

The Case for Contracted Project Management Services

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Project management, as a functional entity, is a comparatively new management concept. For many years, projects were simpler in complexity, the rate of technological change was slow, and replication of design was common. Project teams were small and there was no overall project management role, unless the owner performed it.

With the rapid emergence of new technologies, in the post World War II era, projects became more complex, often "one-of-a-kind" and involving multiple design and construction contractors. These organizational complexities necessitated that the activities of all of the project participants be carefully monitored and controlled. Execution of these broad, multifaceted projects, even when one contractor performed all functions, created the need for a new management approach. This need resulted in the emergence of a project management function.

Today's major civil infrastructure projects are characterized by their magnitude and complexity:

- They involve a wide variety of participants from both the public and private sectors, including national and local government agencies, design contractors, construction contractors, suppliers, lenders and community and public interest groups
- They cost hundreds of millions or billions of dollars
- They involve tens of thousands of workers
- They involve dozens of design contractors, materials and equipment suppliers and construction contractors

Examples include: the Korea High Speed Rail (KHSR) Project; the new Hong Kong airport and related major infrastructure;

extensive redevelopment work in a busy urban center for the Boston Central Artery and Ted Williams Tunnel projects; the Eurotunnel project between Great Britain and France; the Gerede to Ankara Motorway; the creation of an industrial city and ports in Jubail, and two major airport complexes in Saudi Arabia. Bechtel has provided contracted project management services for all of these "mega projects" and many others.

GOALS OF CONTRACTED PROJECT MANAGEMENT SERVICES

Project management is a highly coordinated team approach to planning, organizing, monitoring, and directing the design and construction of major projects. It involves developing and directing a cohesive but flexible team of professionals from engineering, procurement, construction, project controls, and related functions to achieve the project's goals. The goals for project success through effective project management include completing the project:

- Within the scheduled time requirements
- Within or below the budgeted cost
- At the proper performance and specification levels
- To the satisfaction of the owner
- With minimal, but mutually agreed upon, scope changes
- With minimal disruption to the public and the environment
- With successful technology transfer

Figure 1 illustrates the core processes of project management:

A project management contractor is a seamless extension of the Owner's

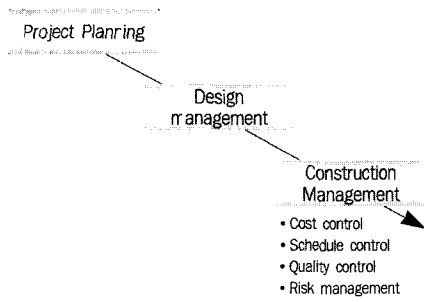


Figure 1 The Project Management Process

resources, augmenting its staff to extend its capabilities to the degree desired to meet the Owner's objectives for control and risk avoidance.

The project management contractor will provide experienced, qualified professionals to inform and advise the Owner with regard to the planning and execution of its project and to direct implementation of the Owner's decisions.

The Owner and the project management contractor (together with whatever other consultants the Owner may wish to include) form the project management team.

The basic organization concept for project management is illustrated in Figure 2. In this figure, the following functional distinctions are made:

- **Ownership Organization.** Regardless of the role the Owner plays in the management of a project, it has an inescapable responsibility for certain functions as Owner. In general, these involve:
 - Providing guidance and oversight to the project management organization
 - Providing interfaces with government, outside organizations and the public
 - Providing and being accountable for the project's financial resources
 - Ultimately, providing for operations and maintenance of the completed facility

- **Project Manager, Cost and Schedule Control and Quality Assurance Staffs.** The project manager, cost and schedule control, and quality assurance staff provide for the overall general management of the project to implement the Owner's objectives and policies. The project management organization:
 - Translates the Owner's objectives and policies into projects for implementation by execution contractors (design contractors; vendors and suppliers of Owner-provided materials, equipment and services; and construction contractors)
 - Provides an overall project control system, including project scope definition and implementation plan, contract packaging plan, milestone schedules, and cost estimates

- Coordinates among the functions of engineering, procurement and construction
- **Design Management Staff.** Design management involves the coordination and quality control of the design contractors, including assuring that the Owner's objectives and policies are incorporated into the designs. Considering the complex interrelationships among design elements and the sensitive balance between installed capital cost and operating and maintenance considerations, this is a particularly important function in most major projects.
- **Procurement Staff.** Procurement includes contracting for design and construction services, and purchase and delivery of Owner-provided materials, equipment and services. Procurement also provides the

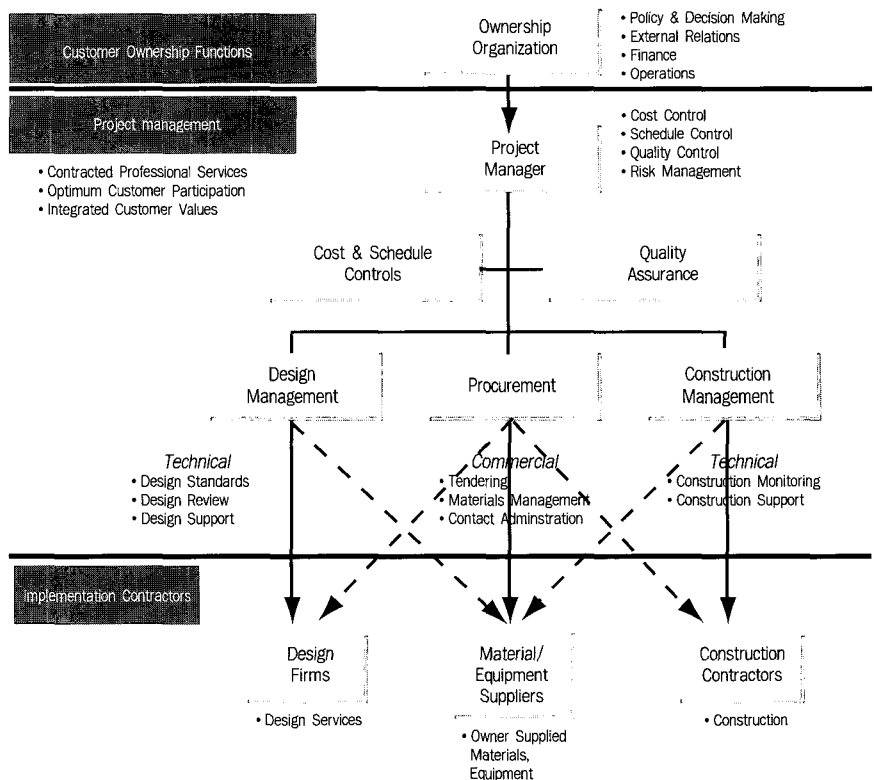


Figure 2 Project Management Organization Concept

commercial expertise for contract formation and administration.

- **Construction Management Staff.** Construction management involves the coordination and quality control of the construction contractors, including assuring that the Owner's objectives and policies are brought into physical reality, construction claims are minimized, and all required documentation for operations and maintenance is delivered.

IS PROJECT MANAGEMENT SUITABLE FOR DIFFERENT COUNTRIES?

The answer is yes! Bechtel appreciates that different management approaches are required for different customers in different cultures. Bechtel also understands that there are concerns that American style project management may not be appropriate worldwide.

Bechtel has been working throughout the world for several decades and has learned to adapt its project management style to many different cultures.

Even within the U.S., we recognize that the old "command-and-control" approach to management (at one time preferred by our customers) is no longer as effective as a consensus-building, cooperative, partnership approach. A partnership among the Owner, project management contractor, and design and construction contractors is more effective in achieving the Owner's objectives.

For several years, Bechtel has incorporated the concept of "partnering" into its project management work, both informally and formally. Partnering is defined as:

"The act of focusing on creative cooperation, avoiding adversarial confrontation, working on carefully building relationships based on respect, trust, and integrity, developing a win-win orientation towards problem solving, and fostering synergistic teamwork."

On recent projects in the United States, partnering has been implemented in the following three ways:

- A commitment by contractors to partnering is incorporated into project specifications
- Commitment to partnering is established with involved local government agencies
- The project manager makes a commitment to a full partnering process with an initial workshop and periodic evaluations

Bechtel adapts its project management to the culture of the country in which it is working. Teams work interactively, usually collocated, and there is a consistent effort to preserve local cultural traditions. This effort includes technology transfer. It is Bechtel's goal to transfer the skills and technology of project management to its customers, working itself out of a job. One current example is the KHSR Project.

The Korea High Speed Rail Construction Authority (KHRC) has adopted an Integrated Project Management Organization (IPMO) approach for management of the very large and complex Seoul-to-Pusan High Speed Rail Project. Bechtel experienced managers and specialists are integrated into the KHRC organization, combining the talents and expertise of the two companies. Bechtel staff are placed in the organization where

they can strategically have the greatest impact. Shared decision-making is accomplished through parallel positions at certain senior levels.

The concept of an integrated management organization to plan and execute a large complex project is not new. It is used in many global locations to unite two or more diverse business and ethnic cultures to maximize the effectiveness of the combined forces. There are notable success stories in the industry which were achieved by this method, which is one of the primary reasons that this approach continues to gain popularity in the industry. Technology transfer is a major effort in the IPMO from Bechtel to KHRC.

HOW BIG SHOULD A PROJECT MANAGEMENT ORGANIZATION BE?

The answer is that it depends on the situation. The size and functions of a project management organization will be determined by:

- The size, complexity, and geographic distribution of the work to be done
- The contracting strategy chosen
- The importance the Owner places on cost, schedule and quality control
- The Owner's attitude toward risk management.

Each function that is provided in a Project Management organization is designed to provide tangible benefits. Although benefits relate to productivity, improved schedule, and quality, they ultimately translate as cost savings and are identified as such.

Table 1 provides a list of project management functions and the benefits they provide.

Table 1 Functions of Project Management and their Benefits

Function	Cost-Savings Benefit
Quality Assurance/Quality Control - to assure designs, materials and construction meet the Owner's standards	Avoids rework and/or later excessive maintenance expense
Procurement - professional contracting and contract administration for design and construction services and Owner-supplied materials and equipment	Lower prices and avoiding disputes and claims
Design Review - to assure designs meet the Owner's standards and design firms maintain schedule	Avoids rework of design or construction work, avoids schedule delays
Design Support - to help design firms meet the Owner's standards and maintain schedule, on an as needed basis	Provides assistance to design firms to obtain resources necessary to meet project objectives; avoids rework of design or construction work or schedule delays
Materials Management - to assure the quality, economical and dependable delivery, and controlled distribution of purchased materials and equipment	Avoids rework and/or later maintenance expense due to inadequate quality, unnecessary expense and/or delays in delivery of purchased materials and equipment, and expense due to loss, vandalism or theft
Construction Progress Monitoring - to assure that construction contractors are maintaining schedules, faithfully following approved designs, and meeting Owner's standards	Avoids rework of construction or schedule delays
Construction Support - to help construction contractors meet the Owner's standards and maintain schedule, on an as needed basis	Provides assistance to contractors to obtain resources necessary to meet project objectives; avoids rework of construction work or schedule delays
Safety - to implement accident prevention projects	Reduces insurance cost
Security - to implement jobsite security projects	Avoids expense due to loss, vandalism, theft, or trespassing
Value Engineering - a professionally applied, function-oriented, systematic team approach used to analyze and improve value in a product, facility design, system or service	Identifies unnecessary project costs, reduces costs, and achieves the maximum benefit from every dollar spent.
Constructibility Analyses - construction specialists, cost estimators, schedulers, and engineers determine general construction feasibility of concept and construction planning to minimize the project critical path and constructed cost	Recommends modifications to design elements for cost or schedule improvements; considers practical construction aspects, such as contractor capabilities, logistics, cost and availability of labor, materials, and construction equipment
Operations & Maintenance Analyses - integrates O&M requirements into the planning and design processes	Improve efficiency of operations and maintenance, improves safety, and maximizes any revenue-generating potential
Public/Community Relations - to determine and assess public opinion toward the project and develop means of achieving community understanding and positive attitude	Anticipates and avoids adverse public opinion and serious opposition that could result in schedule delays and cost increases
Information/Automation Management - development and implementation of standards for communications and deliverables from all participants	Improves efficiency of communications, information transfer to operations, and efficiency of operations and maintenance; reduces document management costs
Finance & Accounting - drawdown of loans as needed, timely payment to suppliers, and hedging foreign exchange exposures	Reduced interest expense, reduced friction with suppliers, and reduced foreign exchange exposure

JUSTIFICATION FOR PROJECT MANAGEMENT COST

Owners throughout the world take different approaches to contracting for project management services depending upon their internal resources (the fewer they have, the more they contract for) and their

aversion to risk (the higher it is, the more they contract for). Thus the only available and meaningful yardstick for the evaluation of the reasonableness of the price of a contractor's project management services is the total cost of project management services for the project as a percent of the Total Installed Cost (TIC) for projects of similar complexity.

Therefore, the appropriateness of the proposed cost for contracted PM services must be evaluated in the context of the total cost of project management services for the project. This total cost of project management services can then be compared to the experience on other projects of similar complexity.

The standard definition of Total Installed

Project Management Cost as a Percentage of TIC Representative Projects

Project	TIC * 1 (US\$ millions)	PM * 2 (millions)	PM as % of TIC
BOSTON - Southwest Corridor (Orange Line)	751.0	69.1	9%
WASHINGTON, D.C. - Metro	5,386.0	460.3	9%
MIAMI - Metrorail	837.0	78.8	9%
BALTIMORE - Baltimore Metro	823.0	88.4	11%
BOSTON CA/TWT (highway)	10,800	1,169	11%
CHICAGO - Southwest Transit Project	388.0	43.3	11%
SAN FRANCISCO - BART	835.0	108.6	13%
ATLANTA - MARTA North/South Line	1,272.0	180.3	14%
Channel Tunnel Rail Link (London)	8,000	1,300	16%
VANCOUVER, CANADA	725.0	130.5	18%

Notes:

- * 1 : TIC = Total installed cost; includes all design, construction, and management costs. Excludes rolling stock costs.
- * 2 : PM = Project management; includes all PM costs; excludes all design and owners management costs.

Cost (TIC) includes:

- All design, construction and project management/construction management costs
- Contractor contingencies

It excludes:

- Development costs such as preparation of proposals, negotiations, etc.
- Escalation
- Interest during construction (IDC) and other financing costs

- Owner's costs (such as the cost of organizations similar to the Special Purpose Company (SPC))
- Owner's Contingencies

Following is a comparison of the estimated cost of project management for selected major transportation projects of a similar complexity. The data for the representative projects has been obtained from Bechtel's project experience, published data and other sources believed to be reliable.

PROJECT MANAGEMENT WILL MORE THAN PAY FOR ITSELF

A strong, integrated project management approach is highly effective in improving the predictability of project costs, schedule, and systems integration. The project management team will pay for itself in many ways, such as through value engineering, and cost savings resulting from joint cost, schedule, and quality control, constructibility analyses, and contract administration.

In Summary, the goal of project management is to minimize or reduce risks for the project. Project management provides the methodologies and organization approach to foster better planning and work execution. The leverage over project performance available from project management is enormous. The investment in quality project management services can readily be recovered in overall project cost and savings.