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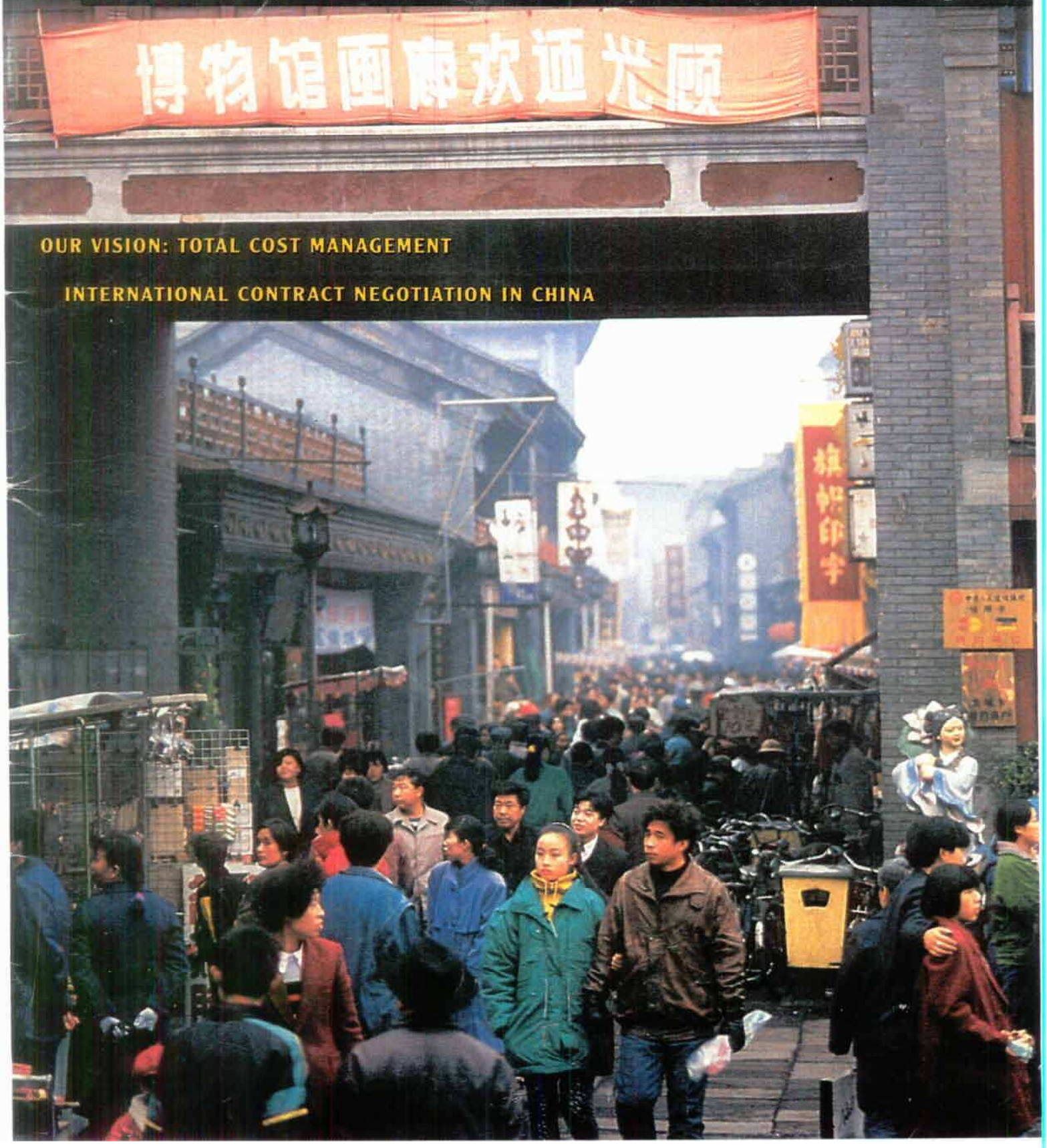

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Fast-Track Management for Projects with Multiple Sites

Sarwar A. Samad

This article discusses the application of fast-track management for projects with multiple sites and is based on the author's hands-on experience with actual projects. Fast tracking a project is when activities that are normally done in a series are performed in parallel [4]. It is written from the perspective of an owner and a major contractor. The organization, interfaces, and communication needed for fast-track management, project control systems, subcontracts, and construction management are discussed. In conclusion, the article summarizes all of the necessary conditions for fast-track management.

Organization

An organization is a group of people working together in a coordinated effort to attain a set of objectives [1]. One of the primary reasons for establishing an organizational structure is to establish lines of authority that enable management to exercise the necessary degree of control over the organization [1]. The purpose of any organizational structure is to define the channels of communication so tasks can be completed in an efficient manner. The organizational structure of the fast-track process may vary considerably depending on the size, type, and complexity of the project.

For the success of any program, it is important to integrate the various functional groups and the client into one functioning team. Individual loyalties and excessive authority must not be allowed to exist since they conflict with meeting the basic goals of a project. If not controlled, these problems can result in the inefficient execution of a project.

Figure 1 represents a combination of a project organization that has line authority over functional activities and a task force organization with personnel drawn temporarily from existing functional groups. Most organizations set up engineering and construction as two different departments managed separately by two managers. However, in fast-track projects, it is necessary to integrate engineering, construction, and installation into one organization for better control. This organization should be headed by a program manager who is an experienced engineer/manager, knowledgeable in all aspects of design, construction, and installation, and who has a strong cost/scheduling background.

In large organizations, there are many levels of management and many administrators whose time is increasingly spent interacting with top management in headquarters, which leaves less time to deal with the workforce. There is also continuing conflict about whether control of functions such as finance and procurement, hiring, funding approvals, etc., should be done at the head office or at a regional office. The program manager often gets caught in internal politics and approval cycles that hinder project effectiveness and progress. A special management approach is necessary to deal with such situations. For fast-track projects, it is vital that management think, act, and operate as a single integrated business unit, especially in today's business climate where partnerships and teams are being formed across organizations and companies. The program manager needs to have full authority and autonomy so that he or she can successfully complete the project.

The design organization should be based on a team concept. If the scope is heavy in civil work, then a civil engineer should lead a team of engineers from other disciplines. The design team is supported by other technical support staff. This organization is efficient and cost-effective. There is constant interfacing between different engineering disciplines, which is essential if there are scope changes. The construction and installation group in the field should closely interact with the design group to avoid change orders and to properly implement the design.

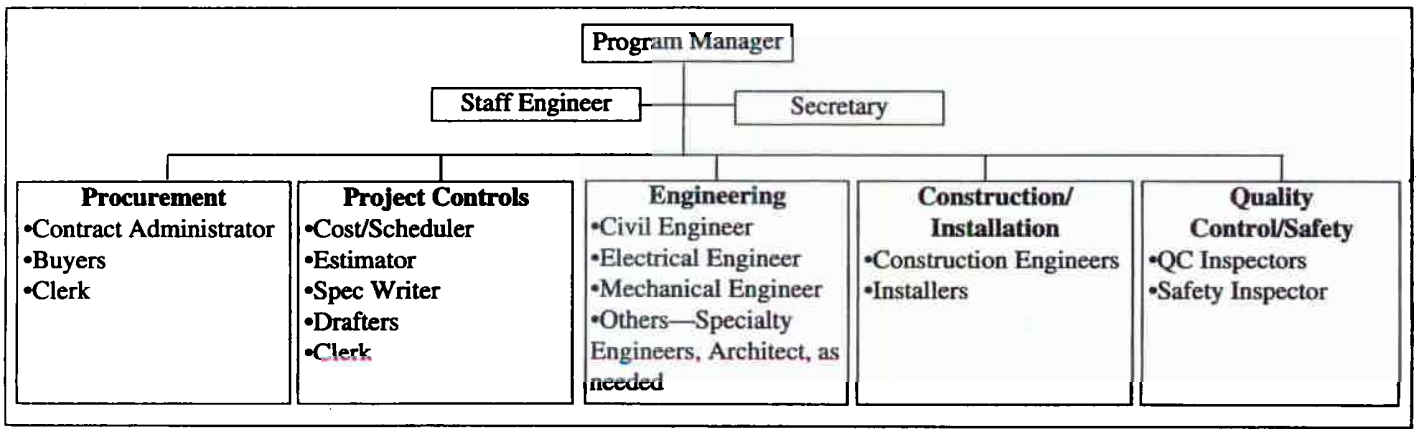

Figure 1—Fast-Track Organization

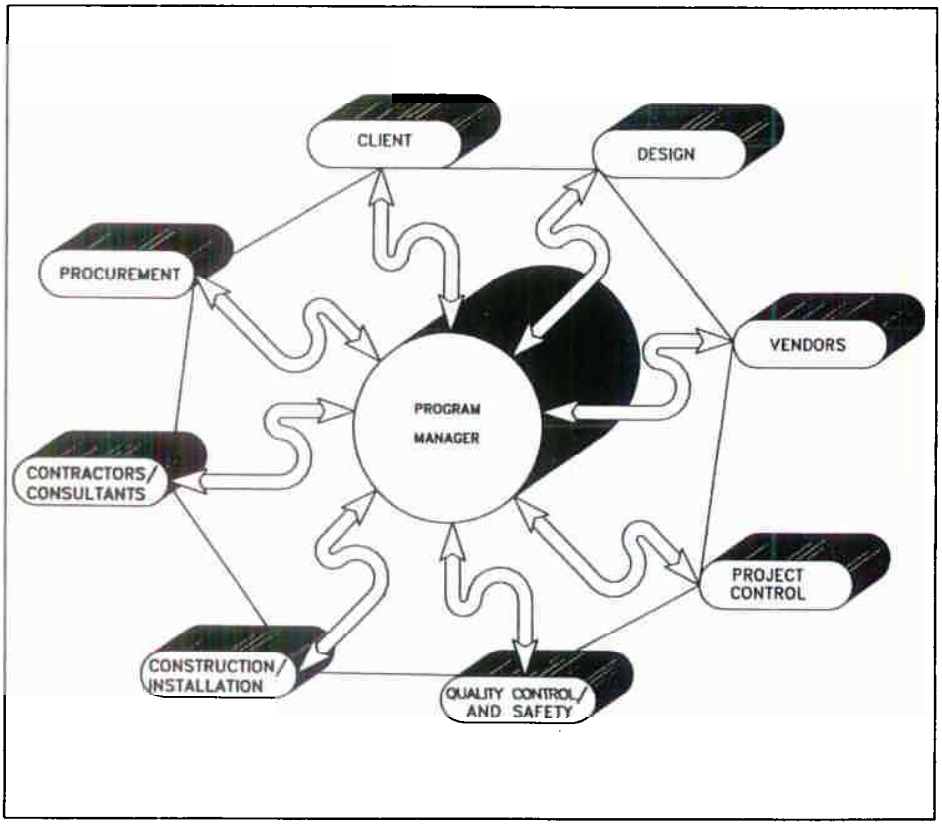

Figure 2—Program Management Interfaces

Program Management Interfaces

The program manager is the main communication link between the client, head office, the field, procurement, and other functions, as shown in figure 2.

Project Communications

Communication between clients and the various functions at every level of a project is vital, both to avoid misunderstandings and minimize disputes, and because good communication and working toward mutual goals aids in successful project completion.

Thorough documentation of all approvals and decisions, including a record of conversations, is a must. Effective project management, open communication, and timely resolution of disputes can avoid conflicts, litigation, and the need for any special workshops to train participants in conflict resolution. However, some organizations choose to train their personnel by conducting partnering workshops. The Construction Industry Institute defines partnering as "a long-term commitment between two or more organizations for the purpose of achieving specific business objectives by minimizing the effectiveness of each participant's resources" [3].

Publishing a monthly newsletter can also improve communication and coordination between project participants and the client. A newsletter communicates information clearly and efficiently, and is an excellent communication tool; all the project participants should be encouraged to share information and ideas regarding all aspects of the project. It can give a "big picture" of the project that includes cost/schedule variances, funding, long-lead materials, change orders, and claims.

A database of information should also be created that contains design and construction problems at various construction sites. After these problems are corrected, they must be incorporated into future design packages.

Meetings and regular telephone conferences should be conducted with all the parties involved to discuss various problems and resolutions. Weekly teleconferences conducted by the program manager with construction and installation crews working at different sites can be held to discuss the progress of the project and also to resolve any problems.

At the start of a project, daily engineering staff meetings should be conducted; however, the number of meetings can be reduced to once a week after the engineers are comfortable with their responsibilities. During these meetings, the program manager can set the schedules and lay down the deadlines. The client should also be invited to participate. Weekly construction meetings should be conducted by the program manager with procurement to expedite the subcontract process. In addition to these actions, cost/schedule reports and presentations need to be given regularly to management and staff regarding the progress of the project.

Design Approach

Fast-track management demands new and creative ideas to reduce cost and scheduling for design activities. Such methods include the following:

- standardization of design—the most commonly-used design details must be standardized (with minor variations) to reduce design and drafting time; and
- standardization of materials and selection of materials and equipment must be based on a market survey that includes comparisons of technical features and cost—materials with lower costs and the same performance must be used.

Performing site adaptation from available design drawings without a thorough investigation often creates design discrepancies. Experience has shown that on-site verification of the existing field conditions, including a study on the presence of any hazardous materials, permitting requirements, and government regulations is vital for design accuracy and schedule compliance for both new and retrofit projects. Conduct a constructability review to make sure that the designers considered all factors and to produce a workable design package.

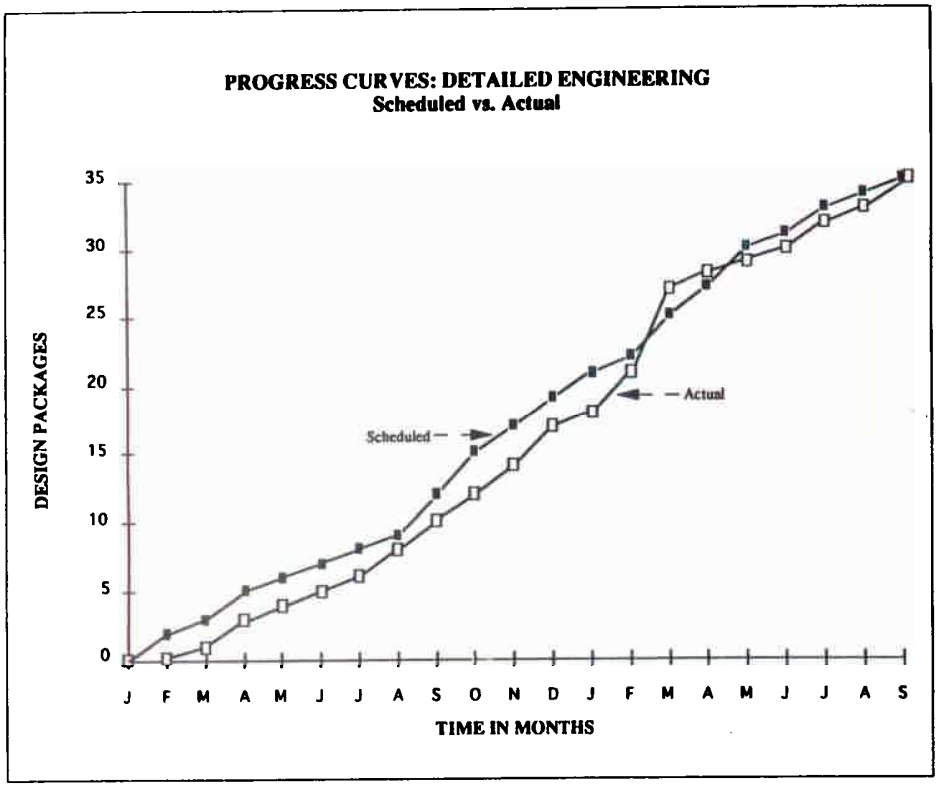

Figure 3—Curves Showing the Progress of Design Activities

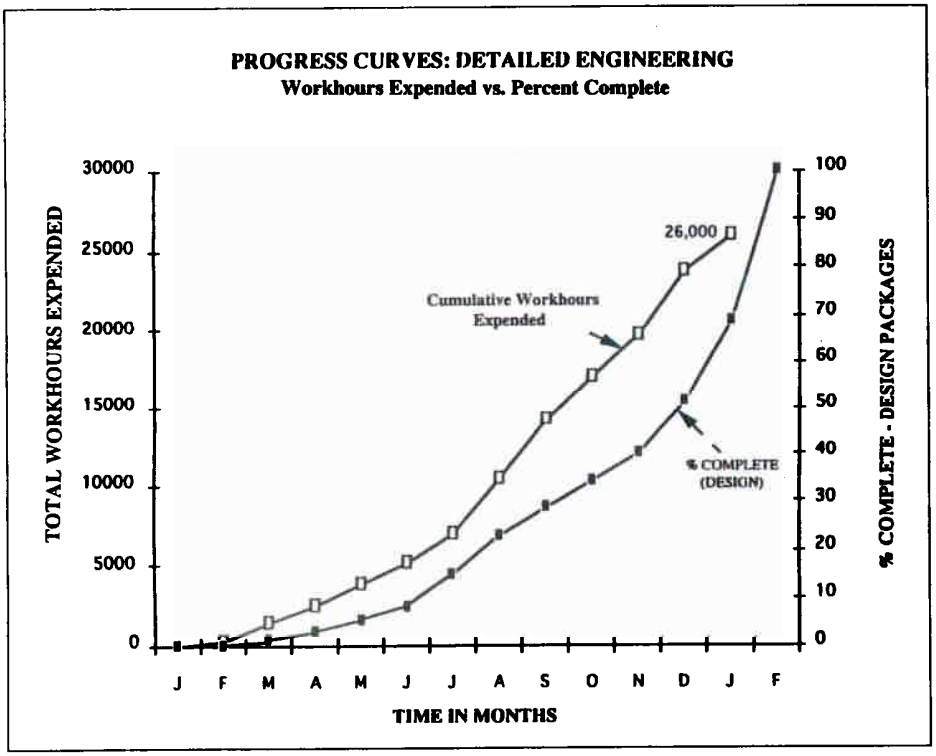

Figure 4—Curves Showing Workhours Expended vs. Percent Complete

Project Control Systems

The ability to manage and control a project is of utmost importance for its success. A project plan must be developed that lists all the control tools and resources required to manage the project. Clients usually take years for front-end planning and if the design phase falls behind schedule the burden of getting back on schedule shifts to the construction phase. Despite slippage in the planning and design phases, the construction completion date remains the same and the project seems to be lagging behind due to slow construction. I have observed that clients are reluctant to change their established project completion dates.

A program manager in today's environment is able to use a wide variety of project implementation tools and techniques. In today's world of microcomputers, mainframe computers are becoming less popular due to higher operational and maintenance costs. Most mainframe-based systems tend to produce voluminous reports with different cut-off dates and inconsistent and redundant data. Program managers need access to accurate data that identifies problem areas and helps with the decision-making process. A good cost/scheduling engineer who understands project control functions and knows how to use the tools and guide the program manager can be more beneficial than a sophisticated computer system.

Following are some objectives of a project control system:

- maintain effective communication between various functional groups, different levels of management, subcontractors, and the client;
- provide continuity of cost/schedule throughout design, procurement, construction/installation, and operational phases;
- provide timely, accurate, structured information regarding cost, schedule, and performance in order to formulate timely decisions, effectively utilize resources, and resolve problems;
- develop, update, and monitor engineering, procurement, and construction schedules with workforce loading on each schedule activity, including cost estimates, variance, cash flow analyses, and reporting for control of

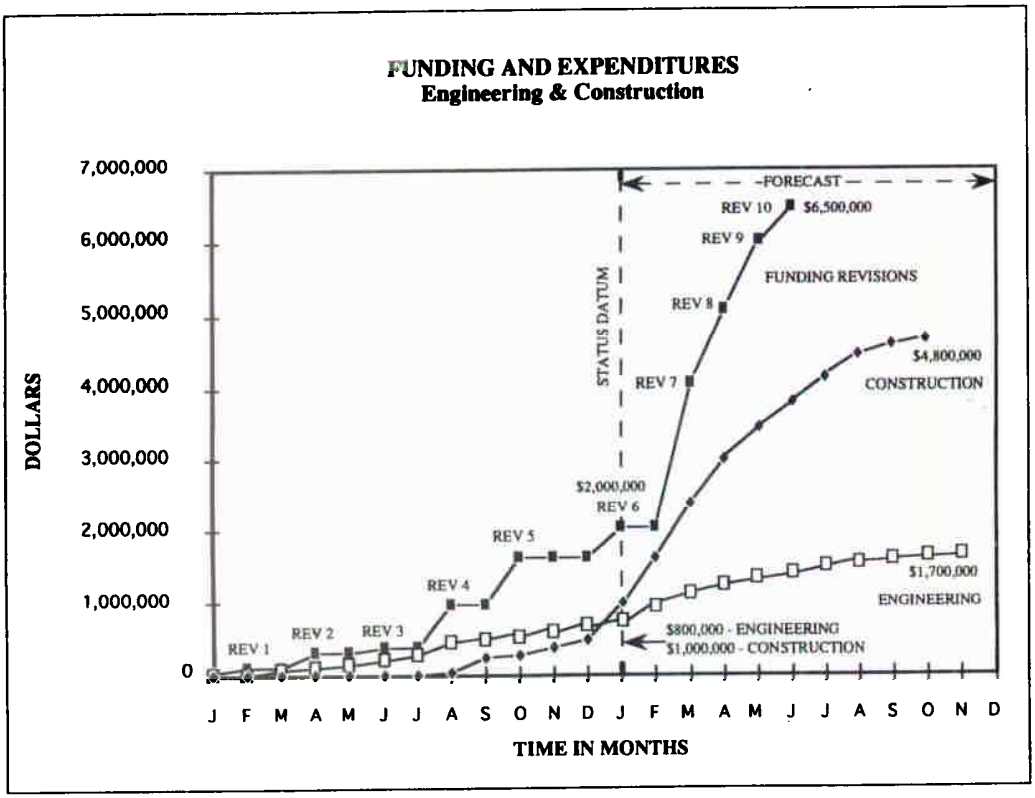

Figure 5—Progress Curves: Funding and Expenditures for Engineering and Construction for Incrementally-Funded Projects

total project scope and costs;

- integrate design, procurement, and contractors' construction schedules;
- evaluate physical progress and contractors' performance; and
- provide thoroughly-documented job progress and management reporting.

Engineering Schedules

Engineering planning is an essential element for successful completion of any project. In fast-track projects faced with rapid scope changes, progress curves must be used for better control and tracking (see figure 3). The curves provide flexibility in statusing and updating and are more efficient than bar charts or networks. The graph data required for preparing progress curves and performance graphs is extracted from drawing and specification control logs.

The engineers responsible for developing the design drawings and specifications must maintain the logs on a weekly basis. The logs contain a listing of engineering work to be accomplished with scheduled dates, and they are continually updated to reflect actual and forecast schedules. The logs also contain budgeted and expended workhours and percent complete, which is based on workhours completed rather than cost (see figure 4). The logs should be maintained for each project site and divided into different sections by specialty, i.e., civil, mechanical, electrical.

Procurement Schedules

Fast-track projects may not be successful unless the subcontractor performance and procurement of materials and equipment are coordinated on timely bases. The schedule shows all the interdependencies between engineering and construction and serves as an integral reporting tool. It also reflects times for materials/equipment shipping and delivery dates, times for submittal review and approvals, and the subcontract bidding cycle.

Construction Schedules

For multiple project sites, the main contractor subcontracts portions of its work to other contractors. If the contract sum is small, we have to deal with subs that are not equipped to produce critical path method schedules and maintain them regularly. The subcontractors' schedules are usually simple bar charts arranged in a logical sequence or are narrative schedules with start and finish dates. The main contractor should ensure that the subcontractors' schedules are realistic. The schedule needs to be continuously monitored and updated by getting input from construction engineers and subcontractors. This further improves the coordination of multiple subcontractors working at one site. The subcontractors' schedules should be integrated into the overall project schedule by maintaining a database in the main office. Weekly and monthly reports can be generated with help of this database.

Funding

It is vital for fast-track projects to be fully funded. If the project is incrementally funded (see figure 5) based on projections as work progresses, it becomes difficult to manage since funding requisitioning usually has long lead times. It is important in incrementally-funded projects to track the costs accurately and on a timely basis to prevent cash flow problems and liability. Experienced and knowledgeable cost/schedule personnel are needed, along with a simple project management system to aid in better project control.

Fast Tracking

Fast tracking a project is when activities that are normally done in series are done in parallel [4]. The process of starting construction before the overall design is complete is known in the trade as fast-track construction [2]. For example, the plans and specifications for the overall project sites may not be 100 percent complete, but the detailed design for individual project sites may be complete before bids are solicited. However, this largely depends on the circumstances of the specific project. Each site may be considered as a subproject. All of the sites may not be subcontracted at the same time and they

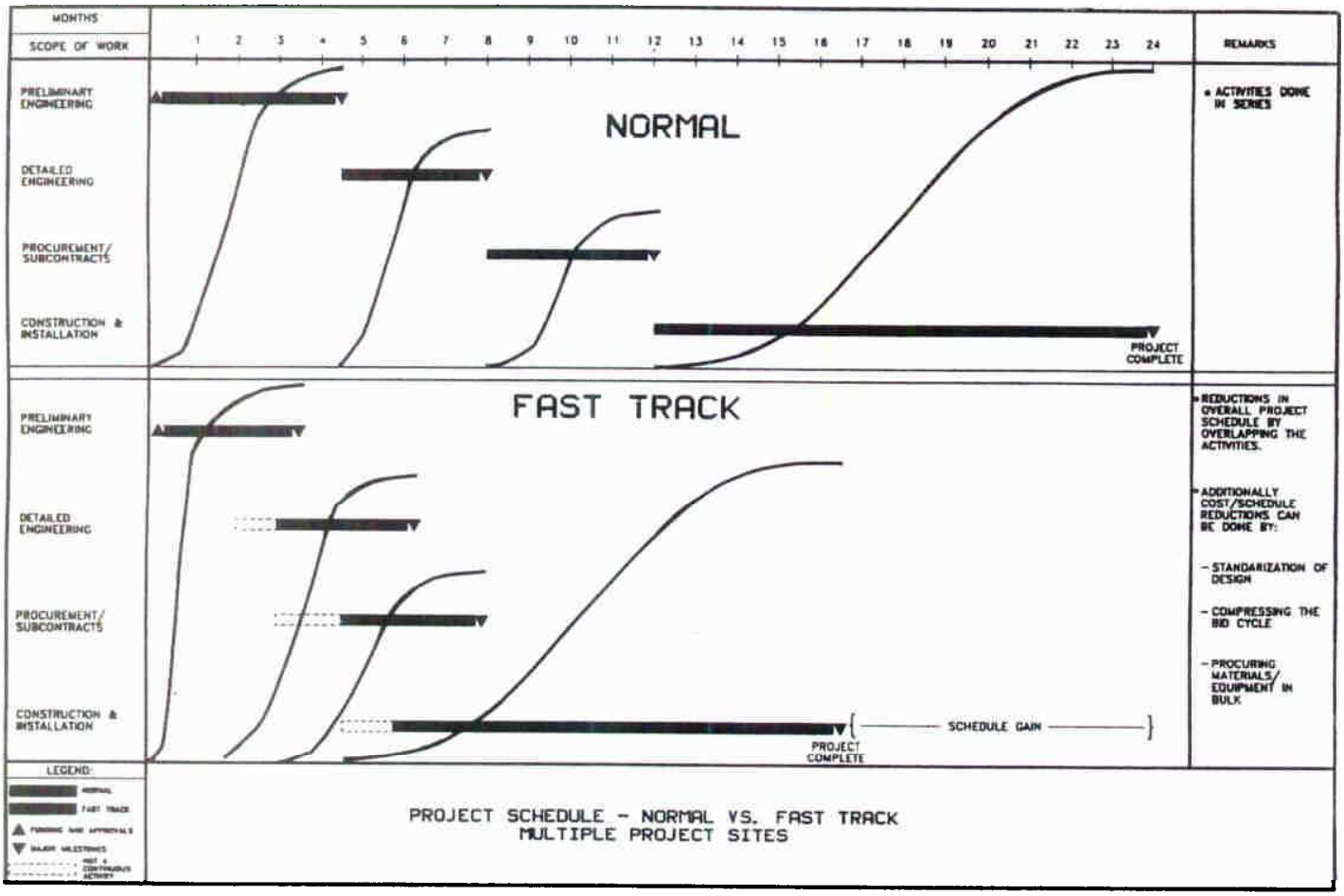

Figure 6—Project Schedule: Normal vs. Fast Track

might be staggered. Emphasis is also placed on creative methods of design such as standardization. The scheduling is, to the extent possible, done by overlapping activities (see figure 6).

For fast tracking, it is helpful to develop a project schedule that integrates the design, procurement, construction, and installation activities. Overlap the activities to the maximum extent possible, making sure integrity of logic is maintained. The schedule should include change orders and shipping/delivery dates for long-lead materials so it can reflect realistic completion dates.

Schedule analysis may also reduce the duration of some activities (approvals, bid cycle, submittal review, etc.). This leads to "cutting the fat"; however, the number of critical activities may be increased, which affects the cost. Also, the project schedule may reflect two critical paths due to logic changes. The dual critical paths require close monitoring and frequent updating of the schedules. As discussed earlier, when the cost/schedule approach is changed, i.e., in lieu of conventional scheduling methods, progress curves are used to control scope changes and for better tracking.

The client needs to appoint experienced and knowledgeable project engineers, expedite decisions and payments, settle changes, and identify the scope in the early stages of the project so the contractor has adequate time for planning and developing engineering criteria, workforce requirements, and the schedule.

The following items also help with fast tracking:

- reorganize and hire more trained staff to increase productivity—however, avoid frequent organizational changes;
- improve communication;
- standardize design;
- procure materials/equipment in bulk for construction and installation;
- consider the contractors' operations capability before awarding the work; and
- expedite approval cycle for design clarifications, submittal reviews (all submittal to be approved before issuing notice-to-proceed to the contractors) and change orders.

These efforts help in the successful completion of a project. However, there are some trade-offs. In some cases

- fast tracking may cause change orders and claims;
- the quality of work may be below average and require rework;
- if the bids received are high, you may not be able to rebid;
- if a subcontractor's performance is less than average, you may not be able to terminate the contract; and
- there may be increased cost compared to normal conditions.

Subcontract and Construction Management

Subcontract and construction management is of paramount importance for fast-track projects. If not managed efficiently, cost overruns and schedule delays may occur. The client often changes the scope of work rapidly and the contractor takes advantage of the situation. Construction subcontracts usually are awarded to a general contractor that subcontracts various portions of the work to other specialized contractors by trade. Firm fixed-price subcontracts are awarded to the lowest bidder on a competitive basis; they may become difficult to control for fast-track projects if managed by a single subcontract administrator. Good construction contract documents, a good program or construction manager, and a good resident/construction engineer are not enough to complete the construction phase successfully.

If subcontracts are not controlled efficiently the results may be poor contract administration, inefficient coordination of the subcontractors, wrong interpretation of contract documents, and unresolved claims/change orders, etc.

Small subcontractors often have resource constraints and are unable to operate with efficient cost/schedule systems. Your subcontractor may submit an inadequate schedule as a contract formality rather than a control tool. Apart from logic errors, they may not include long-lead materials or schedule of values. Schedules may not be updated on a regular basis to reflect slippage, which impacts on the overall project completion date.

The following are other problems that may result from insufficient subcontractor control:

- not attempting to resolve misunderstandings in the contract documents at the time of the award or at the preconstruction conference, but at a later date in the project, thus forcing an extension in the contract;
- incomplete construction crew at the site, untrained workers, working without a foreman, or not working regularly;
- the subcontractor may execute change orders without written consent from the office, and response to change order estimates is slow; and
- submittal/shop drawings may not be submitted in a timely manner and the subcontractor may try to complete the work without approved submittal—replacing the disapproved work may not easy.

Other problems may be due to subcontractors not always predetermining all of the existing field conditions that need to be altered and/or moved, or not verifying/obtaining measurements to order materials. The subcontractor may not always procure materials that are approved and specified equals rather than cheap substitutes, and may not do advance utility planning and take the necessary precautions to prevent disruption of existing services while performing the work.

These problems are not unique to the fast-track process; however, they are costly in terms of cost and schedule. In some cases, the contract administrator may not have the sufficient engineering, construction, cost/schedule, and legal skills to make balanced decisions.

To avoid some of these problems, implement the following items:

- the program manager has line authority over the contract administrator and other functional groups (see figure 1);
- resolving contractual disputes at times is demanding and requires at least two or more certified contract administrators (depending on the scope)—it is also imperative to give good technical and project control support to the contract administrator;
- a database is developed with experienced subcontractors by geographical area—where possible, prequalify the contractors before sending the bid packages;
- a steering committee is formed to select potential bidders, and if possible, include liquidated damages and an incentive clause to ensure contract compliance; and
- a computerized tracking system is developed to control the change orders and claims.

You also must prepare weekly cost/schedule reports, look-ahead schedules, and critical item action reports that accurately reflect the project status, show deviations from established baselines, identify problem areas, and suggest corrective actions based on feedback from personnel responsible for the tasks.

Rapid technological advances and construction innovations have elevated the total requirements for construction management degree programs in some leading institutions in the United States. This has given a boost to the construction industry by placing emphasis on highly-educated construction engineers. Present-day resident engineers and construction engineers are more sophisticated and technically sound then their predecessors.

Construction work includes supervision of the subcontractors' work. Experienced construction engineers are required to supervise multiple subcontractors and to avoid costly change orders/claims.

The construction engineer has to maintain several field documents for design implementation and to ensure continuous communication. Regular inspections should be conducted by the program manager, quality control inspector, and client to make sure the contract documents are implemented. Quality control inspectors with a broad knowledge of construction work and codes expedite the construction work, while inspectors without the proper background and training may hinder project progress. During various phases of the project, engineers are faced with a multitude of design, construction, and installation problems that must be resolved on a timely basis to complete the project within the stipulated time.

Some conclusions in regard to fast-track project management include the following:

- effective communication between the client and all functional levels and early identification of the scope decrease project difficulties;
- standardization of design details minimizes design effort and expedites schedules;
- management tools, such as progress curves, aid project control;
- the program manager should have line authority over all functions for better control and to avoid costly

delays; and

- fast-track projects need to be fully funded—however, if incrementally funded, the request for funding must be made well in advance and requires accurate and timely cost data.

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