INTRODUCTION

General Comments

Few activities are as complex as building design and construction. Compounding this complexity is the fragmented nature of the team charged with designing and constructing buildings and other facilities. In many owner/client organizations, the decision makers are often unaware of the complexities and costs of the process, and may make decisions without the input of those assigned to bring these to fruition. The Great Recession significantly impacted the construction industry. It took years for the industry to recover and it emerged much leaner than before. Workloads that began falling in 2008 continued for years, resulting in enormous layoffs of staff. Contractors, in particular, found many older workers opting for retirement and younger ones seeking work elsewhere. As a result, a labor shortage emerged, particularly in the project manager (PM) ranks. Because of the changed economy, engineers, architects, and facilities managers have been required to learn new skills and reposition themselves. Traditional delivery approaches have been altered, and new ones emerged. The pre-recession narrowing of the need for some services, such as traditional architectural services, has continued unabated. Services previously handled in-house in larger owner/client organizations are now being outsourced, greatly reducing the in-house facilities design
and construction staff members who are available to plan, coordinate, and manage owner/client projects. Some of these outsourced specialists are traditional engineering, architectural, and facilities firms—others are found in niches such as program and project management firms.

Many design firms now face challenges in finding and keeping capable PM staff, in developing better project scope management systems, in complying with fierce fee and time pressures, along with a myriad of other issues. The Great Recession resulted in many experienced people leaving the industry, some retiring early, or young people choosing other fields. As a result, there is a gap in the ranks of capable PMs. Identifying and training PMs is a pressing need in the construction industry.

Outside of the construction industry, the term project management often broadly means scheduling, and project management software is simply scheduling software. Inside the industry, that is only one tiny fragment of the package. However, the entire concept of using PMs is borrowed from outside our industry, and their fundamental role in managing and controlling the project scope, schedule, and budget remains the same both within and outside of the construction industry.

To achieve their goals, design and owner/client PMs must clearly understand their primary role. They are to serve as the communications conduit in a highly fragmented, specialized, and complex undertaking. Their tools must allow them to communicate quickly and effectively.

**Design Firm Project Management**

A fundamental element of design firms is their project management system. This system enables firms to complete projects successfully and hence solve their client’s problems. The project is the profit center of a design organization. The PM is in the best position to control the final outcome of a project and can have a great impact on project and firm profitability. However, not all PMs function in the same manner. Many design firms have what is known as a weak project management system. Typically, in this type of system the principal or partner is responsible for actually producing the work. In effect, the PM is really a technician.

I have often heard design firm practitioners say that profitability and growth are factors of the ability to get the work (success of the marketing effort). I believe that this is only partially true. A much more fundamental factor is the firm’s project management system. With a strong project management system, design firm principals can and should spend more effort toward getting the work and managing the firm.
Many design firms pride themselves on personal service to clients. However, with a weak or ineffective project management system, the principals often deal with the client, and the PM is in charge of producing the work. No single individual has complete control of the project, hence efficiency and profitability suffer. In essence, when more than one individual is responsible for the project, in reality no one is. As a result, the desired personal service is often a myth because those who are actually responsible for performing the work rarely communicate directly with the client.

Facilities Project Managers

There is no single model for project management in facilities organizations. This is a direct result of the varied nature of these clients. In general terms, clients include the commonly accepted groupings of public, private, institutional, governmental (essentially the same as public), corporate, institutional, commercial, residential (high-rise, low-rise, single family, apartments, etc.), retail, and many other categories. As found in design firms, clients can be large or small, domestic or international, specialized or generalized, or fall into many other groupings. Some facilities staff might consist of a handful of people; others might number in the thousands—some are centralized; others dispersed to many locations. Their roles vary and can be ever-changing. I have seen some reorganize regularly; others have decided their model works fine and haven’t changed it for years. Many of these static facilities groups are poorly equipped to meet the needs of their organizations when internal or external pressures require a different response. Two case studies in this book contain elements of this situation (AB&C Telecommunications in Chapter Three and the International Potato Corporation in Chapter Nine).

Despite the lack of a clear model for facilities project management, there are many common skills, tools, systems, and approaches needed by all. This book presents many of these necessary for both design and facilities PMs. Essentially, good communication is at the core of all effective project management in the construction industry.

Project Management in Small Design Firms

Effective project management is important to all organizations. Small design firms are especially handicapped by a lack of project control and reporting systems, a lack of staff time solely devoted to managing projects,
insufficient principal time to run both the firm and projects, and an inability to market with enough regularity to ensure a steady workload.

In addition, many smaller design practices find it difficult to apply published or seminar material on project management. The situations described often assume that the firm has the necessary staff and resources to implement prescribed systems and activities. In many small design firms, principals run the firm and its projects. They make all decisions (major and minor), meet with clients, keep project and financial records, negotiate contracts, and are involved in dozens of other tasks on a daily basis. Many of these individuals find it difficult to understand how project management techniques that are presented for larger design organizations are relevant to their situation.

There are however, many excellent procedures appropriate for large and small organizations that enable firms to escape the treadmill of constant crisis management. Systems and methods can be implemented that will make design practice more efficient and profitable. For example, firms with projects of shorter durations may want to selectively incorporate project management techniques based upon the specific situations presented. It may not, for example, be sensible to establish an elaborate project status reporting system for projects whose duration may be measured in days, rather than months or weeks. In this case, the system may not be current enough to allow the principals or PM to take corrective action in the event of problems. The reporting system should, however, provide enough information to record historical data on project profitability, change orders required, basic contract terms, and similar information.

**Defining the Project Team**

Many organizations and PMs narrowly define a project team. Most consider the project team to only include those immediate firm members working on a particular project. The project team actually should include members of all organizations involved with a project—including clients, consultants, suppliers, contractors, subcontractors, engineers, architects, and so on. The total number of team members may include dozens or even hundreds of individuals from many different organizations. Each individual team should be represented by a PM who is the permanent representative to the overall project team.
Problems with Weak or Ineffectual Project Management Systems

Many firms believe they have effective project management systems, but these are often flawed. There are many signs which point out a weak or ineffectual system—several are discussed below. While no system is without its flaws, the goal of any firm manager should be to minimize their impact. Unfortunately, the pressure of meeting project requirements often results in necessary changes being pushed aside by the notion that it is more expedient to continue operating as you always have. Eventually, these inefficiencies and weaknesses can result in reduced profits, poor service, quality issues, and many other undesirable consequences. An important concept to consider is the need for continuous improvement in your operations. Even effective project management systems require regular fine tuning to incorporate new ideas and concepts, make the best use of new technologies, adapt to changing needs and economic conditions, develop new services, and provide the staff with the skills they require.

1. **Overburdened senior managers:** Weak or ineffective project management systems typically rely on a handful of senior managers to run the organization and manage projects. Under the umbrella of project management, they often market the firm's services (design organizations), develop a scope of services and project design budgets, prepare a project program, select outside consultants and providers, organize schedules, review work, and handle dozens of other activities. They also need to monitor the project scope to determine when and if activities lie beyond the range of services covered under the design contract. In the event that these activities are outside of the agreed scope, they need to alert the client and negotiate an increase in the design fee, if appropriate. Overburdened managers often lack the time or focus to handle these *scope creep* situations, resulting in penalizing the project’s budget and profitability.

2. **Poor internal communications:** The impact of overburdened senior managers has a snowball effect on the most important aspect of effective project management *communications.* Managers lacking the time, focus, or systems to communicate project information to team members will find they need to redouble their own efforts to mitigate the consequences of this failure. Complicating the situation is the lack of a firm-wide approach to sharing infor-
mation, making decisions in a timely manner, and the need for staff to adapt to the unique style and approach of the various senior managers. Often distracted by more global firm management and/or marketing issues, senior managers may fail to transmit vital data to the project team members. Crisis management often prevails in these organizations.

3. **Poor external communications**: Many of the same problems highlighted in Point 2 impact those outside of the design or facilities organization. Clients, consultants, vendors, suppliers, contractors, subcontractors, and many others find themselves lacking necessary or timely information. This can result in project delays, higher costs, errors, and many other problems. While a highly effective project management system isn’t always a panacea, it provides a mechanism to deal with these issues that is lacking in weak or ineffectual systems.

4. **Lack of decision making by those holding the nominal title of project manager**: Some organizations have a loose definition of the term *project manager* and assign the title to many people. Unfortunately, some of these individuals have many of the responsibilities of a PM without the necessary authority to make decisions. Authority often resides with senior managers who may not hesitate to step in when they have different priorities, concepts, and goals than the PM. They may contradict decisions made by the PM, meet with clients without the PM present (design firms), give instructions to staff, meet with consultants, or do a wide variety of activities undercutting the nominal PM. As a result, the PM often ceases to be effective, stops making decisions, and reverts to the role of *doer*, rather than manager.

5. **Lack of decision making by clients**: To be successful, projects require an active and assertive client who is willing to provide input and make decisions. Clients or their facilities representatives must make themselves available to the project team and quickly respond to questions. This is a difficult process in the best of circumstances and nearly impossible without an effective project management system where a PM anticipates the need for client input. Design PMs must regularly communicate with clients or their facilities representatives and push for decisions. Clients must be provided with complete and accurate information on a timely basis. Weak or ineffectual systems lack this important mechanism to ensure client decision making.
6. **Exceeding a manager’s span of control:** There have been many studies identifying the limits to a manager’s span of control. This term refers to the limit on the number of people an individual can effectively manage by answering questions, reviewing work, providing direction, giving instructions, and dealing with problems, conflicts, etc. Beyond this point, a manager becomes overstretched and increasingly ineffectual. A firm with a weak project management system tends to rely on a very limited number of people to manage the firm and projects. On large project teams, a PM will need to have a cadre of assistant PMs to handle various aspects of a job to prevent exceeding their own span of control. In firms where senior managers try to manage the business and projects, the span-of-control limit typically sets how large the staff can become before the operation begins to break down. Studies note this limit to generally be around ten subordinates per manager.

There are many other problems that are apparent in an organization with a weak or ineffectual project management system. Symptomatic of these is the neglect of general planning, financial management, and long-term marketing and public relations. These important subjects often take a back seat to the more immediate crisis management needs of current projects. In situations where a nominal PM has responsibility much greater than their authority, morale can suffer, conflicts may arise, and the PM may seek other employment. There are many circumstances where senior managers complain that their PMs won’t take responsibility on jobs. While this may be true in some cases, often this perceived poor performance may be the result of a senior manager preventing the PM from properly doing their job. It could be that this PM may not be the appropriate person for the role, may lack training, may lack necessary tools, or the system itself may be ineffectual.

**PROJECT DELIVERY SYSTEMS**

There are as many methods of organizing for project delivery as there are firms. Most well-managed organizations are forever tinkering with their systems in an effort to improve service and their own profitability and performance. Some firms even use different systems within their operation based upon the project size, location, client need, or other factors. However, these systems generally fall into one of three formats.
**System Types**

**Pyramid Approach**

This method revolves around a key individual who makes all major (and often minor) decisions (see Figure 1.1). It is commonly used in smaller organizations where the firm’s owner has daily involvement in all project and firm management decisions. One or more key technical and administrative support people aid in executing required tasks. Lower-level staff members generally perform only assigned tasks. If the key individual is not available, activity often grinds to a halt. In a busy firm, daily crisis management may rule, and important planning and operational issues may be neglected.

In a design firm, when an organization has two or more partners, multiple pyramids may exist. Each partner may have his or her own client group and key technical assistant. Formal coordination between partners rarely exists and important planning issues are often neglected. Where one principal is more successful in obtaining work, his or her share of the firm’s workload may become overwhelming. This often creates friction and conflict between partners. Some firms deal with these problems by organizing an informal division of labor whereby assigned project and administrative roles are given to each principal. Unfortunately, most principals still prefer project involvement and may continue to neglect their assigned administrative or marketing functions.

Client organizations are not immune to the issues raised in organizing for project delivery with pyramidal structures. For example, a developer of commercial or residential projects may be deeply involved in all or most decision making. A manufacturing company with only a handful of locations may assign facilities management to an executive who may also have other responsibilities. Managing projects for the company may be a part-time activity for which he or she may not be trained and may

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**Figure 1.1** Pyramid approach
neglect facilities management. Smaller municipalities may have a mayor who has staked his or her reputation (and re-election possibilities) on the success of a project and may become deeply involved without the necessary skills or structure to be effective.

**Departmental Organization**

As organizations grow, pressure increases to formalize project and non-project management assignments. The division of labor concept often becomes the basis for a formal departmental structure. For example, a single-discipline engineering firm often structures itself around marketing, design, production, and field departments. Multidisciplinary firms may establish each discipline as a separate department (see Figure 1.2).

Single-discipline firms frequently appoint department heads drawn from associate or principal ranks. These individuals normally retain full authority for all project and non-project decision making within their departments. In theory, responsibility for project management is delegated to the next lower staff level, and these individuals are called *project managers, project engineers, or architects.* Typically, their role is focused on technical issues, and they have little actual authority.

The concept behind the departmental approach is that as one department completes its work on time, within the budget, and according to the contractual scope, project authority and responsibility is passed to the next department head. In reality, department heads determine project priorities based upon their own workload, level of interest in the project, relationship with the client, and other factors. Often, each department and its head have different methods of project management and capabilities. As a result, the client must adjust his or her operation to three or more different project styles and systems. In addition, if the firm’s principals assume departmental responsibilities, firm management and marketing may be neglected. Under the single-discipline departmental organization, the situation may be little improved over the pyramid approach, as

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**Figure 1.2** Departmental organization
each department may simply become its own pyramid. With no single individual in charge of the entire project, personal service to clients is often a myth and time schedules, budgets, profits, and the long-term well-being of the firm may all be jeopardized.

In an attempt to deal with the deficiencies of the single-discipline departmental system, some design firms have introduced the PM concept. Unfortunately, this system is often not designed or operated properly. All too commonly, firms institute a weak project management system where there is a significant imbalance between responsibility and authority. To be successful, levels of responsibility must be generally equal to levels of authority. In many firms, real decision-making authority remains with department heads while much of the project responsibility is delegated to PMs. As a result, PMs lack the authority, training, or experience to make decisions stick and simply cease being decision makers. This discredits the project manager/management systems in the eyes of department heads, senior managers, and clients. Where department heads are generally owners and PMs are associates or employees, the situation may become intolerable. In these firms, staff turnover may be high, profitability and productivity low, and client satisfaction questionable.

Multi-discipline firms can successfully use a departmental approach when many projects are within a single discipline. Frequently, these firms establish a matrix management system within each department. Where studios are used, a similar system may be developed. Multidisciplinary design firms with projects involving several disciplines require a project management system to handle work that crosses department lines. Often, a PM is selected based upon the predominant discipline required. Without an effective PM, multidisciplinary firms may find themselves with the same problems as single-discipline, departmentally organized firms.

Matrix Management

For many design firms and owner/client organizations, the matrix management (or strong PM) approaches functions best (see Figure 1.3). Under this system the PM is in full charge of the project from beginning (marketing) to end (continued contact). The PM has an equal balance of authority and responsibility and serves as the primary contact point for other members of the project team. His or her major responsibilities include meeting the program, schedule, and budget while maintaining profitability for the firm (if a design organization). Department heads or
chiefs of the various functional areas (e.g., marketing, design, production, etc.) retain responsibility and authority for technical decisions, staff assignments, training in technical areas, implementing quality reviews, and so on. Where technical decisions significantly impact the project scope or budget, the design firm and the client PM must review and approve decisions.

The matrix project management system separates the ownership role from the need to produce a successful and profitable project for both the client and the design firm. Unfortunately, at times of conflict, there is a tendency to confuse ownership with a project’s real needs. To be successful, a firm using the matrix management system must be able to communicate to its staff and management how the system works. On occasion, confusion can arise on the part of staff members regarding whom to contact with questions, comments, or problems (the PM or a department/functional head). In addition, matrix management requires a complete, timely, and accurate job cost reporting system. Other management tools such as a project management manual are also extremely helpful.

Small design firms or large firms with small projects may establish an abbreviated matrix system. In this case, an individual may wear several hats and must be careful to focus on his or her specific responsibilities on a project. Some firms use the full matrix system only on their larger projects and use other approaches on their remaining jobs.

The matrix system requires a strong chief executive to arbitrate disputes between PMs, department/functional heads, and staff members. Although the goal of the system is to avoid bottlenecks and crisis management, disputes will occur and these require careful resolution. When functioning properly, matrix systems encourage decision making at the

![Figure 1.3 Strong project management matrix](image-url)
lowest possible level of the organization and both responsibility and authority must be delegated to make this possible.

**Other Concepts**

Some organizations use variations of the project delivery systems noted in this section. Two in particular require some attention.

**Account Managers**

Under this approach, instead of managing projects, a design firm PM manages a client account. This can be a successful approach, but often leads to imbalances in PM workload. A particular account manager may become overwhelmed with a very active client, while another may be under-utilized by slow client activity or temporary delays in funding, project approval, and so on.

**Studios**

Found in design firms, studios typically focus on a particular type of work such as healthcare, industrial/commercial, and interior design. Each studio is led by a senior manager or principal and is run like a semi-autonomous firm. Sharing of staff between studios is not well coordinated and can result in staffing imbalances and higher overhead costs. The benefit of studios is the ability to focus staff and expertise on a specific type of work. Normally a project management system should be employed within the studio.

**Impact on Construction Costs**

A poorly developed project management system can be costly to both a design firm and its clients. A design firm’s ability to stay within a design fee or to manage design change orders (and often obtain additional fees) is dependent on their project management system. Construction costs can skyrocket when inadequate project management causes poorly prepared construction documents. Contractor bids may be high to cover unknowns or questions on design drawings, or low to obtain the job (then made up through construction change orders).

**Client Selection of Design Consultants**

Among the factors that clients and their facilities staff should consider in the selection of design consultants is the designer’s internal project
delivery system. It is usually best to select a consultant whose system compliments their own. For example, if a client organization has a strong project management system, selecting a departmentally structured design consultant may result in a frustrating and unproductive relationship.

**STRATEGIC PROJECT MANAGEMENT PLAN**

Project management is not a static activity. Developing and improving your project management program requires a plan, regularly updated and directed. This strategic plan guides your decision making regarding hiring, training, software acquisition, project management tools development, organizational changes, compensation, and dozens of other topics.

As is true with all strategic planning efforts, the strategic project management plan requires a step-by-step approach to develop and maintain successfully. These steps typically include an assessment process, benchmarking of best industry practices, determination of goals and objectives, writing of a plan, implementation, and updating/revising. Unfortunately, in most design and construction organizations, the project management program evolves without any planning. Often, it is growth and high workloads that force the change to some form of project management. Typically, project management systems in these organizations lack coherence, the necessary tools, and capable managers.

The typical evolution of organizations in the construction industry includes several steps. Embryonic or early stage firms are typically pyramidal in nature with the owner/founder at the top of the pyramid. This individual is both firm manager and PM. For many, their normal day is one of crisis management with little opportunity for planning, reflection, or change. Some escape this treadmill and develop growing organizations. If there are several individuals at a senior level (i.e., multiple owners and principals), then often a departmental organization evolves where each senior individual has his or her own segment of the firm to run. An example would be a single-discipline engineering firm where one partner is in charge of the design department, a second is in charge of the technical department, and a third handles marketing. While the departmental organization can work in multi-discipline firms, it typically fails to build a coherent project management system in single-discipline firms.

Some firms overlay a weak project management system on top of a departmental structure. This creates a situation where middle managers have most of the project responsibility while senior managers retain authority. This is often the case in governmental bodies and corporate
organizations where the internal project management/facilities management group has little involvement in determining needs, budgets, schedules, and so on. Typically, these individuals have responsibility for meeting the needs of their internal client, but have little or no control over resources.

The next step in the evolution of design and construction organizations is the development of the matrix or strong project management system. When properly functioning, PMs in this system have relatively equal levels of authority and responsibility. They also have all of the necessary tools to do the job and are provided with opportunities for training and advancement. Mentoring programs exist to identify and educate future PMs and organization leaders. Reward programs are developed to provide incentives for excellent performance.

Many organizations claim they have a strong project management system, but an objective examination of their system would find many failures and problems. It is astonishing that many in the construction industry who are professional planners by trade do so little for their own organizations. The typical project management system develops without a plan and lacks any guidelines for the future.

**Elements of a Strategic Project Management Plan**

What are the elements of a strategic project management plan? The following highlights some of the most important items to include.

1. **What is the current status of your project management system?** How is it performing? Are you providing the best service to your internal and/or external clients? Do you have excessive turnover in the ranks of PMs? Do you have all necessary project management tools? Do your PMs get information in a timely fashion? Dozens of similar questions must be answered objectively.

2. **What are the industry benchmarks for best practices?** Do you know how project management is handled elsewhere in the industry? In each area of your project management operation, what are the best practices used by others that could benefit you and your internal and/or external clients?

3. **What are the goals and objectives for your system?** For example, is your system a training ground for future owners of the firm? Is your goal for project management to maximize profits, provide
top-notch service, or both? Is the use of cutting-edge technology vital to your organization? Do you want a culture of continuous improvement built into the system (which can be chaotic)? Do you want to structure career paths for PMs (and possibly all staff)?

4. **Prepare a written plan.** Document all items mentioned in Points 1–3. Prepare an action plan. What should you do first? Second? Provide a budget and resources and include them in the plan. Set a schedule and follow it. Share the plan with all staff, not just PMs. Most of all, keep it simple and achievable while making it challenging enough to require real effort on the part of your organization.

5. **Implement your plan.** This is the hard part. Planning is tough enough. Implementation is challenging. It requires action. You need to spend time, money, and effort. Most organizations achieving success at implementation establish a planning committee to oversee the process. This group meets regularly and makes ongoing decisions under the guidance of the strategic project management plan.

6. **Update and revise your plan.** Changes to the plan are made when a need is determined. It is not a stagnant document and may require occasional revision. The planning committee should periodically examine and update your plan with input from those affected by it.

**Items to Consider under the Plan**

There are potentially hundreds of issues to consider under the strategic project management plan. The following lists some of the most common items to examine.

1. PM compensation
2. PM incentives
3. Reporting tools
4. Computer systems: CADD, BIM, job cost reporting systems, technical software, scheduling tools, budgeting tools, database tools, enterprise software, etc.
5. Support staff: accounting, administrative, etc.
6. Office facilities
7. Communication tools: cell phones, laptops, tablets, etc.
8. General project management organization
9. Non-computer tools: project notebooks, change order management (design and/or construction, budgeting systems)
10. Roles and responsibilities of PMs
11. Training program
12. Mentoring program
13. Defining your ideal PM
14. Communication channels (existing and desired)
15. Organizational growth prospects
16. Sources of project management talent
17. Assessment of current PMs
18. Profits? Service? Quality? All?
19. Project management manual
20. Other

PROJECT DELIVERY METHODS

In the construction process, there are three primary methods of project delivery: (1) traditional straight-line, (2) fast track, and (3) design/build. No single method is superior, in itself, to the others. The primary factors which influence the use of one method over another include time frames, cost constraints, and quality. Other project delivery methods could be identified; however, many are only variations of those listed.

Traditional Straight-line Method

The process begins with the designer determining the client’s (owner’s) physical and functional needs. They then follow through with the creation of the building design, obtain the necessary project approvals, produce all required drawings, obtain either competitive bids, or negotiate prices with contractors before construction begins (see Figures 1.4 and 1.5). This flow allows complete development of the design program, fully developed design solutions, and complete pricing of building costs prior to construction.

This is the method most familiar to designers (particularly architects) because it blends smoothly into their operation. With this method, personnel needs can be planned, and it allows for the use of traditional management methods. Generally, in this method of project delivery, the designer has greater input into the project program than with other methods.
For private sector owners, pricing is often based upon a lump-sum general contract, under which the contractor constructs the client’s building for a fixed price based upon the designer’s drawings and specifications. The contractor will (or should have) performed a complete analysis of costs for the project, including subcontracts, special equipment requirements, and materials. If the contractor properly completes his or her estimate, a residual (profit) should remain upon completion of the building. In the event that he or she exceeds this fixed amount, there usually is no recourse other than renegotiation of the contract or lose money on the job.

It is not uncommon for the client and/or designer to retain outside cost consultants to monitor project costs during design, or to monitor the accuracy and fairness of the bids or the contractor’s negotiated price. The deliberate nature of the traditional straight-line method allows opportunity for the client to increase the budget if necessary, cause redesign of the project, or reduce the project scope. Particularly with public sector owners, this process is vital since the budget is often set by appropriation and it is not always easy to obtain additional funding.

If the contractor is locked into a lump-sum contract and the project costs exceed this amount, the contractor is subject to a loss. Many prefer...
the use of cost-plus contracts. In this method, the contractor is reim-
bursed for all project costs and is paid a fee in addition. A pure cost-plus
contract reduces the contractor’s incentive to keep project costs down;
hence, the use of upset maximums (at a percent over the original esti-
mates) is widespread. Beyond the maximum, the financial burden of cost
overruns shifts back to the contractor. Frequently, however, there is an
agreement between the owner and contractor to split all savings under
the upset as an incentive for the contractor to control and/or reduce costs.

**Fast-track Method**

With quickly changing economic conditions and needs, it is not always
possible to wait for completion of a building under the traditional straight-
line method of project delivery. In response, the fast-track method was
developed to allow for the overlap of the design and construction phases.
Upon completion of the project program and of the schematic design,
the project is divided into bid packages that are awarded (or negotiated)
in order by construction logic so that the earlier packages can be in con-
struction while later packages are still in design (see Figure 1.6).

The impact of the fast-track method on designers and their PMs can
be great. It increases the demand for individuals with specific skills con-
sidering that the needs of construction imperatives and costs require
early decision making in key areas (such as mechanical systems that often

![Figure 1.6](http://sample.com/figure1.6.png)
require long lead times for their manufacture). The effect of these decisions on later bid packages must be anticipated. Input to the design firm by the building product manufacturer or supplier, the general contractor, and the construction manager (CM) is often valuable to the success of this method. This input may be in evaluating product performance, costs (initial and life-cycle), and delivery times. Often, contracts are issued on an installed basis with a performance specification again requiring a manufacturer’s input.

The use of multiple bid packages (contracts) and the general complexity of many projects have required the hiring of a CM to ensure the performance of the contractor(s) and the accuracy of both cost estimates and schedules. In this sense, the CM performs the function carried out by the general contractor on less complex projects. As mentioned earlier, the CM often functions as the general contractor; however, any qualified party (e.g., architect or engineer) could be the CM.

In general, there are two types of CMs. At-risk CMs typically provide a guaranteed price to the owner based upon a documented scope of services and building program. Their profit is derived from completing the project below the guaranteed price. As a result, they have a great incentive to control the fees and costs of design consultants, contractors, and others involved in the project. Not-at-risk CMs are typically hired by an owner to manage the construction phase activities on a project. Traditionally, architects handled this activity; however, many have withdrawn from providing the service due to liability, lack of fees, and other concerns. As a result, CMs have embraced the opportunity.

**Design/Build Method**

The use of the term design/build has come to be an umbrella—covering many variations of the same process. Basically, this method of project delivery involves quoting the owner a price at an early stage for both design and construction of the project (see Figure 1.7). Given the limited nature of the building program at this point, there is a great burden placed on the design/build firm to be able to accurately identify general building components and costs. The essential identifying element of the design/build method of project delivery is the single point responsibility of the design/build principal. This principal may be the architect, engineer, general contractor, specific design/build firm, or other consultant.

Often, there are a great number of variables in the selection of materials, equipment, and systems. This offers many excellent opportunities for the design/build team, as any cost savings achieved during construction...
are beneficial to the design/build contractor. Some design/build teams are true single entity organizations encompassing both design and construction groups. Many however, are cobbled together by an architect or contractor on a project-specific basis simply in response to a market opportunity. In general, they should still be considered two separate organizations. An owner should view this type of design/build team with care as coordination, cost control, and communication may be weak.

**CASE STUDY**

*From: ENGINEERING NEWS-RECORD, May 11, 1998, Stephen H. Daniels, author*

“A Showpiece-turned-sour Triggers Change for Future Jobs”

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On April 16, nearly a year late and $20-million over budget, University of Washington officials finally dedicated a still somewhat incomplete
$98-million engineering building—a 260,000-sq.-ft. showpiece turned sour.

The original plan was for a five-year, two-phase project. But phase two, renovation and reconstruction of an existing engineering and computer science building was scrapped after four years. Only a termination agreement between the university and its subcontractors saved some from financial ruin, says Earl Dutton, owner of Dutton Electronic Co., Inc., Seattle, one of the job’s subcontractors.

The University of Washington’s building binge embraces more than $600 million in construction since 1990. “The university has had a very good track record compared to many public owners,” says Connie Miller, assistant vice president for capital projects. “Most of our projects have come in on time and on budget.” However, Miller says this one “was awful”.

The reasons are manifold and classic. Despite formal partnering, just about everyone involved says the project suffered from a “lack of coordination” between engineers and architects. Walls were built and torn out. Mechanical and electrical subcontractors, working from flag notes on incomplete blueprints, butted up against one another. Lack of detail in working drawings meant that mechanical subs were on their own to figure out configurations. For example, Dutton ran communications wiring outside because it would not fit inside.

The University blames its architect, Boston-based Kallmann McKinnell & Wood, for many of the problems. Kallmann principal, Henry Wood, in turn blames the university. He says that in a rush to get bids out in late 1993, the school went to bid with incomplete design drawings, then ordered more last-minute changes than the design team could accommodate.

Miller admits that as the Seattle construction market began to heat up, there was considerable pressure to get the project “to the streets.” She says: “We talked with the design team. We thought we were ready to bid. The bottom line, simply, is we were not.”

Wood also fingers the general contractor, Ellis-Don Construction, London, Ontario, saying it low-balled the conventionally bid job, then sought change orders to make a profit.

Bruce Blair, Ellis-Don’s vice president and project executive, says that’s not true. He explains that after seeking owner authorizations for architect-initiated or other changes, “we asked for money to do the assigned work.” Blair adds that the firm had to be diligent toward that end.

Miller says it was clear that trouble was brewing by mid-1994, “six months into the work.” By autumn, subcontractors and the general
contractors began falling behind. Field problems were “severe,” she says. “Every major subcontractor struggled.”

Taken one by one, the snags, like recognition late in the game that elevator shafts would not handle standard-size cars, “were manageable,” Miller says. “There were just too many of them.”

Blair blames some of the problems on a geographically distant design firm. Also, the building’s systems are highly complex, and there were the sometimes conflicting interests of the computer sciences and electrical engineering departments. Even at prebid, he says, “we had seven addenda on this project.”

Thanks to partnering and a disputes review board, there is no pending litigation, says Blair. Everything has been settled, except for a change order request and related insurance claim. But Ellis-Don, partly as a result of this project, has virtually pulled out of the Pacific Northwest market.

Results of a university-sponsored independent report to evaluate capital programs are imminent. But the school has already ordered tighter controls on change orders and will require future projects to be better defined before going to bid.