Understanding the market for energy-efficient buildings is increasingly important, not just in terms of who demands efficiency but who supplies it. Previous research suggests that a variety of organizations adopt different types of energy-efficient technologies depending on their “fit” with the structure of each organization’s capital and personnel resources. If organizational characteristics affect the adoption of energy efficiency by building owners and users, do firm characteristics affect the adoption of energy efficiency by building designers? This paper explores the connection between characteristics of design firms and their potential to adopt energy efficiency measures. My exploration focuses on 24 design firms that participated in a utility-sponsored energy efficiency project during the 80s. Using a model of design firm behavior developed by The Coxe Group (1987), I surveyed these firms to determine a set of organizational characteristics for each firm. To place these firms’ characteristics in a generalizable context, I compare the survey results with a general set of data on design firms estimated by The Coxe Group. I then correlate the survey results with data from previous research describing design differences in subsequent practice attributed to the firms’ participation in the energy efficiency project. The results suggest that differences in (1) how design firms structure their work and (2) the goals of the principals in charge affect the likelihood of firms to adopt greater levels of energy efficiency in their practice.

Introduction

Promoting any effective market transformation project depends, to some extent, on understanding the market itself. Research into the market for efficient technologies and buildings has long been focused on the demand side and, more specifically, the individual end-user. During the 90s, this focus has broadened. Cebon (1992a; 1992b) and DeCanio (1993; 1998) expanded demand-side research from the level of the individual to that of the group, showing that structural characteristics of academic institutions, industrial firms, and commercial businesses influence their decisions to invest in energy efficiency. More recently, a supply-side perspective has emerged that looks at the roles played by such actors as manufacturers, distributors, retailers, builders, and designers. Haeri et al. (1997, 311) have suggested that supplier behavior (e.g., changes in what builders believe to be marketable) could serve as a good proxy for market transformation.

But what do we really know about suppliers and their behavior? We know that the construction industry is fragmented. Amory Lovins lists over two dozen categories of actors involved in building projects, calling it “The Tower of Babel” because these actors have different vocabularies and difficulty talking to each other (Lovins 1992, 15). Counting informal participants, Cuff (1991, 79) found more than seventy different groups can be involved in a single building project. Recognizing the differences between groups is an important part of understanding the supply chain, but what about the differences within groups? For example, are all architecture firms equal, or are some more equal than others?

It is clear that some design firms innovate, while others do not. Without a model of design firm behavior, however, it is difficult to tell exactly why this difference exists and what it means for market transformation efforts. In this paper, I select an existing model of design firm behavior, modify it, and apply it to explore differences among design firms and their energy efficiency choices. This paper adds to the developing body of literature on the supply side of the energy-efficient building market by examining a specific set of architecture and engineering firms that participated in a utility-funded demand-side management project. It characterizes these firms according to the types described by the model of design firm behavior and correlates these firm types with levels of transformation potential found for the same firms in a previous research project. The results of these comparisons are more thought-provoking.
than conclusive, but they show that more research in the area of design firm behavior and decision-making could identify leverage points for future interventions to transform the market for energy-efficient buildings.

A Model of Design Firms

A common criticism of the efficiency research has been that it holds energy efficiency central and neglects or reduces the importance of non-energy requirements such as health, safety, reliability, and aesthetics. Although architects, engineers, and others involved in the construction industry are in a position to provide energy-efficient buildings, it is not their job to do so. Their job only requires them to meet code, not to exceed it. To understand the forces affecting design firms, we must assess efficiency in context with other work-related goals.

The sociological literature on design professions shows that the major force affecting most design firms is not the quest for energy efficiency but the need to survive in a competitive and changing marketplace (Blau 1984; Gutman 1988; Levy 1980). Scholars have different views on what firms do to survive. Gutman (1988, 99-108) believes that successful firms are the ones that increase their range of services, employ division of labor principles, and develop a consistent "philosophy of practice" that corresponds to the demands of the building industry. Blau (1984, 122-27) connects both success and failure to the willingness of firms to take risks; she associates "mere survival" with safe, conservative management. Levy (1980, 290-95) concludes that problem definition, education, and media images have played a role in the success of the design professions since the Civil War. This literature contributes useful context and insight, but it leaves some questions unanswered. Both Blau and Gutman focus on architects and do not discuss engineers. Levy discusses architects and engineers, but his analysis explores the professions as a whole, not the behavior of individual firms. Additionally, by seeking success strategies that work for all firms, the sociological literature implies that all successful firms are, in some way, equal. To explore differences between firms, I turned to the management literature.

In 1987, a group of management consultants published their answer to the question "What is the best way to manage a design firm?" in a book called "Success Strategies for Design Professionals" (Coxe, et al. 1987). In contrast to the sociological literature, these authors believe there is not one kind of successful firm, but six. Their book outlines these six different approaches for organizing and managing professional design firms. The authors base their approaches on 20 years of management consulting experience with 600 professional design firms in architecture, engineering, interior design, landscape architecture, and planning. They maintain that design firms compete in a complex marketplace, where different types of management decisions are influenced by two "markets"—one for clients and one for staff. Coxe and his colleagues believe that firm management is a matter of balancing the frequently conflicting needs of the two groups. The main way in which this balance is achieved is through the shape of a firms' operation, management, and organization. I selected the Coxe model for my research because it provides an operational model of design professionals that addresses architects and engineers at the level of the firm. Additionally, it recognizes that different management strategies work for different types of firms.

Coxe et al. characterize the shape of architecture and engineering firms according to two axes—"design technology" and "organizational values". "Design technology" describes how firms structure their work. The authors suggest that firms' technologies can be separated into three categories: (1) strong-idea firms, which are organized to deliver singular expertise on specific areas; (2) strong-service firms, which offer comprehensive talents and experienced handling of complex projects; and (3) strong-delivery firms, which provide more of a product than a service and are designed to repeat the best ideas over and over again. There are two kinds of "organizational values" that refer to the personal goals and motivation of the principals in charge of the firm. "Practice-centered business" describes professionals who see their work as a way of life and tend to have qualitative goals. For architects, this might mean expressing their social vision through the built environment. For engineers, this could mean solving problems through technical creativity. In either case, "practice-centered" professionals feel significantly rewarded by the qualitative, non-monetary aspects of their work. In contrast, "business-centered
"practice" describes professionals who practice their work as a means of livelihood and have a quantitative bottom-line. These professionals define success primarily in monetary and material terms. The intersection of three possible "technologies" and two different "values" describes a matrix with six different types of firms. This "SuperPositioning Matrix" (shown in Table 1) forms the basis for the Coxe model of firm behavior.

**Table 1. The SuperPositioning Matrix (Coxe et al. 1987)**

<table>
<thead>
<tr>
<th>Design Technologies</th>
<th>Organizational Values</th>
<th>Practice-Centered Business: qualitative bottom-line</th>
<th>Business-Centered Practice: quantitative bottom line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong Delivery:</td>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>high efficiency service on</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>routinized assignments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strong Service:</td>
<td></td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>experienced and reliably</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>managed services for</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>complex assignments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strong Idea:</td>
<td></td>
<td>E</td>
<td>F</td>
</tr>
<tr>
<td>singular expertise or</td>
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</tr>
<tr>
<td>innovation on unique projects</td>
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</tbody>
</table>

Although the concepts underlying the matrix look fixed when arrayed in a grid, Coxe et al. describe them in dynamic terms. The authors discuss the evolution of design technologies within firms and with respect to the life cycles of the markets the firms serve. The authors also describe a continuum between "practice" and "business" for which there are different hybrid management strategies. By connecting the cells in the matrix directionally, the authors suggest their model can be used as both a diagnostic tool and a predictive one. Although the matrix was designed as a self-evaluation method for design firms interested in promoting their own success, I use it to help identify organizational differences between firms and explore whether these differences affect the firms' adoption of energy efficiency measures. Specifically, I use the model to characterize the types of firms that volunteer to participate in energy-efficiency projects and to identify the firm types most likely to adopt energy efficiency measures in their usual practice as a result of this participation.

**Methods**

One utility project provided the set of design firms that forms the empirical basis for this research. This project occurred during the 80s, and it provided design assistance and incremental costs of energy efficiency measures to 28 commercial buildings in the Pacific Northwest. The project goals were to achieve 30% energy savings over the Model Conservation Standards and to influence current practice by promoting interest in energy efficiency technologies and design. I used results from a previous case study of the firms in this project to describe the extent to which they were "transformed" into more energy-efficient ones by their participation (Janda 1996). I then used a modified Coxe survey to characterize the same firms according to the Coxe matrix. The results are drawn from a comparison between these two data sets.
Transformation Potential

Based on document analysis, site visits, phone interviews, and in-person interviews done in 1996 with 29 designers from 27 firms who participated the utility project, I found that most of the enduring effects of the project on the designers’ practice could be characterized in four ways: positive, mixed, free-rider, and negative (Janda 1996). This characterization is based on the designers’ views of changes to their practice before and after their participation in the project. All of the designers were asked whether they designed differently as a result of their participation. Their answers to this question, coupled with other information from the interviews, forms the basis for this characterization. As described below, I use these categories as a proxy for the ability of the design firms to transform their practice to incorporate greater levels of energy efficiency. As the interviews were conducted nearly a decade after the utility project was completed, they provide a reasonable indication of the permanent changes to design practice and efficiency choices attributable to the project.

Positive. Designers from nine firms said they designed differently as a result of their experience with the utility project. For these designers, participating in the project imparted a knowledge of new technologies, methods, or concepts that they either were not familiar with before the project or did not use. These are the kind of designers and firms that market transformation efforts would hope to reach, as they have continued to apply lessons learned in the utility project in subsequent, non-subsidized applications. These firms have a high level of transformation potential because their practice is flexible enough to incorporate innovations brought to their attention by participating in the utility project. These firms were much more likely to adopt energy efficiency measures after participating in the project than before.

Mixed. Designers from the 15 remaining firms said they did not design differently as result of their experience with the project. Designers from eight of these firms did, however, say that they learned about a few new technologies in the utility project that they used again in subsequent applications. Many of them also had a negative experience with one or more energy-efficient strategies, including groundwater heat pumps and thermal mass. Strategies that some designers liked and used again—heat recovery systems and occupancy sensors—were the same ones that other designers disliked and would not use again. These eight firms have a medium level of transformation potential because their practice is flexible enough to incorporate innovations brought to their attention by participating in the utility project. These firms were slightly more likely to adopt energy efficiency measures after participating in the project than before.

Free-riders. Designers from six other firms that did not design differently as a result of the project said they got subsidies from the utility for efficiency strategies that they would have done anyway. These are the “free-riders” in the sample. Their firms have a low level of market transformation potential because they were already doing energy-efficient designs before they participated in the project. Included in this group is an architect who taught university-level building science for 28 years and is a partner in a small firm that specializes in energy- and resource-efficient designs. Although these firms produced innovative and efficient buildings with the help of the project, they probably would have produced similarly energy-efficient buildings without it. Thus, these firms were no more likely to adopt energy efficiency measures after the project than before.

Negative. Only one designer thought the project was “terrible.” In his view, the building suffered at the hands of the efficiency advocates. His firm has no chance of adopting efficiency measures for efficiency’s sake, unless they are mandated by law. His firm was less likely to adopt energy efficiency measures after the project than before.

1For the sake of later comparisons, these data reflect only the responses from 26 designers at 24 firms who answered the modified Coxe survey.

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Survey of Firm Characteristics

As described above, the SuperPositioning Matrix was developed as a set of management principles. To test these principles, in 1986 The Coxe Group distributed a multiple choice self-test questionnaire to a mix of over 100 firms. This survey contained ten questions about firm ownership, decision making, staffing, marketing, organization, rewards, pricing, clients, and satisfaction. Each question had six possible answers ("a" through "f"), and each answer corresponded directly with one of the six firm types in the model. Based on the results of this survey, The Coxe Group concluded that firms with a high degree of consistency with the SuperPositioning Matrix were more likely to be satisfied with their success than firms that had a low degree of consistency with the matrix (Coxe, et al. 1987, 61-66).

Because I wanted to use the Coxe model to describe the firms participating in the utility project, I used the Coxe survey for my research. I did, however, modify it in three ways. First, I used most of the same questions, but I added greater detail to the multiple choice answers to distinguish the options from one another. Secondly, I used nine questions instead of ten. I did not inquire about firm satisfaction, as it was not the focus of my study. Finally, because I had interviewed designers about work they did more than decade ago, I asked them to note if there were differences between their firm’s management practices then and now. Space limitations prohibit me from appending the full survey to this paper, but I provide a sample question below in Figure 1. The survey is reproduced in its entirety, along with a more detailed analysis in Janda (1998).

<table>
<thead>
<tr>
<th>Design Firm Questionnaire</th>
</tr>
</thead>
</table>
| Please check the letter of the single response that best describes your firm’s usual practice. If your firm has changed significantly from the time of the Energy Edge project, choose one answer for then (T=Then) and another for now (N=Now), or use a check if there has been no significant change. Please comment in the margins if you wish to add further clarification (e.g., if you changed firms and are describing two different firms rather than changes within one firm).

1. How is your firm owned and managed? (T=Then, N=Now, ✔=No change)
   - a. It is closely held by one or a few members of the firm. The leader(s) act as a partnership; they usually market and manage, but they also make critical design decisions.
   - b. It is held by one or more outside investor(s) who delegate operations and administration to professional managers who do little billable work.
   - c. It is a broad partnership or corporation, with several skilled principals who split their time between equally between billable work, marketing, and administrative tasks.
   - d. It is closely controlled internally with a hierarchical corporate attitude. Top managers market, administrate, and do some billable work.
   - e. It is a proprietorship or small partnership with approximately equal ownership; the leader(s) do much more billable work than managing or marketing.
   - f. It is a proprietorship or small partnership with unequal ownership. Top management does more billable work than managing or marketing.

Figure 1. Modified Coxe Survey: Question One - “Ownership”

In Fall of 1997, I sent the modified Coxe survey to 29 designers at 27 firms (one pair of architects and one pair of engineers worked in the same firms). I received responses from 26 designers at 24 firms. From the survey responses, I gathered a composite picture of where each firm fits into the Coxe model. This picture was created by the counting the number of same-letter responses and using the highest number as that firm’s “type”. Other ways of looking at the data, such as the distribution of answers across categories and the concentration within them, were also explored.
The ideal survey response would be a firm that answered all nine survey questions using only one cell of the matrix. Such a firm would have a "concentration" of nine and a "consistency" of one. None of the firms I surveyed matched the ideal concentration of nine. The highest concentration of answers from any one survey was a six (n=2); the lowest was a two (n=2). A concentration of four was the mode (n=9) for the sample. There were nine firms with a concentration lower than four. The low concentrations were due in part to the fact that four of these respondents did not answer between one and three survey questions. Written comments from these respondents show that the survey did not always provide adequate options to describe their firms in the areas of staffing, project organization, pricing, and reward structure. Despite the low concentration of answers for some firms, however, identifying the matrix type for most firms was fairly obvious. More than half the firms had a difference of 2 or more between the highest and second highest concentration. Only four firms had an equal concentration of answers in more than one matrix cell. These ambiguities were reconciled by interview data.

**Results**

The results reflect comparisons at several levels. First, I compare the characteristics from the utility project participant firms I surveyed to the general distribution of non-participant firms estimated by The Coxe Group. Second, I compare the survey results to the level of market transformation potential found in the previous case study, seeking associations for further research. Finally, I discuss several firm types according to their organizational characteristics, suggesting reasons why they are promising for future market transformation efforts.

**Table 2.** Distribution of Participant and Non-Participant Firm Types

<table>
<thead>
<tr>
<th>Organizational Values</th>
<th>Practice-centered business: qualitative bottom-line</th>
<th>Business-centered practice: quantitative bottom line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Technologies:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Strong Delivery:</strong></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>highly efficient service on routinized assignments</td>
<td>Non-Participants: 10-15% Participants: 17%</td>
<td>Non-Participants: 8-12% Participants: 8%</td>
</tr>
<tr>
<td><strong>Strong Service:</strong></td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>experienced and reliably managed services for complex assignments</td>
<td>Non-Participants: 30-35% Participants: 38%</td>
<td>Non-Participants: 30-35% Participants: 0%</td>
</tr>
<tr>
<td><strong>Strong Idea:</strong></td>
<td>E</td>
<td>F</td>
</tr>
<tr>
<td>singular expertise or innovation on unique projects</td>
<td>Non-Participants: 10-15% Participants: 33%</td>
<td>Non-Participants: 2-6% Participants: 4%</td>
</tr>
</tbody>
</table>

**Participants Compared to Non-Participants**

One drawback of using the behavior of voluntary participants in energy efficiency projects to understand the behavior of other firms is that the participant firms may not be "normal." That is, they differ from the general population of firms or designers in ways that bias their behavior. Based on empirical observations, Coxe et al. estimated the total distribution of engineering and architecture firms according to their matrix (1987, 77). I use this estimate as a "non-participant" group for comparison. In

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Table 2, I compare the results of my project participant survey with the distribution of non-participant firms provided by Coxe et al.

The most striking difference between the two groups is that none of the participant firms identified themselves as Type D firms. In the Coxe model, this kind of firm is a strong service firm with a quantitative bottom-line. The reasons for this lack of this firm type in the participant group cannot be determined for certain based on the data from the sample, but one possible explanation lies in the overall tendency of the participant firms to be far more practice-centered and idea-oriented than the non-participant firms.

Overall, there were more practice-centered (Types A, C, and E) firms, and fewer "business-centered" firms (Types B, D, and F) in the participant group than in the non-participant group. The Coxe Group estimates that the general population of architects is 70% practice-centered and 30% business-centered (Coxe, et al. 1987, 25), but 94% of the architectural firms in the participant group were practice-centered, and only 6% were business-centered. For engineering firms, the Coxe estimates showed the balance to be 85% business-centered firms and 15% practice-centered firms. My survey data showed that although there was a higher proportion of business-centered engineering firms than architecture firms in the participant group, the relative weights were still much lower than in the non-participant group. 30% of the engineering firms in the participant group were business-centered, but 70% were practice-centered. Given that the direct rewards of participating in a utility project are educational rather than monetary, it is not surprising that many of the participant firms take a qualitative approach to their practice.

The participant group also had a higher percentage of Type E firms than the non-participant group. Type E firms combine a qualitative approach with strong ideas and special expertise. Some of the Type E participant firms had strong ideas and special expertise about energy efficiency; others had similar commitments to different ideals (e.g., the ability to control the indoor environment, the quality of light in a building). These differences between Type E firms were not visible from the survey results, but when correlated with the transformation potential gathered from the previous case study work, this schism becomes more evident.

Firm Types and Transformation Potential

The previous section compared a group of participant firms to data gathered from non-participant firms. This section describes only the participant group, matching firm types with their transformation potential. The transformation potential categories are based, as described earlier, primarily on designer’s self-reports of changes to their practice before and after their participation in the utility project. Figure 2 shows the results of this process.

Although firms of Type C and E are represented most frequently as having positive reactions to the project, from an evaluation perspective the project was more successful with Type C and Type B firms. One of the project’s goals was to influence current practice by promoting interest in energy efficiency technologies and design, and this is much harder to achieve with firms that already have an interest in efficient design. Although half of the Type E firms in the sample had a positive reaction to participating in the project, most of the rest of the Type E firms were free-riders. Although effort spent on Type E firms might not be wasted, it may not produce measurable changes to design practice. Type C and Type B firms, on the other hand, attributed increases in their efficiency adoption and differences in their design practice to their participation in the project.

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2 Table 2 contains Coxe estimates and survey data for an aggregate set of all firms (architecture and engineering). The percentages given for architecture and engineering firms are disaggregated by profession and will not add up to the data in the table.
The survey data by itself could not distinguish between which Type E firms have high transformation potential and which ones have low transformation potential. Type A firms were evenly split between the “mixed” and “free-rider” categories, suggesting that they have a medium-to-low transformation potential. As there was only one Type F firm and no Type D firms, results for these firm types are inconclusive. The single Type F firm in the sample was a free-rider, but there is no logical reason to infer that the next Type F firm would be, too. The one firm that had a negative reaction to the project was a Type C firm, but this finding does not outweigh the frequency of positive and mixed changes to practice demonstrated by this firm type. Additionally, interview data indicates this designer’s negative reaction to the project is influenced by personal preferences more than firm characteristics.

Usual Practice and Market Transformation

If a goal of future energy efficiency projects is to increase the average level of energy efficiency in the building stock, it is important that they target firms with a significant market share. The Coxe model of firm behavior provides further insight into why Type B and C firms may be more appropriate targets for future energy efficiency projects than Type E firms: their usual practice is better suited for propagating the adoption of efficient technologies. Type B firms tend to have national chains with standardized building requirements as their clients. An example from the survey sample is an engineering firm that advises McDonald’s. Type C firms often have institutions such as banks, hospitals, and schools for the majority of their clients. Type B firms may have few clients, but hundreds of building projects per year. Type C firms have fewer buildings per year than Type B firms, but the buildings tend to be larger, more complex, and have many opportunities for energy efficiency strategies. Both these types of firms do typical buildings, and technologies adopted in these kinds of buildings may be replicable in similar socio-technical contexts.

In contrast, Type E firms tend to work for specific patrons in organizations and individual clients with idiosyncratic requirements. These clients come to the Type E firms, seeking their services, rather than being courted by marketers or the firms’ principals. An example of a Type E firm from the survey sample is a firm that usually builds one high-end custom home a year. Such firms tend to have expensive price tags associated with their services, and each project is consciously different. Although buildings designed by Type E firms may be highly efficient, the influence these buildings have over the market is indirect rather than direct. They may provide positive media images of efficient buildings, but as each building is special it diminishes the opportunity for spreading energy-efficient strategies.
Discussion

I present the above results to provoke thoughts about differences between firms more than to answer questions or make predictions. As the participant/non-participant comparison shows, the group of firms I interviewed are skewed relative to the general distribution of firm types estimated by Coxe et al. Without further research into the characteristics of firms in other projects, it is impossible to tell whether this result is a fluke or a finding. Additionally, there were some methodological issues with the survey research that may confound the results.

Although the questions on the survey were standardized, I had no control over the way the designers interpreted the questions. I tried to limit ambiguity inherent in the original survey design by providing more detailed answer choices, but the designers' understanding of what constitutes a "department" can differ from mine, my understanding can differ from Coxe's, and the informants' descriptions can differ from each other. I believe the survey is replicable, but it is doubtful that it is fully reliable. Even the replicability might be challenged if different members of the same firms were surveyed. Although the survey asked questions at the level of the firm, the surveys were answered by individuals, and usually only one per firm. There was good agreement between the surveys answered by two members at each of two firms, but that agreement may come from the fact that the designers at both firms were senior members of the same firm. Junior or entry-level members may have responded differently. Finally, my survey did what all surveys do: it preconfigured responses into a series of six boxes for respondents to check. In doing so, it privileges those answers and ignores other configurations. I asked the designers to add comments in the margins if they felt their answers differed from those given. Some did so, but it is difficult to tell how many others thought the given choices were accurate, or just good enough.

In addition to the methodological concerns with the use of the Coxe survey, there are content questions as well. I noted earlier that about half of the Type E firms (strong idea, practice-centered) were free-riders and half had positive changes to practice. Because I could draw upon the understanding of these firms and their usual practice that I gathered in the previous research project, I knew that the major difference between the two groups of Type E firms lay in their pre-existing experiences with energy efficiency ideas. The firms that had positive changes to practice had less previous experience with energy efficiency projects than the firms than were free-riders. This information was not captured by the Coxe survey, but it is critical to understanding the market transformation potential of these or other design firms.

Conclusions

The results suggest that the design firms that participated in a utility-funded energy efficiency project are more qualitatively oriented than non-participants. They were also more apt to be strong idea firms than the non-participant firms. In terms of market transformation potential, the two types of firms most likely to adopt greater levels of efficiency are Type C (qualitatively-oriented firms that focus on providing reliable service to their clients) and Type B (quantitatively-oriented firms that provide efficient delivery of their services). This paper shows that the Coxe model of design firm behavior requires further research and methodological revision to be more usefully applied to the question of why some firms practice greater levels of energy efficiency than others. While firm characteristics do affect energy efficiency decisions, the Coxe survey needs to be coupled with interview data to distinguish between different levels of energy efficiency in practice. Although the survey results do not provide a stable base from which to make predictions about design firm behavior in future projects, they were not designed to do so. They were designed to show that differences among firms matter, and to suggest that understanding these differences could lead to the ability to recognize leverage points for future market transformation projects.
Acknowledgments

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