While those discussions and my web-based survey show some significant use of systems and components that are factory-built, industrial construction is not a central strategy for how green development goals are met at these early adopter firms. In fact, it is something of an after-thought in their processes. However, given the particular results of the study and the history of industrial construction methods in the development industry, I am not yet satisfied with the results related to this hypothesis.

First, this study was hampered by an inability to say what the prevalence of industrial construction was in conventional development projects. There are significant benefits for greening in industrial construction processes, and there are also a number of significant other benefits that have little to do with green, such as the potential speed and precision with which a project can be put together. However, without a clear baseline of how frequently industrial construction is used in various types of projects, it is impossible to measure whether it is used more or less frequently in green projects. Building that baseline would be a helpful and worthwhile research endeavor. In addition, industrial construction is also an area where much previous research work has been done. Relative to technologies like solar panels that are commonly associated with green building, industrial construction techniques are already widely accepted and utilized in the development industry. A large proportion of building systems are now manufactured offsite and sent to a building, which provides a level of precision and control that it is difficult to create on site. Not only does this include particular building components like cooling towers or compressors, but it extends to structural systems that have historically been fully-built on site, such as floor systems, roof systems, and wall systems. In addition, the most common industrial construction techniques are not new. Structural Insulated Panels (SIP) have been utilized in the building industry for nine decades. Standard shopping center construction in many parts of the country uses tilt-wall methods where the building pieces and parts come close to fully formed and are literally, “tilted-up” on site and bolted together. Mobile homes have become the dominant form of new single-family housing in many areas, and post-World War II development history is filled with companies that were going to reposition the development industry (particularly in the provision of housing) with the full force of American industrial might. This phenomenon is described somewhat famously in one of the chapters of Travels With Charley, indicating that it was significant enough as a trend that Steinbeck wanted to write about it in 1960 (Steinbeck 1962). One of the earliest efforts at mass-produced industrially constructed housing, Lustron homes, was heavily supported by the US Government post-World War II, and failed spectacularly with their steel-framed house in a box that promised all the modern conveniences (Liles 2010). More recently, Operation Breakthrough, a HUD-financed effort begun in the 1960s, was shut down when private financing partners decided that they didn’t want to finance industrially-constructed, highly energy-efficient housing that could be built in a day, because they thought it might also be taken down in a day, and their investment could disappear in a matter of hours (Glicksman 2005).
Taken together, these various stories underscore a couple of critical points. First, industrial construction is fairly well understood and fairly widely used in construction and development practice already. Second, industrial construction has been around for a long-time, but it has not become a dominant part of the narrative for how we put buildings together, even when almost all the parts of a structure are shipped to a site and assembled, that building is frequently described as site-built. Third, and more pertinent to the green development discussion at hand, aggressive adoption of industrial construction practices for the express purpose of delivering green projects has not been seen as critical, at least by the adopters with whom I have spoken.

One way of explaining this result is to revisit the underlying reason for why I anticipated that industrial construction would be adopted by green development firms: these firms have a desire to control contractor performance, waste streams, and other project specifics. However, the increased amount of control that green developers wield over their projects may serve as a substitute for industrial construction in practice. A second story is related to the rub between scaling to a regional or national market and the local nature of regulation. Certain technology heavy innovations, like CAD/CAM technologies, may require a certain scale that is difficult to achieve in a single-market. However, since development is regulated as a local police power, firms that build industrially constructed components may need alternative ways to reach such scale and/or may need national or international standards that guide their development process, such as the 1976 HUD-code for manufactured housing. This has been a significant obstacle for SIP manufacturers in New Orleans post-Katrina who need International Construction Code (ICC) certification as a building assembly in order to be accepted as a building material that can be used by right in new construction projects in Orleans Parish. This is an expensive certification to obtain, and many smaller firms have not obtained it, making it much harder to build with their material because one must get special approval from the building department every time their SIP is used. These two explanations are not mutually exclusive, and may in fact be reinforcing. But I do believe that more investigation is needed into the use of industrial construction in green development, and the reasons for and obstacles to its adoption as a building method, both in green and conventional development. Beyond this, there are two major conflicts that will help shape the green development industry going forward, which will be discussed in the next two sections of this conclusion.

The market vs. social optimum of green development

The trends toward environmental innovation in development are here to stay. On one hand, we live on a warming, increasingly inter-connected planet with significant risk from sea level rise, and over fifty percent of the world’s population lives within fifty miles of a coast. Resource-based conflicts continue throughout the world, and they are focused increasingly on fundamental resources like access to clean water. There are several ongoing armed conflicts that involve access to energy supplies, and the global demand for energy resources is growing.

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26 This certification means that the SIP panel is treated like a 2x4 or some other standard building product when used in a wall or roof assembly.
We have already arrived at a time and place where the management of our energy supply and our natural resources has a profound and significant impact on a number of ecological, socio-political, and economic factors that can be ever-more directly tied back to individual actions. As awareness, inter-connectedness, and the ability to share information grow, a movement that offers hope and opportunities to address these problems through individual action will grow with it. The green development movement does that on a consumer level. On the other hand, the business practice of green development is not soft-headed, bleeding heart environmentalism. Some of the largest firms in the world have invested in green production and office facilities and they have seen these facilities help drive their demand (Ford, Nike, Gap, Hewlett-Packard, AT&T, and many more). The largest publicly traded industrial REIT in the United States is also one of the largest (if not the largest) owners of green real estate in the world. Socially-minded investment opportunities are growing through a downturn, and something close to 11% of U.S investments are now invested in explicitly double-bottom line funds according to the Social Investment Forum (though not all of them focused on environmentalism) (Forum 2010). The confluence of this business opportunity with what is rapidly becoming an ecological and social imperative indicates that the green development industry will continue to grow and thrive. In fact, the author believes that ultimately green development will be the only type of development there is, as other practices will be seen as too expensive to pursue because of their human, environmental, and public costs.

As an organizing principle for the understanding of green development, the idea of the market optimum vs. a social optimum has extraordinary explanatory power. It gets right to the heart of the issue in the adoption of double-bottom line practices like green development, namely that there are externalities which our markets don’t 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. And Jim Lutz argues that Liberty’s buildings are more valuable and their tenants pay more because of their overall project quality, of which greening is a component. Beyond this, Tom Darden, a self-avowed “free market kind of guy,” wants to see green building principles instilled into the building code and become nothing more than a cost of doing business, which would push the social optimum much closer to the market one. This framework of the market optimum versus 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. Understanding that gap creates new opportunities for public and philanthropic investment as well as innovations that narrow the gap over time through policy changes, technological changes, and changes in behavior. To state it another way, I am arguing that there are externalities associated with standard development practice, and that if we accurately priced the environmental impact from development (through a carbon tax, changed utility pricing, changes in building code, etc) then we would observe different development outcomes.

To be more specific, we already know some things about the policy environment for green building. Local, regional, and state-wide regulations related to the environmental performance of buildings have been springing up around the country for the better part of a decade. There are some communities where any new building projects need to meet stringent green criteria (San Francisco, California and Frisco, Texas to name two), and the entire State of Oregon is governed by a land-use law that restricts the ability to develop any land classified as farm or forest, as described briefly by Schlosser in this study. We also know some things about the market environment for green building. It has been growing rapidly through a recession. Green Builder Media is now the largest building material/building industry publication in the world, having overtaken Builder Magazine in distribution in 2009. And the US Green Building Council has become one of the largest development-related membership organizations in the country in less than twenty years.

Despite this uncommon growth and interest in green development, there is still much evidence of a market failure in this area, and there are a number of approaches in wide discussion about how to internalize some of the externalities related to green development. Some of these approaches are market-based (like a tax on carbon or changing utility pricing) while others (like making green building approaches part of building code) are regulatory in nature. Still others (like direct public or philanthropic investment in the gap between the social and market optima) are more entrepreneurial. I expect that what we will ultimately see is a combination of these approaches where building codes start to adopt more and more aspects of standard green development practice (this is already happening with the energy codes and with work on the International Construction Code) and a number of market-based approaches will also be tried, including a Renewable Portfolio Standard that includes energy efficiency in buildings as a fuel source, some form of a carbon tax and widespread carbon trading in the United States, and utility pricing schemes that benefit end users who consume less energy rather than more. All these changes are already coming in to practice in various parts of the country, and I don’t see that trend reversing. What I think is more questionable is a rethinking of the way that public and philanthropic investment flows in to development projects. Using philanthropic balance sheets to guarantee development projects that meet the social and environmental goals of the philanthropy could have a much greater effect on the built environment than standard
methods of granting tiny amounts of money to a smattering of organizations. Creating new
types of public investments that expect certain social, environmental, and financial
performance goals from projects, rather than simply giving away money as direct subsidy to
development projects would also be beneficial and allow public officials to steer development
in certain ways that approach the social optimum for greening.

Scaling for financial strength vs. staying small and nimble
This research points out a critical tension in the development industry. 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 model of Williamson
and Eccles. 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. My first hypothesis predicts that
these larger firms will have greater ability to adopt environmental innovation because of their
supernormal ability to finance green projects, and this study finds significant evidence for that
hypothesis. 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 I have called the first principle of organizational structure for real estate
development firms, i.e. development firms are small, on average – 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 now, 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?

As green development grows, we will also see a continued reliance on relationships, and
particularly the OPC relationships that are central to the development process. It’s not clear to
me whether these relationships will follow a Liberty model (use the same people on multiple
projects but don’t vertically integrate or formally contract between projects) or the Zocalo
model (vertically integrate with design and construction), but I tend to think that the former is
more likely. I believe Eccles argument that based on the structure of development firms, inter-
project relationships are hard and may actually be poor strategy except in certain
circumstances. The requirements of green development create one of the circumstances that

27 There is an alternative confounding factor in the work on REITs, which revolves around the bargaining power
that Liberty wields over their partners. There are companies who do an appreciable share of their work just for
Liberty. This is a level of bargaining power that none of the other firms in this study can exercise over their OPC
partners with the possible exception of Zocalo with their captive designer, and even then the scale of bargaining
power is different. I have not adequately addressed these bargaining power issues here, but it is worth pointing
them out as an area for future study.
would push towards greater vertical integration, but I also think this is running up against another change that I have predicted here, namely that green development becomes the dominant path. If that’s so then the reason that vertical integration is so necessary will cease to be as important over time, and the underlying tension due to the nature of the industry will again dominate this problem, and we will see less reliance on vertical integration, but continued reliance on long-term relationships with particular design and construction partners.

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. Beyond this, there are good reasons that developers behaved as they did for many years, and the conventional OPC relationship has significant learning nested in it. I believe that the new equilibrium will be a structure that retains the labor productivity and flexibility benefits of small firms, while creating new ways of accessing greater financial strength and expertise. The M-shaped formulation that Williamson describes in his inside contracting study combines these characteristics. Such a confederation of small, semi-autonomous firms operating in local markets responds to the need for nimble, flexible, long-standing entities with great reputation and relationships in any local market. However, having a central office that provides greater financial strength to individual operators and can attract and retain the expertise required to meet the demands of this evolving industry will also create significant advantages. Such a structure recognizes the localized nature of the development process, particularly the regulation of development as a police power, while also recognizing the advantages that scale and balance sheet have for getting deals done. These confederations of many small firms will ultimately dominate the development market, supplanting the independent players that have traditionally been part of the development eco-system. These companies will all operate in a green manner, and will largely be structured as semi-independent offices. Small, local companies will be at an even bigger disadvantage with respect to capital access and volatility in the markets, as they won’t be diversified geographically like the bigger firms. Finally, these larger firms will seek out long-term relationships with development team partners, but those relationships will not frequently be contractual or rise to the level of vertical integration. They will instead be characterized by trust and shared understanding built from having worked together on a number of projects.

**The case for a large-scale public response**

The best information we have about the scale and scope of climate change and the associated environmental calamities is sobering. In addition, the coordination required of any response that will adequately address these problems is greater than any effort heretofore launched by the human species. Simultaneously dealing with the tangled issues of climate, energy access, and economic growth will require a skill that outstretches our political leadership at home and abroad. Moreover, the type of change that is necessary, a change where billions of people make adjustments to their behavior over protracted periods of time, is not the stuff of electoral
cycles and political debate. We cannot call on the citizens of the world to cut back on consumption in support of the war effort, because this particular effort does not have a well-defined end point. It is a problem we have created over 300 years of industrial growth and development, a problem that arose out of many things that were rightfully seen as progress as we built a more productive, wealthier society, and dramatically improved the standard of living for most people on the planet. We will not solve this problem overnight, or even a generation of nights, and we will not solve it without solutions that offer similarly-scaled growth and opportunity to individuals. That said, the rules put in place by government send powerful signals to the marketplace, and I believe it is the marketplace that will be most able to drive the change needed to respond to our current set of environmental challenges. But this is a tricky statement to make, because the marketplace will only get there if given an appropriate set of signals by a powerfully coordinated set of political voices setting policy for the economies of the world.

The U.S.-based real estate development industry can be seen as a microcosm of this problem. Every jurisdiction creates and enforces its own rules around real estate development, and acting in concert across jurisdictions to influence behavior by a number of small, private actors is difficult and requires something more than just political skill. Beyond this, the industry has a well-developed set of norms that allow developers to easily assemble and disassemble teams to deliver on projects. Those projects are complex, durable, and capital intensive, and they respond to a poorly coordinated set of localized regulation that makes it hard to scale between jurisdictions. As I show in this study, that set of characteristics does not lend itself well to environmental innovation, and developers who have decided to adopt such innovations have reorganized themselves in predictable ways to make this transition easier. As a result, the transition to greener practice is a slow and somewhat cumbersome one, and diffusion through the balance of the industry is likely to be even slower if it happens at all. In addition, there are some tools that green developers/investors, such as Tom Darden, would like but do not have such as more stringent building codes that require certain energy performance goals in all new construction. Such a discussion underscores more fully the problem of a social versus a market optimum. One of the largest determinants of that gap in any location will be the policy context in which the project is built. The requirements of Corvallis are likely to be much closer to the social optimum for green than the requirements of New Orleans. Therefore the cost for any one developer to meet or approach the social optimum are much higher vis-à-vis the non-green competition in New Orleans than they are in Corvallis, and in order to survive as a green developer, one must be that much better at capturing the reputational value associated with building a better product. This is true in part because policy in New Orleans does not protect the public and quasi-public goods and services (adequate storm water infrastructure, abundant access to energy, clean air, natural habitat) as aggressively as policy in Corvallis. It is also true, in part, because consumer demand for greener products and services is higher in Corvallis than New Orleans. To confound this challenge further, those two characteristic are endogenous, and the result from one directly influences the other in ways that are difficult to untangle.

Still, a large-scale public response is possible, but it is a response that needs to happen in lock-step with progressive industry leaders. Part of it is the hard, cumbersome work of adjusting the
International Construction Code to force higher and higher performance standards in our buildings, and then pushing local jurisdictions to adopt this code. Part of it is investing in retraining the workforce to construct buildings in a greener fashion, and then matching those people with construction firms who need better trained labor. Part of it is providing research and development investment incentives (rather than direct research and development investments)\textsuperscript{28} to steer more private money into green technology. Part of it is working on aggressive long-term advertising campaigns that simultaneously point out new options while asking people to change their behavior in fundamental ways. And part of it is adopting more rigorous ways to protect public health and welfare that influence our land-use and consumption patterns, making the path clearer for the companies and entrepreneurs with better approaches.

To extend the comparison back to our international challenge of climate change, energy, and economic development, the approach required must be one that breeds hope and growth. Jimmy Carter’s miss when he asked Americans to turn down their heat and put on a sweater had nothing to do with the technical nature of his response. He could not have been more on target. Barack Obama was just as right when he asked people to fight escalating fuel prices with a tire gauge. The reason they were both widely ridiculed had nothing to do with the accuracy of the statements, but the psychology of what underlies it. The technical challenge of our time is about achieving economic growth that is powered by renewable sources, creates no toxins, mutagens, and carcinogens, that increases the supply of fresh water, and purifies the air. In short, we need to build economies like cherry trees.\textsuperscript{29} No one complains that the cherry tree creates too many blossoms (their waste) because cherry blossoms are beautiful and productive. And while I believe that government can help set the table for such a transition, they cannot force it through command and control approaches, especially when those approaches require the willing participation of most of the people on the planet. This is not to say that a powerful government response is not necessary, in fact exactly the opposite is true. But more to point out that it does not look like the sort of regulatory approach we have generally seen with respect to the environment. Instead, we need approaches that create new partnerships with industry, especially partnerships that cross jurisdictions, to create protracted and large-scale campaigns that drive consumer demand in new directions and that support entrepreneurial efforts offering a better path forward and into a greener tomorrow.

Other areas for Research and Policy Development

There are a number of other areas where additional work is needed around research and policy. Listing them is not intended as an idle exercise. First, it is somewhat ironic that almost all of the research intended to convince developers that they should adopt green practices is focused on convincing them that their costs will be lower and revenues higher if they adopt...
green. However, both my web-based survey and the previous research of Koebel tend to suggest that developers who adopt environmental innovation do not do so because they are trying to decrease costs or increase revenue. This alone may be a powerful indication that green building advocates may focus on the wrong things. Second, the Liberty and Zocalo stories indicate that there may be certain types of developers who are more likely to be interested in green development. They are long-term owners/operators who already engage in quality competition to select their partners rather than price competition. Third, encouraging long-term relationships between owners, contractors, and architects, and doing things that make the maintenance of those relationships easier may be one of the biggest supports to green development possible. The ability to engage in inter-project learning, and building the kind of institutional memory that comes from having worked together on a number of past projects is critical for development teams trying to navigate through green projects. Fourth, I found that green development adopters are a very well educated group, and it may be that a willingness to take big bets on double-bottom line approaches correlates with high levels of educational attainment. This is another characteristic that could also separate likely adopters of environmental innovation from less likely adopters, and a way that new relationships could be formed between developers and public or private investors.

The topics below are all areas where more research and policy development is needed to create a clearer picture of what is happening in the development industry as many firms make this transition to greener practices.

- **Understanding the motivations behind development firms who adopt environmental innovations**: As mentioned previously, almost all of the advocacy work that attempts to convince developers to create greener projects focuses on costs and benefits. At heart, these studies attempt to convince people that green projects have little to no first cost premium, create significant operating savings, and provide a more valuable product over the long-run. But when one asks developers (and builders, as Koebel did) why they have adopted certain innovations, the answers have little to do with costs and benefits, particularly short-run costs and benefits. In the survey results presented here, the three most common reasons for adopting environmental innovations were 1) because the firm believed it was the right thing to do, 2) environmental innovations were part of their commitment to high quality spaces, and 3) one of the principals wanted to adopt environmental innovations. The fourth most common reason was green projects are more profitable. Koebel’s results, focused just on innovation in construction, found a similar long-run view where innovative companies were interested in maintaining competitiveness, enhancing image, etc. and they had much less concern for the short-run costs and benefits of their innovation adoption. This points at an interesting gap. Though double-bottom line firms (like those who have adopted green building practices) have to maintain profitability in order to remain competitive, it seems that the financial costs or benefits of double-bottom line practices are a secondary or tertiary consideration for them. What is of primary importance is the commitment to quality inherent in greening, and the sense that the adoption of environmental innovation is the right thing to do. This is an unexpected finding that deserves further study in order to understand more about effective strategies for the diffusion of environmental innovations.
innovations through the development industry. Right now, the primary strategy used for information diffusion, a cost-benefit approach, may be exactly the wrong thing to focus on. If these results are right, then such an approach misses the mark in the best of circumstances, and may actually be detrimental (remember the author’s exchange with Toni Wendell from the introduction) in the worst. In addition, it also implies that there may be certain firms who will only adopt green development practices to the extent that such practices are public requirements, i.e. they are reflected in the building or zoning codes. If firms are making these changes because they want to be seen as having a commitment to quality, they believe it is the right thing to do, and because they want to enhance long-term competitiveness, then there are likely some developers who will never want to make this transition. In addition, the findings about educational attainment may help to further identify likely adopter firms if the correlation between green development adoption and educational attainment holds up under further scrutiny.

- **Building a better baseline for behavior of conventional developers:** The most unexpected finding for me in writing and researching this dissertation is how poorly understood the development industry is as a whole. I’ve grown accustomed to the lack of understanding of the real estate development business in everyday social interactions, but I did not expect that according to both the North American Industrial Classification System and the United States Green Building Council, real estate developers don’t exist as a particular category of firm. The splintered nature of the industry and how its economic activity is counted creates significant problems in understanding the structure and operations of development teams and development firms. The structure put forward in this paper is a good starting point. It relies on the expert opinions of several developers and development scholars, and the long experience of the author in this field. But it cannot take the place of a thorough and systematic review of economic activity in this realm, a study all the more difficult to carry out since the economic census does not put this particular economic activity in a single category. My hope is that this research and other outgrowths of it will lead to a long-term partnership between some combination of ULI, NAIOP, and NAHB to look at the structure of their developer members and to understand better how they organize around development practice. Such a study will create a much better model for understanding the particular pressures that the disruptive innovations of green development create for real estate development firms.

- **How critical are inter-project relationships to green development:** This dissertation has argued that inter-project relationships are critical to successful adoption of environmental innovation, because they help build the necessary trust between team members, a trust for which one cannot easily contract. The firms interviewed in this study placed a high importance on these inter-project relationships and on having partners that were similarly motivated, committed to similar goals, and desirous to work

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30 It was fully a year into our relationship before my wife had a basic understanding of what I did. Prior to that, she would tease me about being a drug dealer, a spy, or a part of the witness protection program.
together to meet those goals. The evidence for this structure was apparent in both positive and negative ways. For example, Zocalo and Liberty evidenced the benefits of such long-term relationships and had a clear understanding of how and why they were important given their operating framework. Green Coast, Goggin, and Cherokee presented a number of negative examples, where the lack of such common experience, motivation, and understanding created really significant problems that their development teams had great difficulty overcoming, and in some cases did not overcome. More research supporting this reliance on inter-project relationships would be valuable to tease out more of the nature of these relationships, and the relative importance of each relationship vis-à-vis the others, i.e. is the owner-architect relationship – which has traditionally been the most important – the most valuable one to have these shared visions and values for green development. In addition, the Cherokee story implies an interesting counter-point to this discussion. During our interview Darden discussed at length the fixed nature of development teams who found environmental innovation wrong-headed. He talked about groups who had built 15 projects in a particular conventional way, and could not possibly imagine why they would change practices on a 16th. This is underscored by the idea that Schlosser, who maintains significant long-term relationships with the same design and construction talent, will never undertake something that is not a public or private requirement. In effect, it may be that a mindset that is open to environmental innovation may also be critical in firms being willing to adopt such changes in practice and product, and this may be as important a differentiating factor in adopters as a willingness to work on an integrated team that maintains significant inter-project relationships. To state this another way, it may be that both inter-project relationships and a mindset open to green development are necessary, but neither is sufficient as a condition for adopting environmental innovation in development.

- **Are products that tend to long-term investment (rental housing, office space) more frequently greened than products which are sold on completion (single-family housing):** This question arises from the first part of my hypothesis that says investors in green development need to take a longer-term stake in the projects. We have already discussed the idea that certain types of developers may be pre-disposed to green because of their preferred role as a long-term owner, but this theory could be extended and tested against product type. It would be interesting to know if products that have a shorter investment life for the developer, like condos and single-family homes, are more or less frequently greened than products that are fairly commonly held for long periods by the original developer, like office and residential rental projects.

- **Do not for profit developers have a green development advantage due to their expanded access to patient capital:** In Chapter 3, we found that non-profit developers relied heavily on patient sources of capital like philanthropic and public investment in order to carry out green projects. So while this phenomenon was not important in the financing stack of most private development projects, such sources were the dominant source of green projects developed by non-profits. It would be interesting to know if this phenomenon provides a similar advantage to non-profits as what REITs enjoy in their access to public capital markets, and this research might also connect with an
investigation of the market and social optima for green, in part by testing how much private and philanthropic investment is needed to get these green projects run by non-profit developers to happen.

- **How can we create structural changes in procurement and contractual relationships that make quality competition easier and that make long-term relationships more possible:** Sir John Egan was asked to convene a commission for the British Government to study how this can be achieved in Britain. His recommendations, which are referenced earlier in this study, could also have significant influence on the industry in the United States. In addition, coordination of these concepts with the writing of AIA agreements, work that is already happening to a certain extent within the AIA, would help drive such a program forward. In recent years, the AIA has developed new agreements for integrated design teams, for design-assist roles with various development team members, and for projects that use green consultants of some type. These agreements help tremendously. But additional changes should be made in public procurement processes, which still require some level of price competition on public contracts, in order to more directly recognize quality variations between team members and the reality that inter-project relationships are often more valuable than securing the lowest bidder. This recognition was central to the work by Egan. The U.S. development industry could use a similar champion.

- **Can we start a University of Green:** Goggin presented this idea during her interview for this study, and it deserves mention here. As a long-time member of the International Council on Shopping Centers, she participated in the programs they have for teaching people the basics of shopping center development, especially the University of Shopping Centers. From her experience developing the project described in this study, she believes a similar program is needed for green development. She felt like the baseline of information that she had as an interested developer was not nearly good enough for what she needed, and that she couldn’t get the protection and support she needed from her design, construction, and other development team partners. At its best, the University of Green would deliver a series of practical, nuts and bolts lessons and materials to help people adopt green development practices. This might range from a list of dos and don’ts that could be adapted for various climate zones or project types to a lease or various contract documents that spell out critical aspects of the relationships between members of a development team taking on a green project. But the basic premise for such a program would be to take people like Goggin when she started the project, and arm them with the necessary tools to be successful in green development.

- **Is it possible to identify likely adopters of environmental innovation and help them adopt:** One of the indirect findings of this study is that some developers may be more likely adopters of green development practices than others, just as a function of the development team structure they are most comfortable using and the educational attainment of their principals. As the author pointed out in his analysis of Schlosser Development, the most significant difference between the way that Schlosser describes his development team and process and the way David Zucker or Jim Lutz describes his is the sense that Schlosser has that there is no extraordinary value in green development vis-à-vis a conventional building. Schlosser is already prone to rely on development
partners that he knows well, he has made a commitment to only develop in supply-constrained markets like Corvallis and Austin. It is worth noting that these markets are supply-constrained in part because of their significant environmental regulations, and Schlosser prefers quality competition rather than price competition to choose development team members. He believes that he saves as much from the relationships and commitment to quality as he would gain through using a conventional bid process and price competition in the letting of contracts. It's likely that developers like Schlosser are more prone to adopt green building practices than those who don’t already practice some of the things that this study argues support environmental innovation in green development. By developing a tool to identify these people, and by developing a more appropriate advocacy strategy that targets such potential adopters, the diffusion of environmental innovation in development might be more cost-effectively accomplished. This would also be an effective role for government to support environmental innovation adoption in the industry.

- **How can we create the greatest positive impact with the stimulus:** The American Reinvestment and Recovery Act has pushed forward an extraordinary series of environmental reforms, many which directly affect the real estate development process. However, most of these programs pay little to no attention to the structure of the firms that they fund, and the reliance on price competition for choosing partners may make the impact of the expenditures less effective than it could be. If some of these stimulus funding programs were focused on supporting groups who met the characteristics or criteria for likely green adopters, the same investment of public dollars may create much more benefit. Beyond this, coupling public expenditures with industry-led efforts like a University of Green would result in significant improvements in the effectiveness of such public expenditures.

**In Conclusion**

I feel indebted to both Toni Wendell and Leith Sharp for steering this line of inquiry without intending to do anything of the sort. Toni helped make clear a lingering frustration I had with the cost-benefit research described in the beginning of this study. She is a successful business woman who has built a construction and development company that is now a force in the local marketplace. Trying to convince her that she doesn’t understand her business, or that she is paying attention to the wrong metrics are probably not helpful approaches in pushing her towards adoption of different development practices. In addition, there is a real possibility that she is right, and that some of the push towards green development is actually poor business practice that results in more expensive buildings with features that building occupants don’t want or at least don’t want to pay for. Beyond this, Leith Sharp, in her description of her own journey as an environmental advocate, helped push me towards the methodological approach that I have relied on in this study and that I think holds great promise for filling the significant gaps in understanding that I have highlighted throughout this dissertation. That methodology required looking at the structure of the organization(s) that one is trying to influence, and understanding how decisions get made in those organizations. This approach helped uncover two critical problems for environmental innovation in development: 1) that the development
industry is poorly understood, and 2) that the motivation of leading adopters of environmental innovation does not match up well with the arguments that green building advocates make to non-adopters. Beyond this, Sharp’s emphasis on incremental learning – helping people take small steps out of their comfort zone on the way to longer-term, more systemic change – is useful for testing and understanding the process of innovation diffusion. In the end, it’s useful to know that there is strong evidence for three of the four hypotheses presented here:

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 for the providers of design and construction services, partner firms 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.

But even more useful to know that this study has helped point out significant gaps that need much more additional research. I hope you will join me in that continued investigation.
Appendices

A. Definitions of Terms from Gordon work
B. Survey Instrument
C. Initial email to potential respondents
D. Follow-up email to potential respondents
Definitions of Terms from Gordon

The following definitions of contractor organizations, contracts, and award processes are taken directly from Appendix I in Gordon.

Organizations

General Contractor – A single business entity acting as the contractor in complete and sole charge of the field operations, including the marshaling and allocation of manpower, equipment, and materials (Clough 1981).

Construction Manager – A single business entity acting as a construction consultant to the owner and project manager, either for a fixed fee or a fee as a percentage of the cost.

Multiple prime contractors – More than one contractor holding contracts directly with the owner to perform specific parts of the same project. The contractors can be general contractors overseeing various trades, or subcontractors performing one trade. The owner is responsible for overall project management and coordination, replacing a general contractor or a construction manager.

Design-build team – A single business entity that performs both the design and construction of a project. The team can be one company or a partnership of firms.

Turnkey team – One business entity that performs the design, construction, and construction financing of the project. Payment is made at the completion (when the contractor turns over the “key”).

Build-operate-transfer team – One business entity that performs the design, construction, construction and long-term financing, and temporary operation of the project. At the end of the operation period, which can be many years, operation of the project is transferred to the owner.

Contracts

Lump Sum – The contractor agrees to perform the stipulated work in exchange for a fixed sum of money (Clough 1981). This lump sum commonly includes all labor, materials, project overhead, company overhead, and profit.

Unit price – The contractor agrees to be paid a set cost per unit of each item, such as per-cubic-yard of excavation. The actual total amount paid is based on the actual measured units constructed on the project, times the unit price agreed to. The unit-cost for each item commonly includes all labor, materials, project overhead, company overhead, and profit. Sometimes overhead items are paid separately.
Cost-plus – The contractor is reimbursed the cost of doing the work, including labor, materials, and project overhead, plus a fee, including company overhead and profit. The fee can be a fixed sum, a percentage of the cost, or a formula incorporating both.

Guaranteed maximum price – The contractor is reimbursed the cost of doing the work, including labor, materials, and project overhead, plus a fee, including company overhead and profit, up to a prearranged maximum price. Once that price is reached the contractor must finish the job at no additional cost to the owner. If the job is finished under the maximum price, there is often a sharing of the cost difference between the owner and the contractor as an incentive to the contractor to reduce costs.

Fixed fee – The contractor is paid a lump sum fee, including company overhead and profit, but reimbursed for labor, materials, and project overhead.

**Award**

Competitive bid – a contractor is selected by the lowest price proposal, in market competition.

Cap – a fixed price is set by the owner against which contractors propose a level of quality and options for a project.

Negotiation – the price and/or contractor are selected by negotiation between the owner and either several contractors or one contractor.

Qualification and price proposal – the contractor is competitively selected based on qualifications and price. The process is often quantified with a ranking formula.

Time and price proposal – the contractor is competitively selected based on the proposed schedule and price. The process is often quantified with a time-price formula.

Qualification, time, and price proposal – the contractor is competitively selected base on their qualifications, proposed schedule, and price. The process is often quantified with a ranking formula.

Design and price proposal – the contractor is competitively selected based on their proposed design and price. The process is often quantified with a ranking formula.
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).**

** 
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).

<table>
<thead>
<tr>
<th>Person 1 (Name and Title):</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Person 2 (Name and Title):</td>
<td></td>
</tr>
<tr>
<td>Person 3 (Name and Title):</td>
<td></td>
</tr>
<tr>
<td>Person 4 (Name and Title):</td>
<td></td>
</tr>
<tr>
<td>Person 5 (Name and Title):</td>
<td></td>
</tr>
</tbody>
</table>

4. Tell us more about these executives by filling out the chart below.

<table>
<thead>
<tr>
<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>
</tr>
</thead>
<tbody>
<tr>
<td>Person 1:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Person 2:</td>
<td></td>
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<tr>
<td>Person 3:</td>
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<tr>
<td>Person 4:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Person 5:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Write other background in here: 

- 
- 
- 


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

<table>
<thead>
<tr>
<th>Metric</th>
<th>Your firm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Revenue</td>
<td></td>
</tr>
<tr>
<td>Residential Development Annually</td>
<td></td>
</tr>
<tr>
<td>Commercial/Industrial Development Annually</td>
<td></td>
</tr>
<tr>
<td>Number of Employees</td>
<td></td>
</tr>
<tr>
<td>Firm Capitalization</td>
<td></td>
</tr>
</tbody>
</table>

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)

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-Homes
- LEED-Neighborhood Development
- LEED-Commercial/Major Renovation
- LEED-Interiors
- LEED-Core and Shell
- LEED-Operations and Maintenance
- NAHB Green Building Guideline
- NAHB Green Building Standard (After ANSI adoption in 2008)
- DOE Builder's Challenge
- Enterprise Green Communities
- 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
- Builder ignorance/unwillingness related to green building approach
- Lack of material availability
- My firm has not developed green projects
- Uncertainty and/or limited data about the performance of the project or particular components
- 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)
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 entitlement 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
- [ ] 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

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>Currently</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></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Expected over the next 5 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Year completed</th>
<th>Size (# of units or square feet of space)</th>
<th>Green Building Rating System Used</th>
<th>Level Achieved in Rating</th>
<th>Other major goals for project</th>
<th>Biggest challenges</th>
<th>Additional comments about the project</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

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 post-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 the 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)?

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

- Conventional Debt [ ]
- Developer equity -
  - company funds or funds from principals [ ]
- Investor equity [ ]
- Tax Credit Equity (NMTC, LIHTC, HTC, solar credits, etc) [ ]
- Other public financing (CDBG, HOME, etc) [ ]
- Philanthropic grants [ ]
- 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 [ ]
- Other (please describe below in comments section) [ ]

Comments: [ ]

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

- Site-built [ ]
- Modular [ ]
- Panelized (including structural insulated panels) [ ]
- Computer assisted design/computer assisted manufacturing [ ]
- Other (please describe below in comments section) [ ]

Comments: [ ]
Initial email 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
Follow up email to potential respondents

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 19th 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
Bibliography


