Project Organization and Management

David Allard

Sponsored By

APPA
Published by APPA:
APPA is the association of choice serving educational facilities professionals. APPA's mission is to support educational excellence with quality leadership and professional management through education, research, and recognition.

Reprint Statement:
Except as permitted under copyright law, no part of this chapter may be reproduced, stored in a retrieval system, distributed, or transmitted in any form or by any means - electronic, mechanical, photocopying, recording, or otherwise - without the prior written permission of APPA.

From APPA Body of Knowledge
APPA: Leadership in Educational Facilities, Alexandria, Virginia, 2009
This BOK is constantly being updated. For the latest version of this chapter, please visit www.appa.org/BOK.

This chapter is made possible by

APPA
1643 Prince Street
Alexandria, Virginia 22314-2818
www.appa.org

Copyright © 2009 by APPA. All rights reserved.
Project Organization and Management

Introduction

The art and science of building for colleges and universities has become more demanding, and managing all of the inherent issues requires technical knowledge, management expertise, and political skill. Often, increased expectations have to be measured against conflicting interests and competition for resources. Construction costs have increased dramatically. Operating costs over the life cycle add up to many times the initial cost. Competition for the best faculty and students has dramatically increased the requirements for more and better facilities. Technological advances, in both the design and construction phases, have provided new tools, but have also increased expectations for schedule reductions and increased efficiency. Management of cash flow has become an increasingly significant factor. Risk management and litigation are an integral part of the process.

Campuses provide some of our most beautiful and treasured built environments. The physical constraints imposed by limited land area and the need to preserve the distinct cultural landscape of the traditional campus are difficult to resolve. Pressures to hire prestigious designers for master plans and campus buildings can frequently complicate the process. Debates involving campus interest groups, students, alumni, trustees, and administrators cover a gamut of issues, including preservation, architectural traditions, environmental concerns, security, and accessibility.

Trustees and administrators generally understand the importance of the process and comprehend the challenges. And, while it is easy to recognize the need to hire a professional to manage these issues, finding a project manager who possesses the full range of skills necessary is a formidable task in itself. Few professionals are fully trained in these complex and interrelated issues; this chapter delineates some of these issues and provides some assistance.

Project Management and Organization

Project management is a complex process that includes effective control of quality, budget, and schedule. The process encompasses a diverse set of tasks ranging from initial programming, budgeting, and schedule development to project commissioning, final closeout, occupancy, and beyond. The project manager serves as the agent for the owner, who coordinates the project team and renders decisions consistent with the predetermined project objectives.

We tend to define the term project manager as a single person. In many large institutions, the project management process embodies several individuals and/or departments. This is certainly a logical approach, as the knowledge and skills required for the programming, design, and budgeting phases are different than those required in the construction phase. In these cases it is crucial that the management is carefully meshed so that all the dots between the initiation of a project and its completion are, in fact, connected; this is more easily said than done.

Where the project manager is placed in the organizational structure plays an important role in determining both the focus and effectiveness of the manager. From a pure project management point of view, there are strong advantages to having one person continuously and solely in charge of a project from cradle to grave. This is typically not possible in large organizations where the quantity of work requires many people and managing the process frequently leads to several discrete or
somewhat independent departments.

There are many organizational structures, each containing some inherent benefits and concerns. Though this simplifies things, we list below several basic approaches:

A. The Planning and Design Department: This department typically focuses on the program development, planning, and design aspects of the project. The project is then turned over to a capital projects construction office at the construction phase. Many of the issues faced directly by this office are discussed in detail in the Chapter on Design Management, which focuses on design issues.

B. The Capital Projects Construction Department: This department typically takes management responsibility for the project upon completion of construction documents and handles bidding, contractor selection, and construction coordination. The issues faced in this office and the various construction delivery methods are discussed in the Chapter on Construction Management, which focuses on construction issues and construction delivery methods.

C. The Physical Facilities and Maintenance Department: This department frequently has responsibility for the operation and maintenance of the physical facilities. In many smaller institutions, this department contains a division that deals with the responsibilities of A and B, above. The focus of these organizations tends to be on the operating and maintenance issues that drive the majority of their workload, sometimes at the expense of planning and design.

D. The Independent Planning Office: Because of the inherent problems in Organization C, an initial planning and design effort is done by a smaller group that reports directly to a president or provost, outside the business administration side of the university. This office can focus on the design issues, which may not be achievable in Organization C, but perhaps it loses some effectiveness as a result of being somewhat removed from the realities of day-to-day operations that prove to be so central to Organization C’s temperament.

E. The VP or Associate VP for all Physical Facility Matters: Organizations A, B, C, and D can be combined in almost any combination, and typically are the responsibility of the chief business officer of the university. Since business vice presidents are human (for the most part), they sometimes tire of adjudicating the inevitable conflicts between organizations A, B, C, and D and so establish a supermanager to coordinate all facilities efforts. This does not fundamentally change Organizations A, B, C, and D, but is intended to bring them all under the supervision of an individual who is both more familiar and more sympathetic with the complex issues involved than is the business officer.

The issue of how to organize these departments and the various pros and cons of each are well beyond the scope of this chapter, but we point out the different basic management approaches for two reasons. First, doing so vividly demonstrates the wide range of skills and areas of concern that are inherent in planning, designing, constructing, and maintaining facilities. A project manager does not need to be skilled in all areas; indeed, being overly skilled or concerned with one area may weaken his or her role as project manager if he or she tends to focus on design or technical issues rather than the whole. It is essential for the project manager to be aware of and sensitive to the broad range of concerns that have to be balanced.

A second reason to consider these organizational issues is to understand that where a project manager fits into the overall organizational structure has a major impact on how effective he or she can be. The project manager’s concerns are going to be a reflection of the department out of which he or she operates. When projects are managed across departments, the transitions will focus on the responsibilities of each department. If those transitions are not carefully handled and each department does not truly understand and empathize with the other departments, the project will suffer.

Regardless of how it is organized, effective project management is crucial to the delivery of successful projects that fulfill the essential requirements of the building program. Furthermore,
effective project management enables project participants to contribute without being engulfed in constant crisis management—the nemesis of design professionals, owners, and facilities administrators.

**Characteristics of Project Managers**

A skilled project manager is required to manage all projects, regardless of size. However, the skills that successful project managers require are not always ingrained in professional designers. Most talented designers display little ability or interest in the business of project management; often the best technicians become project managers by virtue of their proven ability in a selected area of expertise. However, the best technicians may make the poorest project managers, as they have a tendency to focus on those technical aspects of a project that present the greatest interest to them. This misplaced focus may be contrary to the broader project needs.

The most important characteristics of an effective project manager are a combination of education and experience. Project managers must possess strong organizational ability that will allow them to recognize and organize the disparate aspects of a project and to give structure to the project team, the process to be performed, and the many details that arise. The breadth of disciplines a project manager must deal with throughout the course of a project demands an individual who is experienced in handling a variety of unanticipated situations—a true generalist. An effective project manager must be an excellent communicator and must possess the insight required to examine the broad scope of a user's needs without becoming handcuffed by details.

Successful project managers are also competent and knowledgeable leaders with high ethical standards who have the confidence to delegate but understand that accountability cannot be delegated. They are decision managers who ensure that the right decisions are made by the proper persons, at the right time.

**Recruiting an Effective Project Manager**

Most of the qualities and characteristics of a successful project manager center around the ability to work effectively with people, rather than technical capabilities. Although they must possess basic technical skills, overemphasis on these will not necessarily result in a good project manager. Project managers are people managers; they must possess good interpersonal skills and know how to direct, motivate, and manage the project team, users, contractors, and the campus and community constituencies with whom they interact. The skills of project managers reviewed above are not taught but are gained through experience. Although it is difficult to find someone with all the preferred attributes, qualified individuals may be recruited from local or regional design firms, industry, or the contracting community.

If an institution has a small staff or is just entering a period of major expansion, it is often wise to recruit one knowledgeable manager to be at the center of the program. This individual can provide invaluable assistance by establishing the project management system to be implemented, training younger or inexperienced staff members, and serving as a technical and managerial resource. Whatever the institution's needs, the emphasis should be on finding a good manager with broad technical knowledge, not just a technical design expert.

**Project Team: Roles and Responsibilities**

Designing and constructing a project is a major task that requires the involvement of many different players. It is critical that the process be led effectively by all participants of each appropriate team. Chapters Design Management and Construction Management address design issues and construction delivery models. Regardless of the contractual relationships, the three key participants who are
responsible for all aspects of the project are the owner, the architect, and the contractor. (For discussion purposes, we will use those three terms exclusively though they may, depending on the type of project, be called something different; for example, depending on the type of project, the architect’s role could be filled by an engineer, a planner, or a landscape architect, and the contractor’s role could be filled by a construction manager.) The relationship of these three has been frequently described as a three-legged stool, with the metaphor clearly depicting the need for each of these individuals to fulfill their roles and effectively lead their respective organizations. An open and professional relationship among them is essential to take full advantage of their respective skills and obtain a successful outcome. The roles of each may be briefly described as follows:

- **The Owner:** The owner provides the program to be accommodated, establishes objectives, hires the architect and contractor, and provides the financial resources. The owner may sometimes provide additional consultants or expertise to help define and shape the building program. The owner is ultimately responsible for making decisions and ensuring that the architect and contractor are performing appropriately and efficiently. It is imperative that the owner have a clear line of authority, and it must be invested in by the project manager. Few things are more detrimental to a project than confusion stemming from conflicting directives given to the architect or contractor. It is not unusual for such directives to come from someone more highly placed in the Institution—a dean, vice president, president. The project manager must be involved in all decisions and serve as a single line of communication for all owner directives and decisions.

- **The Architect:** The architectural team consists of the architect and a host of consultants dealing with building engineering—civil, structural, mechanical, and electrical. In addition, he or she may be responsible for coordinating the efforts of specialized consultants who may deal with unique issues such as acoustics, lighting, display, conservation, and environmental aspects. The architect is responsible for his or her own performance as well as for that of the consultants. It is critical that the individual leading the architect’s effort—usually called the project architect—serve as a single line of communication for his or her team.

- **The Contractor:** The contractor is responsible for all phases of the construction and bears the primary responsibility for all of the ways and means of construction, site safety, the performance of all subcontractors, maintaining the project schedule and budget, and tracking any changes that may require additional funding. It is critical that the individual leading the contractors—typically called the project manager—serve as a single line of communication for his or her team.

As noted above, other chapters deal with some of the intricacies of contractual relationships and the design process. What we wish to emphasize here, in the clearest way possible, is that the efforts of the three key team members must be led clearly and effectively by a single person. Of course, many others will contribute to and participate in the process, and sometimes decisions will be reached without all members present, but it is imperative that these three individuals communicate directly and continuously and lead their respective organizations effectively.

### Managing the Project

Managing a major project is a daunting task. Starting with the earliest discussion of the program needs through ongoing occupancy, the project manager must deal with a diverse range of issues and a complex array of processes. Planning, design, construction, and occupancy will involve a host of characters with differing objectives which must be reconciled—and when reconciliation is not possible, coordinated and resolved. A certain amount of frustration is inherent in the process. The process requires a person who can manage to see the forest while dealing directly and effectively with all the trees.
Project Purpose and Developing a Building Program

The initial project program defines what is required of the project in terms of meeting user needs, space requirements, building functions, systems, and desired features. The accuracy and credibility of the initial project program is essential, since this descriptive information forms the basis for activities to follow. These activities may include selling the need for the project to governing boards or legislative bodies, influencing the method of financing, and instructing the design team regarding the design intent of the facility. The initial project program takes shape early in the process and drives all other aspects of the project throughout its course. Without restricting necessary and sometimes far-reaching creative thinking, the project manager guides the process by providing realistic assessments of the developing program with respect to its ability to meet the documented needs.

One of the most difficult and challenging issues facing the project manager is helping to clarify and define the purpose of the project. It is also one of the most important issues, and one in which a truly effective project manager can help his or her institution to use its resources wisely.

Within educational institutions, there is a broad streak of democracy, and the educators, though thoroughly knowledgeable in their respective disciplines, may have inaccurate or misguided views of their spatial needs. Adding a physical solution or granting a request for a specific space is not necessarily the best way to meet every need. Concepts of solving space requests with operational suggestions or the idea of sharing spaces are typically greeted with cries of horror. But, in the end, academics are typically not responsible for funding their project and rarely have sufficient financial incentives to voluntarily pare back space requests. On the other hand, they are intelligent, generally rational, and quite frequently open to suggestions about innovative ways to meet their fundamental purposes.

As in all human endeavors, sorting out what people want from what they truly need is difficult. Some universities have institutional planning and research offices that try to quantify needs for space. Frequently, the design team will include a programming expert or a consultant who specializes in institutional analysis and space utilization. The architect and his or her consultants can be very effective at helping to balance academic wish lists—by thinking outside the box, referring to other successful efforts, applying some measurable standards, and so forth.

While this is one of the more subjective and challenging roles project managers play, they should fully realize and relish their role in helping to define the fundamental purposes to be accommodated and arriving at a mutually beneficial building program.

Program/Scope Management

As the design team begins to explore the project through the schematic and preliminary design phases, unforeseen or expanded program needs develop. This "program creep" creates pressure on both the project budget and the schedule. The project manager must avoid or appropriately respond to program creep or the resulting unintended, expanded program will no longer match the original project budget.

The design team should compare the project program to the original intent at each review stage. The designer should deviate from the original program and budget only when authorized by the project manager. The project manager should make sure the design team identifies the need for additional compensation at the time each program change occurs.

The project manager must also control the project scope. Many designers complain that their clients "nickel and dime" them to death with minor requests that accumulate or expand as the project progresses. The project manager must demand that the designer highlight any additional services requested as soon as they are requested or at least at each project review stage. The designer
deserves fair compensation for all work performed, but there is no reason to allow unrecorded additional services to be an issue at the end of the project.

**Managing the Users' Expectations**

Establishing and maintaining realistic user expectations is important. This task should be tackled as soon as the design firm has been selected and must be effectively managed throughout the course of the project. Establishing realistic expectations involves educating users so that they understand that the project will consist of a complex series of interrelated alternatives, choices, and trade-offs, and that the end result will not be perfect. This somewhat negative disclosure must be presented in a positive and constructive manner to avoid alienating the users.

At the initial design session the project manager, the users, and the design team should discuss and mutually agree on a list of elements that will define a successful project. Next, failures that will determine the project to be unsuccessful should be listed. The successful-project list consists of the desirable goals that can be tracked throughout the project. All of these goals need not be completely satisfied to have a successful project. The unsuccessful-project list represents the real critical objectives for the project. If any of these objectives are not met, the project is not successful.

It is imperative that the list of project expectations be phrased in a quantitative, not a qualitative manner. For example, a "highly flexible building design" is a qualitative objective, whereas "the ability to increase the amount of fume hoods by 20 percent without requiring modifications to the building mechanical system" is a quantitative objective. This technique allows the design team to comprehend what is needed and ensures that expectations are reasonable. The stated expectations should cover all important project elements, including budget, schedule, and design considerations.

Managing the users' expectations through the course of the project requires constant vigilance. Users might expect a "highly flexible" science building to be one in which space can be quickly converted from, for example, housing a physics laser experiment to housing a full chemistry research laboratory at little or no cost. The users must understand that "flexibility" has not only a first cost, but also a follow-up cost when the flexibility is actually exercised.

The users should be reminded that the budget affects the quality of the end product, and the quality of the end product affects the budget. An effective way to deal with these expectations is to provide a design basis document. This document is prepared by the design team and records the parameters under which the building was designed and within which it can be expected to function properly. It further forms the basis for informed decision making as the building is operated, maintained, and modified throughout its useful life.

**Budget and Schedule**

Is it on time? Is it in budget? These two questions are probably asked by university business officers more often than all other questions combined, much to the chagrin of project managers who are laboring to build a university program uniquely suited to its purpose and that will be an enduring treasure for the campus. But, they are indeed fundamental questions, and questions generally thought to be completely objective. They comprise the most common complaints levied against architects and contractors.

They are also typical questions that prospective architects and contractors are asked in the interview phase. Are your projects on time? Are they in budget? The answers are almost invariably yes and yes. (You very rarely hear a contractor say, "I may be slow, but I’m expensive." ) So how do you reconcile the difference between these two worlds?
Well, first, you might say that almost every project is indeed on time and within budget—perhaps not close to the original budget and schedule, but fully meeting the final ones. After all, unless the contractor was fired, or just didn’t finish at all, the project was completed within the schedule. The same holds for budget: The owner may have paid significantly more than anticipated, but unless the owner went bankrupt or sued, there was a final budget that paid all the bills.

Of course, that’s a glib analysis. But there is some underlying truth there: Which budget? Which schedule? The truth is, projects frequently get started with budgets and schedules that are simply unrealistic. The budget may have been worked out based on a very preliminary program, using net square feet and gross square feet numbers that are not achievable for the desired program, or unit square foot prices inappropriate for that site or building configuration. The same occurs with the schedule.

The pressures on the project manager to produce a budget and schedule very early in the process are enormous. And once those are set—regardless of how many caveats and qualifiers are used—it is difficult to modify them. One of the primary causes underlying difficult or failed projects is the early establishment of project budgets that are too low.

**Establishing the Project Budget**

The establishment of a project budget is a major challenge. Everyone can agree on the importance of developing a budget that is realistic and appropriate, but exactly when that can best be accomplished in the process is subject to debate. The project manager’s experience and comparisons of the project type with those of peer institutions can provide guidance. Yet every project has many particular factors, such as site conditions, utilities, institutional building standards, and phasing requirements, that will significantly affect costs. It is usually impossible to identify all those factors, let alone provide meaningful costs for them, before some design work is undertaken. Yet, a preliminary budget is typically a requirement of getting an approval to even start any design process. Frequently, getting agreement on the proposed building program can be accomplished only with the discipline of a cap imposed by a preliminary budget.

Total project costs are more than just the construction cost. It is critical that the project manager identify the comprehensive costs for the project. Such costs include architect and engineer fees, other consultants, furnishings and equipment, testing, moving expenses, insurance, internal institutional charges, and so forth. Major projects may include financing costs to cover cash flow. And it is critically important for there to be an owner’s contingency for unforeseen conditions that will be the owner’s responsibility. These costs can add 20 to 30 percent or more to the total project cost. Institutions vary widely in how they budget for these soft costs, so it is critical that the project manager establish a budget that addresses how all the costs are to be met.

Despite the difficulties, establishing an appropriate project budget is one of the most critical tasks of the project manager. It should be recognized that establishing and maintaining a project budget is a reiterative process, with a preliminary budget subject to continual review and analysis as the project moves through the design and estimating phases. This is a part of the process that is difficult; the hierarchy of a university administration requires that budgets be established and maintained. Yet there is a reality to the process that must be faced. It is important for the project manager to establish a level of trust within the institution that can sustain this effort.

**Project Cost Control**

The owner, architect, and contractor share responsibilities for controlling costs. Each must assume responsibility for costs directly under their management, but there are contractual relationships that will affect all the costs for all three which must be clearly communicated.

The architect’s cost may be based on a lump sum, a percentage of construction cost, or on an hourly
basis. Standard American Institute of Architects (AIA) contracts require the identification of the consultants and specific tasks that fall under the architect’s basic services. The internal project design costs should be monitored by the designer to compare expenditures against the design fee budget. If the design firm cannot make a fair profit on the project, detrimental shortcuts may be employed to lessen the shortfall.

It is not unusual for any client to press the architect for services that go beyond what the architect considers the basic services. The project manager should stress at the outset that any request by any member of the project team that will result in fees for additional services must be approved in writing before that work is undertaken. It is not the owner’s responsibility to determine whether the architect is spending more time than allocated at any stage of the project. It is frequently the case that the architect has accommodated a host of incremental requests or services from the owner and discovers after the fact that the architect has expended significantly more time than allotted. It is always difficult to assess these services after they have been performed; under certain circumstances the owner may elect to compensate the architect for such work. Standard AIA contracts include language that defines when an architect is entitled to charge for additional services, and architects frequently consider this to be sufficient authorization. It should be emphasized that the architect is responsible for managing his or her budget, and the work should be explicitly approved before the architect undertakes work that he or she considers to be an additional service.

The owner or contractor can cause the architect to perform additional work for which he or she is legitimately entitled to more compensation. Delays in reaching or communicating decisions can add to the designer's time spent on any phase of the project. If a project must be put on hold, additional compensation may also be appropriate for stopping and remobilizing at some future date. Unreasonable requests from the contractor can include excessive requests for evaluations or information, repeated inspections, and resubmission of shop drawings, and can cause the architect to incur unanticipated expense. There are sections in standard AIA contracts to address these issues, but ultimately the process relies on open and ongoing communication between the owner, architect, and contractor to avoid "after the fact" expenses.

The contractor assumes responsibility for the construction budget. The construction contract may take many forms: lump sum, cost of the work plus a fee, or construction manager with or without a guaranteed maximum price; alternative delivery methods are discussed in the chapter on Project Delivery. Regardless of the type of construction contract, the contractor must keep a running tabulation of the project budget that includes the original agreement amount, approved changes to date, and all pending changes. The owner should require a log that tracks all requests for information or evaluation of alternative prices with estimated cost impacts for any pending changes.

Change orders are anathema to most project managers. But a certain amount of change is inevitable, and there are good changes that can accommodate changed conditions or take advantage of unforeseen opportunities. Regardless of the reason, the project manager, architect, and contractor need to work together to make sure an orderly evaluation and tracking process is in place so that changes can be implemented in a timely and effective way.

The project manager must be fully informed of the budget for both the design and construction phases as well as all of the associated owner’s costs for which project funds will be expended. The project manager must clearly track all direct owner costs and the project contingency. There may be advantages for the owner to contract for some built-in items directly; these can include some built-in equipment such as carpeting, audiovisual systems, and fixed seating. There are implications to these items, such as taxes, warranties, and responsibility for damages, that should be carefully analyzed before proceeding. The architect and contractor can be valuable allies in assessing the best way to deal with some of these items.

Establishing the Project Schedule
The project schedule is continuously influenced by changes in the project program or budget. Therefore, the project manager should develop the project schedule only after the project program and budget have been developed to a point where reasonable scheduling assumptions can be made.

**Project Schedule Control**

The project manager must track the project schedule at each project stage. The design firm's schedule should provide for detailed planning of work activities and communicate critical dates and activities to the owner as well as the internal design team. The schedule becomes a useful method for monitoring percentage of project completion, offers milestones for all involved, and can make meeting deadlines a real possibility.

The design schedule is usually defined in terms of the design phases to be accomplished, such as schematics, preliminaries, design development, construction documents, and bidding. The information on the schedule will vary from a list of activities to be accomplished to specific time frames, sequences, and individuals responsible. Many computer scheduling programs are available, but care must be taken not to make the schedule overly complicated. The schedule is a communication tool that must be clearly presented and easily understood to achieve its primary purpose. Therefore, the scheduling method and detail level must be properly matched to the size of the project.

Many scheduling methods exist, and each has its advantages and disadvantages. One of the simplest methods is the milestone chart. In its most basic form, this method consists of identifying a target completion date for each activity or phase. For short projects with few participants, milestone charts work well.

The Gantt chart (or bar chart) offers a slightly more complex scheduling method and overcomes some of the drawbacks of the milestone chart. The Gantt chart, a widely used scheduling tool among design professionals, presents a list of tasks along the left side of the chart with horizontal bars indicating scheduled start and finish dates for each task. However, bar charts do not differentiate the importance of one task over another or indicate the interrelationship among various tasks or which activities are crucial for completing the entire project on schedule. Even considering these apparent drawbacks, bar charts remain an effective scheduling method for projects of medium complexity.

For large, complex projects, the critical path method may be used. This method is a form of network scheduling. It is a highly mathematical system in which task interrelationships are defined, durations assigned, and task schedules analyzed. The system calculates the earliest and latest time an event can take place without affecting the completion of the project. This difference between the earliest and latest time an event can occur is called *slack time*. The critical path is the series of activities and events that have no slack time. The time required for noncritical tasks becomes irrelevant from the standpoint of total project time. Therefore, only by shortening the time for a task on the critical path can the overall project time be reduced.

None of the available scheduling methods is a panacea for ineffective project management. The project manager should make it the design firm's responsibility to present the updated project schedule at each project design meeting and to recommend necessary adjustments to keep the project on track.

**Contract Management**

**Design Team Selection**
The project manager is responsible for coordinating the selection of the project consultant. These duties include developing a list of qualified firms to be considered, coordinating building selection committee meetings, coordinating communications with consultants throughout the interview process, and providing committee members with inside information about potential consultants. This role of providing information about firms can significantly influence the selection process in a positive way and is advised when there is a lay selection committee.

**Scope of Services and Fee Negotiation**

Another important project management responsibility is preparing the proposed scope of services and negotiating an appropriate fee for the delivery of those services. The proposed scope defines what design services are necessary to achieve the project program and is used as the basis for negotiating the contractual scope and professional services fee.

An excellent method for determining the required scope of services is to analyze the activities needed to complete the project. Working from a detailed list of standard and additional project services will help ensure that a comprehensive proposed scope of services is developed.

The AIA provides helpful tools for developing the scope of services. AIA Form F860, “Phase/Service Matrix,” and AIA Form B162, “Schedule of Designated Services Worksheet,” are both useful in developing scope of services (Figures 57-1 and 57-2 on those forms).

The developed list of activities can be reviewed and a determination made as to services for which the design firm will be responsible and any services that may be performed more efficiently by in-house personnel. However, caution should be exercised if in-house personnel are to be used. Because of project complexities, schedules, and in-house workloads, staff may not respond in a timely manner to project issues, and apparent efficiencies gained by using in-house staff may evaporate and result in a contract or schedule dispute.

The delivery of the best possible final product will depend heavily on the services provided throughout the course of the project and the appropriateness of the fee paid for those services. Therefore, even if a project is managed by a state agency, the project manager representing the institution should influence the scope of services as well as the design fee.

Staff from state agencies may not be sensitive to institution issues and complexities, and the institutional representative will have to ensure that all issues are appropriately addressed. Areas that are sometimes targets for fee reductions include predesign and site analysis services, design team travel, value engineering, building commissioning, and site inspection visits. However, these services are essential for a successful project and should be included in the project scope.

**Design Errors**

The design profession appropriately engages in some experimentation with the use of new technologies and processes. This is necessary to prevent stagnation and the decline of creativity. Unfortunately, new and innovative ideas sometimes produce unsuccessful results, which lead to design errors.

There are several types of design errors. Simple mistakes are confined to a single building element, ambiguities in the contract documents, and details that are unworkable. Major errors are of significant financial magnitude, such as failure of a building exterior envelope owing to incorrectly specified mortar mix. Major errors can take years to manifest and are very costly to rectify. The owner's project manager can best protect the owner's interests by verifying in the interview stage and confirming throughout the project that the design firm employs a systematic and thorough approach to quality control and coordination among disciplines. By the time design errors become apparent in the course of construction, it may well be too late to avoid a lengthy and costly solution.
Disputes

Disputes should be prevented if at all possible. Open communication with all parties is the best way to prevent disputes. If a dispute does occur, it should be approached with honesty, integrity, and an earnest desire for settlement.

Owner-architect disputes can arise during the design phase as a result of ineffective management of the program, change in scope of services, project schedule, project budget, or user's expectations. Complaints during construction may be the result of inadequate contract administration, including construction observation and verification. A clear, thorough, well-managed design contract that specifies a full range of services should help prevent conflict.

Project Review and Approval

Formal project design reviews should be established and delineated on the project schedule. These formal reviews should be required before proceeding to the next design phase. The number and timing of the reviews will be determined by the size and scope of the project. A small project may require review only at the end of preliminary design and at the completion of construction documents, whereas a large project may require extensive review at the completion of each design phase.

It is the project manager's responsibility to ensure that the appropriate participants take an active role in each review. The list of appropriate participants may vary as the project progresses and may include user group representatives, facilities planning and management personnel, project planning committee members, and architectural or engineering personnel from a state agency. In some instances it may be advantageous to include local building, zoning, health, fire, or historic preservation officials in some aspect of the review process.

The specific method of review may vary by project, by phase, or in accordance with the time available. Review documents may be provided to each participant for independent study, or a single set may be circulated for sequential review. The sequential method presents the advantage of cumulative thinking while reducing redundant comments, but it requires significantly more time. Independent review requires a greater number of review sets and may result in redundancies, but can be accomplished more quickly. One often successful review technique involves a collaborative review by all members of the project team at the design firm’s offices. This method allows the owner's review representatives to complete their review without the normal workday interruptions, in a location where the design team has immediate access to all of the project data. This process is also conducive to addressing problems that may arise. However the review is accomplished, all pertinent comments should be meticulously compiled onto two record sets of documents: one for the design team and one for the owner.

For large projects, the services of an independent review consultant may be beneficial. Consultants specializing in independent contract document review can provide a valuable second opinion relative to code compliance, constructability, coordination among contract documents, and legal pitfalls contained in specifications. Similarly, when contract documents are nearing completion, some municipal building code authorities may provide a helpful preliminary plan check for a fee.

Each formal design review should include several areas of focus. The project should be examined for compliance with the required program and space utilization guidelines. It should be reviewed for technical correctness in all areas, including architectural, structural, civil, mechanical, plumbing, electrical, and code compliance areas. Review for compliance with established in-house construction standards, environmental regulations, zoning requirements, Americans with Disabilities Act requirements, and even reprographics standards should also be performed.

The project review should always include a review of the updated project schedule and projected
construction cost. If the design team is being used to help monitor the overall project budget, then
the budget should also be examined. Any cost or schedule discrepancies must be addressed, and any
change in scope of services should be reviewed.

The final project review must also include an assurance from the design team that the projected
construction cost is expected to be within the budget. It may be appropriate to introduce alternates in
the bidding process to ensure that the base project is within budget. Care should be exercised when
selecting alternates. Usually no more than two to three alternates are appropriate, as an extensive list
complicates the bidding and contract award process.

Alternates are an effective budget protecting tool. They may be deductive or additive. Additive
alternates are usually preferred, as contractors may limit their overhead and profit charged, whereas
contractors rarely give overhead and profit credit on deductive alternates. It is also important not to
mix additive and deductive alternates in one bid package. Contract awards containing mixed
alternates can become very complicated.

The acceptance of alternates out of order can make contract award difficult, particularly if the
selection of alternates changes the successful bidder. Therefore, it is recommended that alternates be
prioritized before bidding and accepted in the order listed.

**Project Management Responsibilities During Construction**

**Maintaining Continuity**

The project manager provides continuity from the design phase into the construction phase. Project
managers can help ensure that the original project intent is enforced if they are involved during the
project construction. Without their project knowledge, seemingly innocuous decisions made during
construction can drastically change the long-term functionality of the facility. Even though actual
daily onsite inspection responsibilities may be delegated to another individual, the project manager
either should be directly involved in overseeing project construction or should at least review all
project changes. In this capacity, the project manager should also protect the users' expectations by
explaining the construction process and updating the project progress to the users.

Partnering is a structured process that focuses on developing a team of stakeholders united by a
common mission and project objectives. The partnering process is designed to assist all parties in
preventing disputes and instilling a spirit of cooperation among the owner, consultant, contractor,
and subcontractors. Readers interested in knowing more about partnering are referred to the chapter
**Project Delivery**.

**Construction Change Orders**

Projects are rarely completed without the necessity of making several changes during the course of
construction. It is the project manager's responsibility to review all change order requests to
determine their validity, cost, and possible impact on budget, schedule, and the final product. In
reviewing the change order request, the project manager should consider the information provided
by the contractor and the interpretation and judgment of the design firm. The project manager is the
owner's representative and should have the authority to approve or deny a change request.

The project manager must maintain an accurate list of the status of all change requests in progress
and must not allow any requests to languish. Most standard contract forms require the contractor to
obtain an approved change order prior to executing any change in the work. However, many times
the change must occur when the need for the change is discovered to avoid further impacts on the
project schedule or budget. Therefore, the final approval of many change orders actually follows the
completion of the work described in the change order. Such after-the-fact dealings can unfairly
increase the owner's leverage in negotiating the cost of a change. Therefore, it is the project manager's responsibility to maintain the integrity of the owner-contractor relationship by ensuring the timely and fair resolution of all change requests.

Reporting, Documentation, and Communication

Many project management activities during construction administration require detailed procedures that outline the steps to be followed and document routing and approval methods. To avoid costly oversights, standard documents and checklists should be consolidated into a construction procedures manual. Typical items and forms covered in the manual should include the following:

- Advertisements for bids
- Builders or plans exchange list
- Prebid conference agenda
- Addenda
- Bid opening procedure
- Notice to proceed
- Notice of return of bid bond
- Contract award letter
- Preconstruction conference agenda
- Applications for building and zoning permits
- Notifications to local utilities
- Field reports
- Field directives
- Change order status sheet
- Shop drawing status sheet
- Application and certification for payment
- Closeout punch list form
- Substantial completion form

The form and content of many of these documents may be dictated by state laws or the administrative procedures of a state architecture and engineering agency. However, if latitude exists, these contracts should be based on standard forms provided by organizations such as the AIA or the National Society for Professional Engineers.

Accounting for capital projects presents unique challenges. Because contracts are written that cover long time spans and have multiple invoices, the university’s basic accounting system, which deals with purchase orders, will not work well for the complex records required. The complexity of the accounting records that a project manager must track is daunting, including construction and designer contracts, change orders, additional services, an array of consultants, and furniture and equipment.

University accounting systems typically include capital accounting modules, which may allow for the variety of contracting and invoicing procedures that will be required. But they rarely track all the detailed accounting information the project manager will be required to maintain. Because of the complexity of the records, it is typical for project managers to keep their own financial records, which supplement the university accounting system. It is imperative that the project manager thoroughly understand how all financial records are to be maintained and review the procedures with the appropriate accounting, purchasing, and internal control departments.
Project Management Alternatives

The In-House Project Manager

As evidenced by the previously enumerated responsibilities of the owner's project manager, there is truly no way to completely delegate the ultimate authority for the project budget, schedule, and functional design requirements to an outside source. Even if such an attempt is made, the residual right to override decisions made by the contracted project manager remains with the institution, resulting in the awkward situation of delegating responsibilities but not the corresponding authority. Any significant imbalance in the responsibility/authority equation will seriously impair decision-making ability. Therefore, the owner must exercise some level of project management responsibility for every project.

Contracting Project Management Services

The goal of contracting project management services is to enhance the owner's success by securing proactive management of the project. Contracting for project management is usually considered when the owner does not have the staff to manage the project.

Many architectural design firms profess to offer full project management services. These services may include the following:

- Project overview management
- Budget and cost control
- Schedule control
- Site evaluation and selection
- Utility and permit coordination
- Coordination of multiple architects/engineers and contractors
- Value engineering analyses
- Construction delivery process evaluation
- Contractor bidding, negotiation, and selection
- Problem identification, analysis, and resolution
- Building diagnostics
- Acquisition and management of supplemental services
- Monitoring unit cost contracts
- Partnering development and training
- Dispute resolution
- Occupancy planning and logistics
- Commissioning

When parties are contracting for project management services, the project management responsibilities, expectations, and limits of authority should be clearly defined and understood by both parties. The owner usually expects one individual from the contracted firm to remain with the project on a daily basis through completion of construction and final occupancy. However, it is not unusual for the project manager to change between design and construction.

Many third-party professional consultants also provide contracted project management services. These consultants may present the advantage of working directly for the owner in a manner that facilitates the traditional owner-architect relationship. A third-party consultant is removed from the architect-contractor relationship and is free to provide an independent assessment of all aspects of the project in a fashion similar to the in-house project manager.

Project Management by State Agencies

Some institutions must rely on a state architect/engineer (A/E) agency to provide project
management services. These relationships and division of responsibilities may vary from one state to another. Some states encourage collaboration between the institution's planning department and agency personnel, whereas in other states, A/E agencies have complete autonomy in the execution of their duties.

State agencies that manage college and university design and construction also manage many other state facilities' projects. Therefore, to protect an institution's interest, the institution's project manager should be involved in the process and provide pertinent, practical, and timely information to the state agency.

There are advantages and disadvantages to direct management of design and construction at the institutional level. Direct responsibility allows the institution to expedite the project, to work more closely with the design consultants and the contractor, and to control the funds locally. However, the institution must also accept the risks inherent in any construction project. These may include defense against lawsuits, complete financial responsibility for judgments against the institution, and construction claims and liabilities. In addition, delegated authority does not relieve the institution from complying with all state laws.

Learning More About Project Management

Project management is an evolving discipline. Architectural and engineering professions have only relatively recently begun to incorporate project management principles and techniques. However, several organizations and publications focus on the field of project management; some of these are listed in the References at the end of this chapter.

The Professional Services Management Association is a growing organization of design professionals whose interests lie in project management. The Project Management Institute is a general-purpose organization with members representing industry, government, and larger engineering and construction firms. Both organizations hold annual conferences, publish newsletters, and sponsor regional seminars. The AIA has published a series of three books, titled *Managing Architectural Projects*, directed toward the architectural consultant. These books contain helpful information relating to establishing effective project management practices. The AIA also offers professional development programs on project management, including seminars, short courses, and correspondence courses.

References


