The Structure and Operation of the Commercial Building Market

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ABSTRACT

By increasing our understanding of the structures, operation, decision-makers and decision-making in the commercial building sector, we should be able to more rapidly transform the use of energy in commercial buildings. This paper describes the structure and operation of the new construction and existing building markets. It is based on several recent studies that involved more than 160 one-to-one interviews, 1600 surveys with building professionals, and analysis of secondary data. The paper describes three models that are typical of current construction practices analyzing the opportunities and barriers these models pose for the construction of efficient new buildings. The paper also discusses the operation of four segments of the existing building market examining how decisions are made and who makes them, and how this influences efficiency in existing buildings. A key finding is that there are a relatively small number of large firms operating at the regional and national level who, if influenced, may cause significant transformation of the efficiency of commercial buildings. More attention needs to be given to understanding these regional and national markets.

Introduction

There is widespread interest in accelerating the adoption of new technologies, developing more efficient designs, and increasing the integration of systems in commercial buildings. Some authors estimate that doing this will reduce energy use in commercial structures by as much as 40 to 80 percent (Lovins, 1994). Assuming the technologies and designs are available (Nadel, 1998), the key to transforming this market is to get owners and professionals in the commercial sector to adopt and implement these new technologies and designs.

Programs that target the commercial building market often assume that the market is a relatively homogeneous place. For example, programs target architects and architectural firms specializing in commercial structures assuming that they have significant influence over the design of a building. In some cases, this is true. In other cases, the architect is just one of several building professionals having input but only minimal influence in the final design.

Our research suggests that the commercial building market is highly differentiated. Actors in the market, and even actors within the same profession, differ substantially in their ability to influence the adoption of new techniques and ideas within the market. Also, our work suggests that there are a relatively small number of actors who are positioned to disproportionately influence the efficiency of buildings. Making available reliable energy efficient technologies will lead to a general improvement in the efficiency with which energy is used, but the major advances in energy efficiency will only come when organizational and market issues are effectively addressed in combination with technical advances. This can only happened when we understand the market and the players. The goal of this paper is to begin the process of more thoroughly describing the actors, their relationships, and their decision-

making criteria and market operations. A further goal is to identify barriers that impede transformation of the market and to suggest some points of entry and strategies for intervention beyond those currently being used.

Methods Used in this Paper

Over the last several years, we have been involved in several studies of the commercial building market. The material in this paper is a synthesis of these studies (ADM and TecMRKT Works, 2000a; ADM and TecMRKT Works, 2000b; Reed, 1999a; Reed, 1999b; Reed, 1999c; Reed, 1999d; Reed, 1998; TecMRKT Works and PG&E, 1998; TecMRKT Works and PG&E, 1999). Each of these studies involved extensive data collection. Overall, we completed more than 160 in-depth interviews with building professionals, architects, engineers, facility managers, property owners, property mangers, and others. In addition, we have completed and analyzed survey data from more than 1,600 building professionals. We also have analyzed a substantial amount of secondary data such as EIA Data, F. W. Dodge reports and Dun and Bradstreet data.

This paper synthesizes findings from these reports. More importantly, it includes trends and findings that were not previously reported because they were outside the scope of the original effort or because they became apparent when the reports were examined from a crosscutting perspective. In some instances we have quantified trends or provided estimates of sizes. In other cases, quantification will have to await the opportunity to explore additional data.

An Overview of the Structure of the Commercial Building Market

The commercial building market can be viewed as being comprised of three segments, the new construction market, the existing building market and the commercial apartment operators market. We can further subdivide the new commercial building market into a leased space market and an owner-occupied market. This paper deals primarily with the new construction and existing buildings market.

As can be seen from Figure 1, the market trend is for commercial firms to lease the space they occupy rather than to own property. The ratio of leased to owned space increased from the 1960s to the 1980s with the largest increase in the 1980s. The decline in the leased to owned ratio in the early 1990s reflects the drop in commercial building construction in response to the oversupply of commercial space in the early

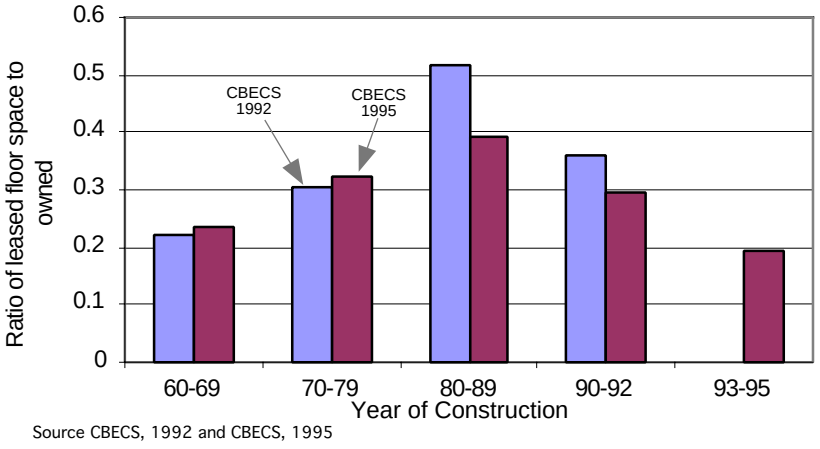


Figure 1 Ratio of nonowner occupied to owner occupied nongovernment commercial buildings in the US based on 1992 and 1995 CBECS data

1990s. We believe that the results of the 1999 CBECS survey will show that the trend toward leasing has resumed and is accelerating in the late 1990s.

Firms that have owned space in the past are finding that owning buildings may have some disadvantages and many new firms do not want to own buildings. Ownership limits flexibility and requires firms to develop expertise in property acquisition and management, thereby diverting attention from the firm's core business. National and regional commercial property firms are building and leasing an increasingly large amount of commercial space.

Within the leased space market (Figure 2), space is built to suit for a specific client or it is built for speculation and is finished when it is leased. The majority of the lease market is the former.

A significant portion of the commercial leased space is owned or is being developed by regional and national commercial property development firms. The goal of these firms is to develop properties as economically as possible. Wherever they can, these firms standardize specifications and construction based on experience from other sites. This has significant implications for transforming building markets.

- Decision-making for large amounts of space is controlled by a relatively small number of large national and regional firms.
- These firms utilize local architects, developers and builders but they tend to apply generic standards based on their own experience.
- These firms are an obvious target for market transformation programs because they are small in number and control a large amount of resources.
- These firms may not be greatly impacted by local programmatic initiatives unless their local representatives have a strong voice at the corporate table. However, they use and sometimes seek local incentive programs to leverage their own investments.
- These firms may best be addressed through regional and national programs.

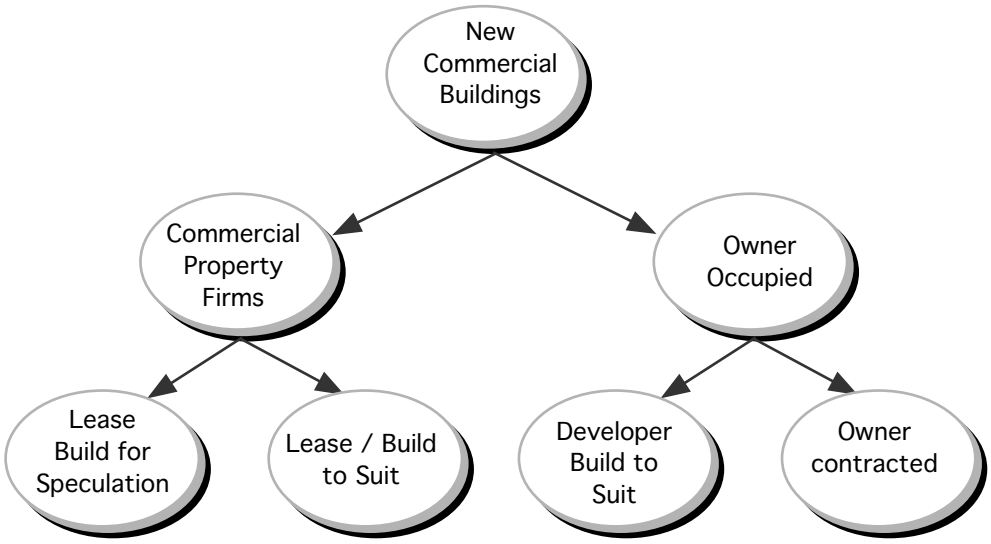


Figure 2 Conceptual View of the New Construction Market

There is yet another set of consequences of leased space for creating energy efficient buildings. The incentives for the builder / lessor are to build and present space that will lease at high rates of return. This means constructing space that is attractive to the potential les-

sees as economically as possible. It also means that the lessee has some leverage over the features and the cost of space subject to local market forces.

However, energy efficiency is not usually an important leasing criterion for clients. Relative to other costs such as recruiting and retaining employees, lessees may find changes in energy costs quite marginal. For the most part lessors are not concerned with it because they do not pay the energy costs once they lease the space.

Some refer to this as the "split incentives" problem. The term "split incentive" names the problem but masks both the issue and a method of addressing the issue. The problem is really one of the key decision-maker having low or no investment in the incentive being offered or, putting it more boldly, being offered a largely irrelevant incentive. This is a matter of bad marketing.

The problem is one of identifying the incentives that motivate decision-makers. Lessees are usually looking for space that provides an attractive, functional, and productive work environment at an acceptable price per square foot. To the extent that energy efficient environments, for example daylit or glare free environments, may be shown to be more productive environments (more work completed, fewer absences, etc.), lessees may show greater interest in them. For these decision-makers, talking about productivity or image benefits is much more effective than talking about energy savings. Fortunately, there is a very strong correspondence between an energy efficient environment and a productive environment although this linkage is not yet well documented. The best current studies that document this link are Heschong, 1999a; Heschong, 1999b, which demonstrate a 20 percent increase in performance in daylit classrooms and a 40 percent increase in sales in skylit retail settings.

The implications of these findings for inducing change in the buildings market are:

- Tenants are important in determining the design and construction of leased buildings.
- They typically are not focused on energy issues because those are not at the core of their business.
- Tenants are a large audience that can be reached. Key high-level decision-makers need to be helped to see in a general way how good building design (not necessarily energy efficiency) may influence the bottom line of their core business. Building professionals that work for tenants, property managers and others, need sources of information that can help them make good decisions and interpret the effect of good building design to their superiors.
- Promoters of energy efficiency need to be thinking about incentives that focus on the issues that are important to the tenant in terms of the tenant's conduct of their core business and place less reliance on monetary incentives tied to energy savings.
- There is a strong need for research on how building environments influence human behavior in order both to improve the way buildings are designed and to help users of buildings understand the features of buildings. The latter is particularly important.

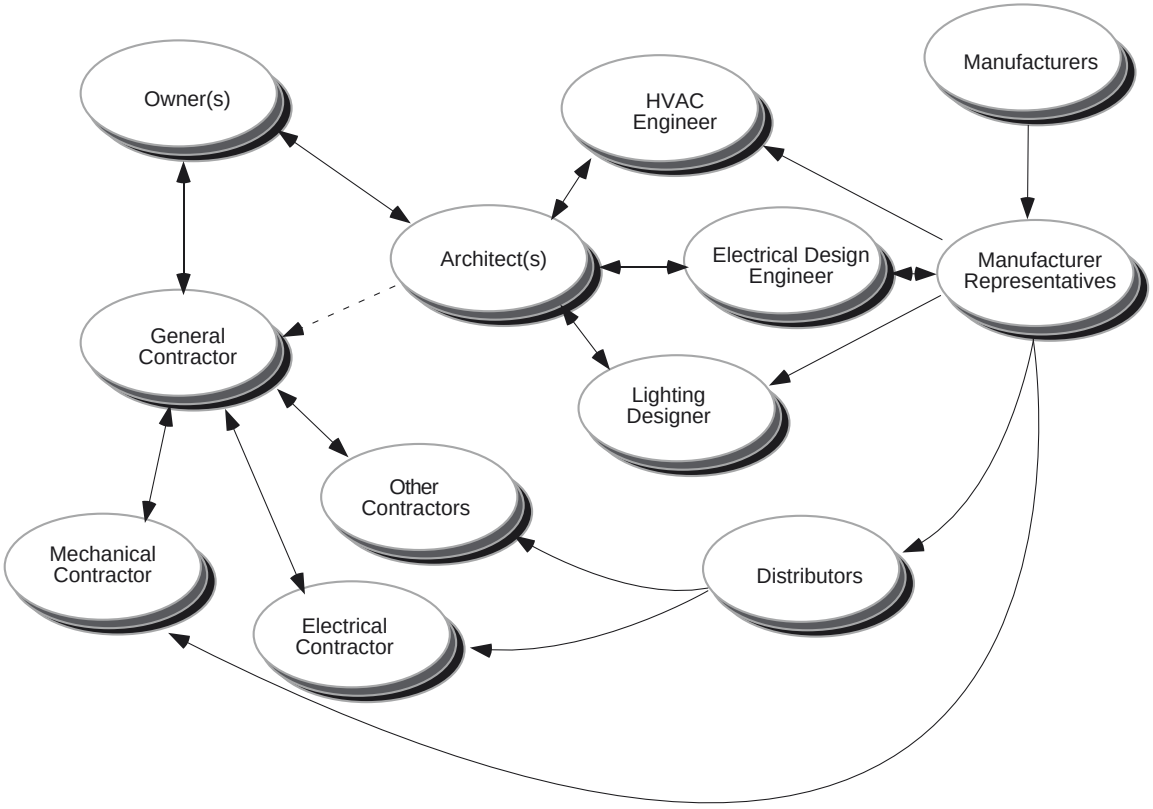
Three Models of the New Construction Process

There are three general models that describe patterns for organizing new construction, the traditional architect driven *plan/design/build* model; the *design/build* model, and a third model, the *collaborative/integrationist model,* which is an emergent approach. The ability of different actors to influence what occurs in new construction and the incentives to design good buildings varies significantly from model to model.

The Traditional Architect Driven Plan/design/build Model

Figure 3 illustrates the traditional architect driven model. The construction of public buildings, owner occupied buildings, and buildings with complex functions is often organized around a variant of this model. In this model, the "owner" typically engages an architect, perhaps through a competitive solicitation or competition. The architect is responsible for developing the concept, the schematic, and managing the development of the detailed plans and specifications. Depending on the size of the firm, the architect will either use internal expertise or engage external consultants to develop the detailed designs and specifications for the HVAC, electrical distribution and electrical components, life-safety, and security systems, etc.

The owner solicits bids from contractors to construct the building. The bid process may elicit bids from general contractor teams that include the general contractor and the subcontractors or general, mechanical and electrical contractors separately. The architect plays an important role in supervising and approving construction. The owner and architect(s) are the key decision-makers. They make or heavily influence decisions about the footprint, orientation, facade, equipment, etc. Other players have a much smaller role in determining efficiency, comfort, and owner value.



Source: TecMRKT Works. 1997

Figure 3. General Model of Actor Interactions for a Traditionally Designed Building

The theoretical advantage of the traditional model is that design issues are worked out in advance and presumably the solutions are integrated. In reality, the level of the integration is highly dependent on the ability of the architect/manager to manage the work team, the de-

gree to which the architect coordinates with the general contractor and the subcontractors, and the degree to which the general contractor is able to manage the entire construction team.

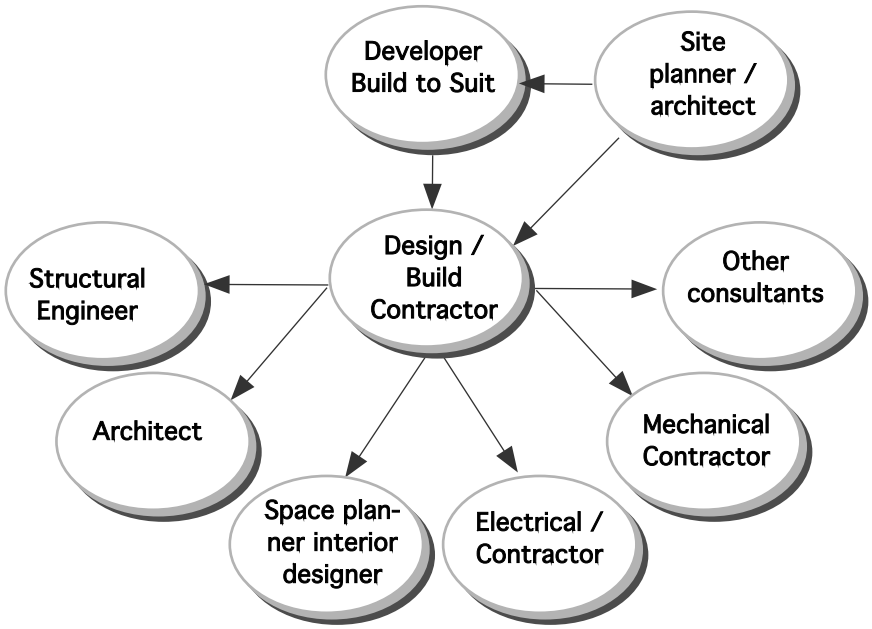
The level of integration can range from full partnership in the design process to nearly independent work by each consultant. Well-coordinated teams can produce buildings that are more efficient, provide customer value, and greater user comfort than teams that function less well together. The level of integration is partially a matter of the owner's willingness to pay for the services, partially a function of the choice of actors, the actors' communication skills, and the management skills of the team leaders. In many projects, the integration of the team at all stages is lacking, but most especially in the early stages, resulting in buildings that function less well.

Our findings suggest that:

- The traditional model is being used less than in the past because of the costs associated with it and the desire on the part of clients for speedy construction.
- The traditional model can lead to well integrated buildings but frequently does not because of communication and management issues.
- Architecture is practiced nationally and internationally. Local initiatives to influence building professionals may reach local architects doing more traditional projects but may not influence national or international teams working in the traditional mode on large projects.
- Sustainability is currently a rallying cry among building professionals, many of whom still follow traditional practice for some of their work. The rhetoric of sustainability and the practice of sustainability do not always match.

The Design/build Model

In the last 50 years, an increasing proportion of new construction activity has been organized using the design/build model (Figure 4). Various key informants tell us that the proportion of projects using the design/build approach is growing with 50 percent or more of projects being completed using this model.



Source: TecMRKT Works, 2000

Figure 4. Design/build Model

A key advantage of the design/build model is speed. In the design/build model design and construction are completed on parallel tracks with parts of the building being designed as other parts are being put into place. The design/build model is organized

around the contractor and is heavily dependent on the contractor's experience and knowledge. Basic elements of structural design are repeated from building to building while variations in appearance are introduced by changing the elements of the façade, changing the foot print, or placing the building differently on the site. In this model, design and layout tasks are done more or less independently and sequentially. Professionals often operate with rules of thumb. The work is formula driven and the level of analysis is not high. The exchange of information among professionals is limited to the information each requires to complete their portion of the job. The design/build approach is linear and leads to buildings whose systems are less well integrated than they might be because decisions made in the beginning of the process foreclose options later in the process.

The contractor and/or developer are the key decision-makers and rely on other building professionals for input. The incentives are to please the client, contain first cost, and deliver the building quickly. The client's priority goal for the building is often to enhance the image of the building. There is really no one professional in a position to champion a high performance building.

A Design/build Example

Buildings that are built to house national and regional chains/franchises are most frequently done using a variant of the design/build model. What is important in this model (Figure 5) is the role of the in-house staff and what we call the "image" architect. The image architect determines the design and provides the specifications. The local architect provides the knowledge and contacts to make sure that the building meets local codes. This implies several important points.

- To influence the design of buildings used by chains one needs to target the corporate in-house staff and their image architect.
- If one is able to influence those individuals then one can influence the design of similar stores nationwide.
- Influencing the building designs of chains probably requires regional and national cooperation among those interested in influencing the energy efficiency of buildings.

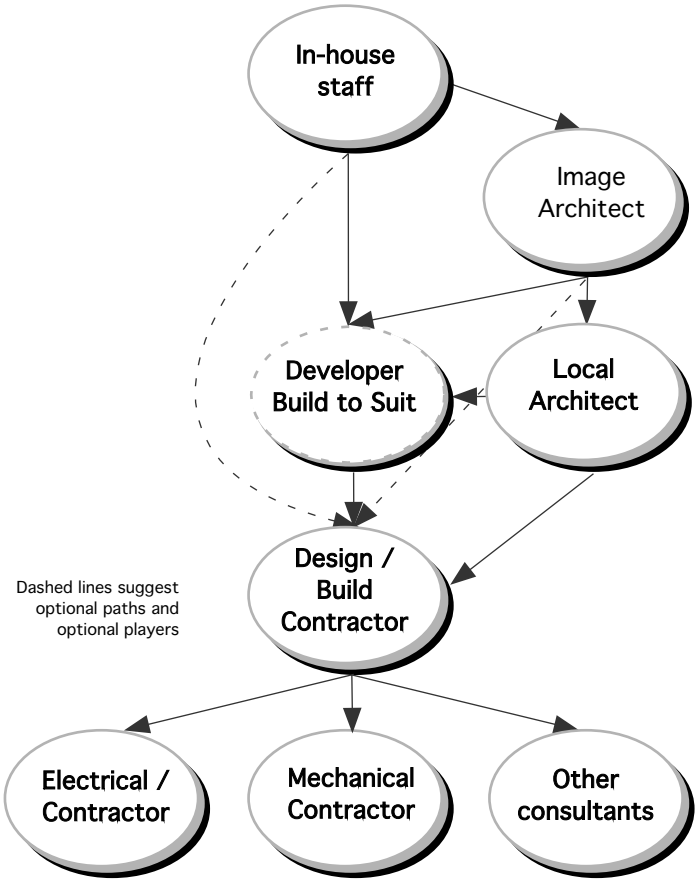


Figure 5 The National Chain Variant of the Design / Build Model

- Targeting programs to local building professionals at the utility service territory level or state levels can and do impact local construction but may have less impact on buildings built by national and regional developers.

When there is concern about the efficient use of energy and user comfort in the design/ build model, it is most likely driven by the tenant/owner or the tenant/owner's representative and tends to stem from two sources.

The first is that owners/tenants in highly competitive industries are cost sensitive and they want buildings that can be maintained as inexpensively as possible. To the extent that the energy to operate a building is an important cost factor in their operations, owners will seek buildings that are efficient. However, this is seldom the case.

A second driver, and one that is especially important for owners in high technology industries, is employee productivity and the retention of valued employees. In some industries, compensation has reached levels where employees focus on amenities and the environments where they put in the long hours required to earn their salaries. Several of those we interviewed observed that building owners are increasingly sensitive to employee response to the built environment. They are seeking building environments that minimize problems, such as the glare associated with CRT screens, and designs that give individuals control over at least some aspects of their physical environment, such as the ability to control the lighting and temperature in their work areas.

From the perspective of the owners/tenants, the productivity issue is clearly the more important of the two. From a market transformation perspective, it is productivity (owner/tenant value) that sells efficiency. Efficiency is simply the icing on the performance cake.

The Collaborative Process Model

There are building professionals who are significantly concerned about the quality and performance of buildings that has resulted from the devolution of the traditional architectural model and the shortcomings of the design/build model. These professionals perceive that performance and quality problems stem from the fragmentation of responsibility, design processes that are more serial than parallel, design processes that are self-contained, and inadequate communication between disciplines during design and construction. These professionals have adjudged efforts to reform the traditional and design/build models inadequate. They believe that building professionals must give much more attention to organizational issues in building projects.

In the place of these traditional models some building professionals are promoting the collaborative process model (Collaborative Process Institute, 1997) to address integration and quality issues. The basic premise of the collaborative process model is that high performance teams design high performance buildings (Figure 6).

Unlike the other models, the collaborative model stresses the importance of close attention to the organization, management and interaction among members of the team as an integral part of the design process. The collaborative process involves creating teams that work well together, that stress performance, that work together to build performance, and that utilize common communication and planning tools to make the design and construction process function smoothly. Collaborative teams try to minimize conflict by encouraging high levels of communication among the members of the team and by utilizing common tools, such as 3D rendering, that can lead to early identification and resolution of problems. Also,

collaborative teams emphasize the development of a team culture that focuses on good buildings and emphasizes common understandings and approaches to building problems. The focus of collaborative teams is systemic and their goals are oriented to achieving an "optimal combination of cost, quality, function, scope and time" to meet the needs of clients. A focus on energy, indoor air quality and work environments is a natural outgrowth of this process. It is interesting to note that the literature on energy commissioning and re-commissioning discusses the need for integration among disciplines but provides little practical guidance as to how that integration can occur. The collaborative process is an attempt to define methods for creating higher levels of integration. Proponents of the collaborative process model believe that this is the only way to consistently produce high performance buildings.

Collaborative process teams differ from partnering arrangements which are often nothing more than loose confederations of building professionals who agree to work together on a specific project and go their separate ways when the project is completed. By investing capital in the team, those promoting the collaborative process model believe that the use of common tools, shared understandings, and common approaches will make them effective competitors in the market place

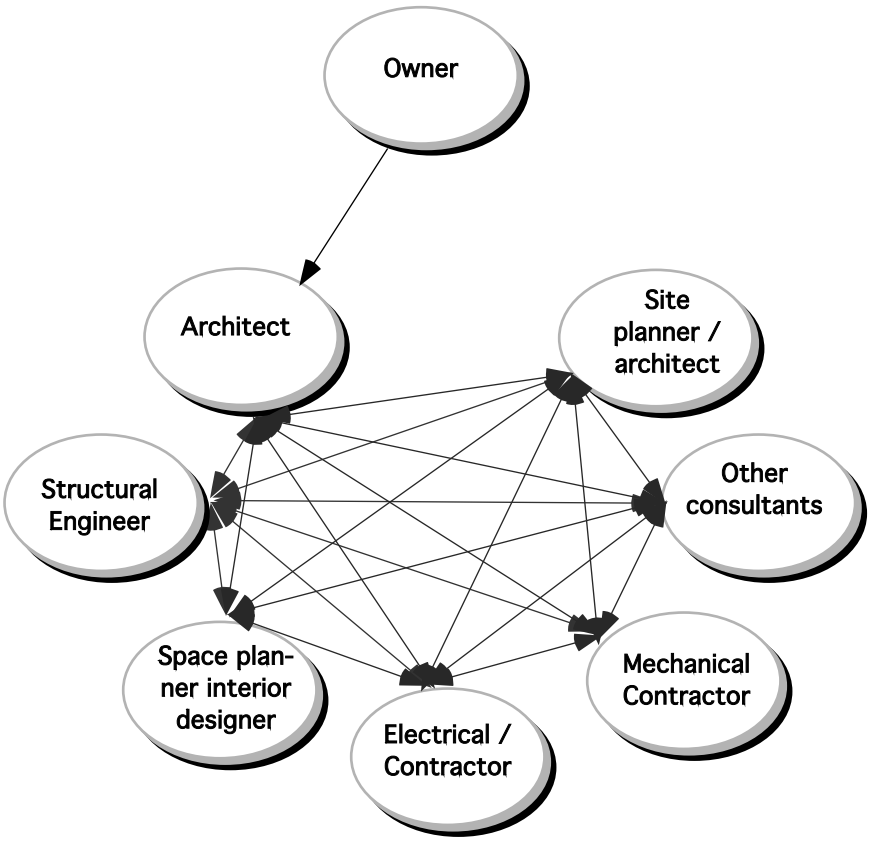


Figure 6 Collaborative Process Model

One recent study (RLW, 1999) suggests that the percentage of buildings now being erected using a systems optimization approach, which is consistent with the collaborative approach, is in the range of 4 – 8 percent. Interviews conducted in 2000 suggest that at least a few large developers are seriously considering working exclusively with firms using a team approach. They have come to understand that teams of convenience do not produce quality buildings.

The important point is that the collaborative model is a different approach to organizing the construction of buildings. Its team approach and systemic view of the building process are highly consonant with the desire to build more efficient structures. The collabo-

rativist movement potentially represents a set of important allies with whom those interested in energy efficiency may wish to work.

Decision Making about Existing Buildings

With existing buildings, the emphasis shifts to maintenance and renovation. Decision structures and key actors vary across types of building ownership. It is useful to review four types of ownership/management in order to understand important differences that may influence energy efficiency efforts.

Large Firms which Own and Operate Large Commercial Buildings

There are a substantial number of firms that own and manage a very large amount of commercial lease space. In the previous section we described developers who build buildings. Most of those developers provide their own building services from cradle to grave. Some of these firms are regional, but many own and manage property throughout the US. Figure 7 illustrates the way in which a very large property-owning firm might be structured.

In such firms, the investment managers make decisions about investments and investment strategies. The operations manager is responsible for managing the properties that make up the firm's portfolio. The maintenance manager is responsible for overall maintenance activities. For such a firm, each large building or building complex would have a facility manager responsible for leasing and operation of the building. The facility manager will have a small staff that may include one or more leasing agents responsible for keeping the space filled and managing tenant affairs. The facility engineer is responsible for the operation and maintenance of the building. A large building might have a chief engineer, an assistant chief engineer, and as many as 25 journeyman engineers.

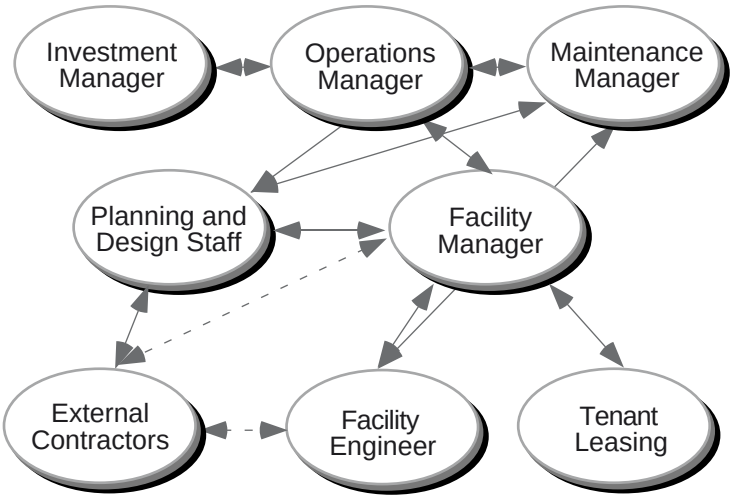


Figure 7. Market actors for a large building owner

When it is determined that changes are to be made to a building, the corporate planning and design staff is called upon to develop recommendations and do the design work. Depending on the size of the staff and the amount of work, planning and design may be done in-house or through a consultant. Typically, outside contractors are used for projects that go beyond general maintenance.

In this situation there are several actors who influence decision-making. Tenants can dictate the layout of the space and any special requirements that they might have such as improved lighting design. Several of our respondents indicated that tenants entering spaces are now asking for lighting that minimizes glare on CRT screens. The costs of changes initiated

by a tenant are usually recovered through the lease. Tenants can and do ask for changes, but as we have pointed out previously, the motivations for doing so are seldom the energy savings but other incentives such as increased productivity or reductions in complaints from their staff.

A facility manager is responsible for the cost of operations of a building and may make a case to management for investment in the building to reduce maintenance and operating costs, to improve leasing prospects, or to replace equipment nearing the end of its lifetime. Such requests for changes usually originate with leasing agents or the facility engineer.

When changes are made to a building, the corporate design staff probably has the most influence over design and equipment selection. The building engineer also has some influence by virtue of the engineer's knowledge of the building. One facility engineer told us that because of exposure to information about glazing films, he was able, with the help of an engineering design firm, to demonstrate that glazing film would meet payback criteria, and was able to get it installed. Facility engineers work closely with outside consultants in developing recommendations and defining the scope of work. The influence of contractors is usually minimal unless they are also providing design services.

- From a market transformation perspective, the corporate design staff and the facility engineers for large property owners are key actors.
- What key actors can do is limited by investment criteria and budgets established by upper level managers including the investment managers and corporate operations managers. The building and planning staff, the facility manager, and the facility engineer are aware of the criteria and plan projects accordingly.
- Upper level managers in large property owning firms do not have a detailed understanding of energy efficiency issues but the members of their corporate planning staffs do.
- Consulting engineers, lighting consultants, and other professionals can have a significant amount of influence in renovations and rehabilitation but are typically responsive to the dictates of the client.
- If the goal is to change the market, then for large commercial property owners, the primary targets should be the in-house staff and the upper level managers. The in-house staff need details while the upper level managers need more general information.
- Change will come more quickly if the efficiency improvements allow the owner to command higher rents or make the space have characteristics that make the space more desirable to the client.

Smaller Commercial Property Owners

Smaller firms that own and manage commercial property typically have less elaborate management structures. An owner and staff may work directly with facility managers to operate buildings. Operators working in this scale do not have planning and design staff but there may be an individual who deals with technical and operational issues. This individual typically works with consultants or may work directly with contractors to deal with physical issues in buildings. The choice of whether to work with a consultant and then a contractor or directly with the contractor is partially a function of the scope of the project being considered and whether or not the contractor can provide the necessary design assistance.

In planning changes to a building, there will be a heavy reliance on consultants or contractors who can provide design assistance. Depending on training and inclination, the

facilities engineer, if there is one, may play a more prominent role in determining what is done and work directly with the contractor.

The owner will establish the investment criteria. In these cases, decisions are usually driven by first cost. Changes may be made in response to tenant requests. Changes not requested by a tenant may be implemented if they can be shown to have a reasonable payback.

From a market transformation perspective, the key actors are the owner and/or the technical operations manager, the facilities engineer, if there is one, and the consultant/contractors.

Fee-managed Properties

There is a trend for property owners to rely less on their own staff and increasingly on property managers who manage, operate, and maintain buildings on behalf of the owner for a fee. Arrangements vary from owners who rely on a property management firm to provide comprehensive services, leasing as well as maintenance and operations, to property owners with internal facility managers who contract for individual services such as maintenance, HVAC, security, and others. The trend appears to be that both property management and service provider firms are moving to provide a more comprehensive array of services and that the distinction between property management firms and property management service firms is disappearing.

Owners are increasingly viewing the operation of the physical plant as outside the scope of their core business. It is also clear that many property management and service firms are aggressively developing at the national and international scale.

Depending on their size, property management firms typically have one or more managers responsible for the physical operations of the buildings they manage. The size of buildings and the number of tenants are an indicator of whether buildings have a facility manager and staff or the building is serviced by roving maintenance staff.

Changes to buildings to make buildings more attractive, to change the costs of operation, or to meet maintenance and replacement needs may be made in response to requests by tenants or prospective tenants. The cost of tenant requested upgrades is factored into the tenant's lease cost. The general maintenance and operation of the building is usually handled through a budgeting process.

The owners become more directly involved in decisions concerning large-scale investments related to building upgrades that require capital. Typically owners have competing projects that offer them three to five year paybacks and they will select among those projects. However, the owner does set the parameters within which alterations may be made to a building. Owners take pride in their buildings and they may undertake changes to buildings with longer paybacks that would not normally meet their investment criteria if they perceive that these investments have less tangible benefits such as improving the image of the building. The property management firm is usually responsible for recommendations and is likely to be responsible for managing the process on behalf of the owner. The owner and property management firm will rely heavily on consulting architects and engineers unless the property management firm has in-house expertise in these areas.

The extent to which energy efficiency is an issue depends largely on who benefits and the size of the benefits. An owner will proceed with efficiency upgrades if it makes the building more attractive to tenants, if it reduces costs in some way that adds to the bottom line and if it meets the owners investment criteria. Depending on the incentives in the prop-

erty management firm's contract, it may be in the interests of the property management firm to lead the way or not. Lower costs may help property management firms retain a contract. If, for example, there are contract incentives for decreasing cost or increasing yield, then to the extent that energy efficiency contributes to these goals, the property management firm will be incentivized to do something. Based on our discussions with property management firms, contracts are seldom written in ways that encourage the property manager to become an advocate for energy efficiency.

Depending on what is to be done to a building, an operations manager may write bid specifications or engage consultants to establish such specifications. Building engineers may have substantial input into this process. The property management firm will then place the specifications for bid.

From a market transformation perspective, key factors that may lead to decisions to improve the efficiency of a fee-managed building are:

- Requirements from tenants or prospective tenants that may lead to upgrades
- The potential for a more than acceptable rate of return on an investment. Usually the property management firm or a third party will have to identify these opportunities.
- Incentives in the contract between the owner and the property management firm that accrue to the property manager that encourage the property manager to get involved.

If the goal is to transform the commercial building market, property management and firms offering property services should be important targets. Potentially, energy efficiency, or more appropriately, the derivative products of energy efficiency such as productivity and "good" buildings, are products that could be added to the business lines of these firms. There are at least two incentives for such firms to offer the products, the profit from the product and the competitive advantage that such products might provide in a bidding process.

Owner-users

The proportion of owners who manage and maintain their own buildings appears to be declining. Self-management is being displaced by the use of property management firms or service contractors. For large firms that own and maintain their own buildings, there is usually a corporate property manager responsible for acquisition and sale of properties. In addition, there are typically one or more managers with staff who are responsible for managing and administering the various facilities. Depending on the size of the company, this person may be a professional architect or engineer or a manager whose staff includes such professionals. Depending on the size and number of buildings, there may be on-site or roving maintenance personnel.

The manager of physical facilities is responsible for upgrades to facilities and maintenance and operation of facilities. Typically the facilities manager's operation is a budget driven process. There are always pressures to reduce costs. Requests for capital for upgrades typically compete with other investments that a firm or company makes, for example, computer equipment, advertising, etc.

In rare cases with large firms, the facilities staff may do design work internally but most will subcontract the work to consultants. The key market actors are the manager of a facility and that person's staff. The corporate property manager or other senior managers will be the key actors when an acquisition or major upgrade is taking place. For large firms, the internal staff needs to be the target of market transformation efforts. Facility managers tell us that for them information is the key. The need it quickly and at the appropriate time.

Their search for information is seldom very broad or in great depth. They will ask their contractor or ask the contractor to recommend a consultant to tell them what they want to know. The result is a tendency to go with what is or was rather than what might be.

Smaller firms will not have such elaborate structures. The owners or senior managers may handle facilities management. In many instances they may see building issues as a distraction or may defer to a building maintenance manager. Typically smaller firms will have fewer facility and maintenance personnel and major work that needs to be done is likely to be contracted.

Owners will make efficiency changes if they see opportunities to significantly reduce costs. However, owners don't typically have an interest in building issues and energy efficiency if near the bottom of the list both in terms of priority and return on investment. Smaller owners who manage their own buildings may not have sophisticated staff who understand or promote energy efficiency. Even when staff do understand, they tell us that they often have difficulties in getting the attention of management and convincing management of the wisdom of energy efficiency. As one manager put it, management just thinks it is "black magic."

Summary and Conclusions

In this paper we have discussed the structures, actors, and decision-making criteria in the commercial building market. We have also described some of the barriers to more efficient buildings.

It is clear that the commercial building market is very heterogeneous with a wide range of actors who influence the efficiency of buildings. A number of barriers may impede improving the efficiency of commercial buildings.

In the new construction area we note that:

- Building professionals apply their skills and knowledge independently and serially. This can and often does result in buildings that are not well integrated and perform poorly.
- Key decisions and even designs for many new buildings are completed by professionals who are an ocean or a half a continent away. Their decisions and designs are implemented by local firms who are hired to assure that buildings conform to local standards. This makes it difficult for champions of energy efficiency at the local level to influence designs.
- The commercial building market is increasingly driven by standardized design criteria used by large developers. This may make innovation difficult if developers hew to the tried and true.
- Most of the market interventions in the last 10 – 20 years have been based on the use of monetary incentives. This strategy has worked but promoting the value of efficiency in terms of productivity and good environments may have far greater appeal to decision-makers at the bottom line.

With respect to existing buildings:

- The trend is for property management to be separated from ownership and occupancy
- The separation of management, occupancy and ownership makes it less likely that there will be a champion for energy efficiency.
- The trend is for property management and management services to operate across regional and national boundaries which makes it difficult to intervene at a local level to influence these types of operations.

- Current property management contracts minimize incentives to all parties that might lead to more efficient buildings.
- Independent consultants or contracting firms that provide design services inform many of the decisions that are made in the existing buildings market. These consultants are motivated by many considerations that they deem to take precedence over energy efficiency.
- Professionals serving both the new construction and existing building markets indicated that they currently use less information than they would like because sources of information are scattered, of suspect quality and almost always with too much or too little detail.

These observations lead to several recommendations:

- There is a need for more research linking energy efficiency and other factors, such as productivity, sales receipts, floor traffic, etc., that might motivate people to build more efficient buildings. There is very little literature in this area and probably fewer than five defensible empirical studies. Energy efficiency is much easier to sell if it is directly and significantly connected to the bottom line.
- We need to recognize that many decisions are made well beyond local boundaries. DOE, EPA, and the various regional and national market transformation organizations around the country should be targeting key decision-makers that the national level who influence building design. There are probably a few dozen key firms who drive the architecture and engineering done by national chains in malls, strip malls, etc. An effort is needed to explore the potential for changing this market and the strategies for doing so.
- Likewise, there are probably 50 to 100 large developers of commercial office spaces who impact our suburban-scapes. Here too, there is a need to explore the potential for changing this market and to identify strategies for creating that change.
- The information needs of the commercial building community must be more fully met. It is not so much a lack of information but a matter of making quality information more accessible and usable. The Internet is clearly an important tool for delivering content to the commercial buildings community. Building professionals are increasingly using the Internet. The problem is organizing and packaging the information so it will be used. The vice-president may need a two-page piece explaining why he may want skylights and a one-page summary of the benefits. The facility manager may need a five-page piece dealing with the twenty things that need to be considered in assessing the potential for skylights. The consultant may need the software and an explanation of the technical considerations. A contractor may need materials on how to organize and assemble skylights. This is another arena where regional and national organizations as well as local ones might effectively work together.
- Finally, there is a need to reorient some of the current research emphasis on understanding local markets to understanding the broader regional and national markets, especially in commercial buildings, malls and shopping centers, property management firms and building services companies. These regional and national markets have relatively few players and control or manage significant amounts of space. They are audiences that can have important impacts in improving the efficiency of commercial buildings.

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