MANAGING PROJECT PORTFOLIOS, PROGRAMS AND MULTIPLE PROJECTS[1]

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ABSTRACT

Projects are the vehicles for implementing business strategies in essentially all human organizations. In recent years managers have recognized that projects must be managed at four levels: Strategic portfolio, multiproject program, 'group of small projects' (where appropriate), and the individual project level. This paper discusses the objectives, concepts, issues, and methods involved with the first three of these levels. The multiple project environment that exists in all but a few organizations is first discussed, and the objectives of multiple project management are defined. The concepts underlying *strategic portfolio project management* are then presented, and a 12 step project portfolio management process is discussed. The role and responsibilities of *project portfolio steering group* are described, and the relationships between this group, project sponsors, the project management office, and individual program and project managers are discussed. The differences are then explored and discussed between a) managing multiple projects within programs, and b) managing them as multiple small projects inter-related only by their use of common resources. Finally, an approach to developing a system for multiproject operations planning and control is described, based on successful experience in several parts of the world.

1. THE MULTIPROJECT ENVIRONMENT

It is rare to find a project in any organization today that exists by itself without interaction with other projects. The reality is that projects must be managed as inter-related efforts at four levels in large organizations:
- The project portfolio level.
- The multiproject program level.
- The 'group of small/minor projects' level.
- The individual major project level.

The first three of these topics are discussed in this paper. The processes, systems, procedures and tools for managing individual major projects are discussed throughout the project management literature. It should be noted that these levels are not mutually exclusive: a major project can be within a program and a portfolio, for example, and if so it would require management at all three of these levels. A small project can be managed as one of a group as well as part of a project portfolio.

The multiproject environment that exists in most large organizations imposes complications at each of these project levels and at each level of the functional organization. The basic problems result from competition between and within projects for resources and for management attention. Since no known organization possesses completely unlimited resources it is not possible simultaneously to plan and execute all the projects that can be conceived. In addition to resource constraints many projects depend on the results and products from other projects. At appropriate levels in the organization the multiproject requirements and priorities must be brought together to assure that all projects are completed to realize the maximum benefits for the entire organization.

Multiproject Objectives: The higher order objectives of multiproject management, in comparison to managing a single project, include:
- Completing all projects to best achieve the overall strategic goals of the organization.
- Determining both long-term and short-range priorities between projects to enable appropriate decisions regarding allocation of limited resources.
- Identifying and understanding the comparative risks involved in each project, deciding which are acceptable to the organization, and managing the accepted risks proactively.
- Acquiring and maintaining an adequate supply of resources to support all projects, including people, facilities, material, and money; but at the same time assuring that these resources are gainfully and efficiently employed in approved, productive work required to complete the approved projects.

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[1] Adapted from Archibald, Russell D., Chapter 8, "Managing Project Portfolios, Programs, and Multiple Projects," *Managing High-Technology Programs and Projects*, Third Edition, 2003. New York: John Wiley & Sons.

- Integrating these multiproject requirements with other ongoing activities and operations not directly related to projects (such as production of off-the-shelf products.)
- Developing and using organizational patterns and management processes and systems to satisfy the ever-changing project needs on one hand, and on the other hand to provide organizational stability, professional development, and administrative efficiency for persons managing and supporting various projects.

2. MANAGING PROJECT PORTFOLIOS

Developing and Applying the Project Portfolio Management Process: The development and application of the project portfolio management process must be planned as a management project. The most appropriate approach is to assign the manager of project management, assuming there is one, as the project manager. Persons who are obvious candidates to be members of the project portfolio steering group should be included on the project team with appropriate responsibilities. Other members of the team will be drawn from the project management office/PMO staff and probably will also include experienced internal or external consultants in strategic and project management.

The project objective is to design, develop and implement the project portfolio management process for the specified parts of the organization. The project scope defines exactly which parts of the organization are to be included in the implementation. During the initial implementation of the process the senior members of the project team are transformed into the project portfolio steering group. This group is established formally when the process design has been approved and its implementation is authorized.

The project portfolio management process consists of the following twelve basic steps.

1. **Define the *project portfolios* required within the organization.** This would normally be done as a part of the organization's strategic planning and management process. The defined portfolios would reflect the organization's growth strategies, reporting structure, geographic markets, product lines, and other significant factors.
2. **Define the *project categories* within each portfolio based on uniform criteria for the entire organization.** The list of project categories for the organization is prepared by the project team reflecting the factors discussed by Archibald and Voropaev [2003].
3. **Identify and group all current and proposed projects within appropriate categories and programs.** Preparing an inventory of projects is a necessary prerequisite for this step. Grouping the currently approved projects by the team into their appropriate categories will generally be straightforward. Creating and selecting new projects is further discussed in a following section.
4. **Validate all projects with the organization's strategic objectives:** The implementation project team *cum* project portfolio steering group compares the objectives and scope of each project within a portfolio and ascertains that these are directly linked to one or more of the organization's strategic objectives. If not, higher-level managers must decide if the project will be cancelled or retained in the portfolio after suitable modification.
5. **Prioritize projects within programs and portfolios:** The implementation project team designs and recommends the methods and procedures for prioritizing projects and programs within each portfolio. Further discussion of project prioritization methods is presented in a following section. The team, acting as the project portfolio steering group, then applies these methods and establishes the current project priorities, with supporting assistance from the project management office/PMO staff.
6. **Develop the Project Portfolio Master Schedule**: The implementation team designs and develops the format for this master schedule and enters summary information for each project and program within each portfolio reflecting the currently approved project priorities.
7. **Establish and maintain the key resources data bank.** A significant element of the design of the project portfolio management process will be the selection of which key resources are to be included in this data bank. The number of such resources should be kept small, at least initially. As experience is gained in the practicalities of maintaining and using such a data bank, additional resources can be added to it.
8. **Allocate available key resources to programs and projects within portfolios.** This step requires development of fairly detailed plans and schedules for each active program and project within each portfolio. These initial project plans will include estimates of what key resources are required over time to plan and execute each project as scheduled. As resources are allocated the project schedules will obviously

be affected. When the projects are re-prioritized (step 5) these resource allocations are revised and the projects are then re-scheduled.

9. **Compare financial needs (primarily cash flow) with availability.** This also requires fairly detailed plans and schedules for each program and project with cost estimates linked to schedules. Planning templates for newly conceived projects can be used until more detailed plans for them are available.

10. **Decide how to respond to shortfalls in money or other key resources and approve the list of funded projects and their priorities.** The steering group makes these decisions regarding allocation of funds. It then oversees the repetition of Steps 5 through 10 until available money and other key resources have been allocated on an optimum basis.

11. **Plan, authorize and manage each program and project using the organization's project management process and supporting systems and tools for each project category.** The manager of project management and the supporting staff assigned to the PMO provide direction and assistance as required and reflecting the PMO charter to carry out this step.

12. **Periodically re-prioritize, re-allocate resources to, and re-schedule all programs and projects as required within each portfolio.** Repeat Steps 1 through 12 as required on a monthly or quarterly basis. Reflect changes in strategies, products, markets, competition, and technologies, as well as progress made to date (or the lack thereof) on each project. Add newly proposed and approved projects. As further discussed later in this paper the project portfolio steering group gives strategic direction to each project sponsor who interprets that direction and communicates it to the affected project manager(s).

Responsibilities of the Project Portfolio Steering Group: The project portfolio steering group responsibilities include:

- Approving the design of the project portfolio management process during its initial implementation, and any significant subsequent changes to it.
- Active participation in the operation of the project portfolio management process:
  o Integrating and validating the organization's strategic objectives with the programs and projects within the project portfolios over which the group has cognizance.
  o Establishing and integrating the relative priorities of projects within each portfolio at appropriate pre-established intervals and when required by major events or changes in the projects or their environments.
  o Approving new projects for inclusion in the assigned portfolios and re-prioritizing all portfolio projects when such new projects are added.
  o Communicating the current project priorities to their sponsors and through the sponsors to the program and project managers, as well as to the functional management structure of the organization.
- Recommending to the CEO and other cognizant senior managers the acquisition of additional financial and other resources when required to plan and execute the projects needed to achieve the strategic objectives of the organization on a timely basis.
- Identifying opportunities for improvement and recommending improvements in the project portfolio management process and the other project management processes, systems and tools.

In large, complex organizations there will usually be more than one project portfolio to be managed, and these may overlap and compete for available corporate resources and management attention. The CEO, general manager or other senior executive or multi-portfolio steering group may be required to resolve inter-portfolio conflicts—unless one portfolio steering group holds responsibility for all portfolios.

Relationships Between the Project Portfolio Steering Group, Project Sponsors, the Project Management Office/PMO, and Project/Program Managers

The *project portfolio steering group* provides strategic direction for all programs and projects within the portfolios under its cognizance, as indicated in the above discussion. The currently approved portfolio master schedule reflects the key resource allocations and project priorities that have been established by the steering group. This master schedule includes the currently agreed target dates for key milestones in each program and project. This information is transmitted to the project sponsors and the manager of project management.

The *project sponsors* assigned to major programs and projects inform the manager of project management, the cognizant program and project managers, and also the affected functional managers, of any changes to the resource allocations and priorities for their projects. The sponsors also communicate to those managers any other information (both internal and external to the organization) of a political, economic, technological or other pertinent nature that may have an effect—good or bad—on their programs or projects.

The *manager of project management* communicates the resource allocation, priority and milestone information contained in the portfolio master schedule to the managers of all programs and projects for which a sponsor has not been designated. Depending on the manager of project management's charter he may carry out the responsibilities of the sponsor for all such projects.

The *program and project managers*, both of individual major programs and projects and of multiple smaller projects, receive their strategic direction from either their project sponsors or the manager of project management. The manager of project management will provide operational support and professional project management guidance to the program and project managers if this is within the scope of his charter. Each program and project manager must reflect any resource, priority, schedule, or other strategic changes to their program or project in their plans, estimates and schedules, and quickly provide an assessment of the impact of such changes to their project sponsor and/or the manager of project management. The project sponsors and the manager of project management immediately transmit these impacts to the project portfolio steering committee for inclusion in the next iteration of the project portfolio planning process.

3. MANAGING MULTI-PROJECT PROGRAMS

Characteristics of Multi-Project Programs: Programs are defined as comprising of two or more projects that are interrelated in some fairly direct way. Classic program management comes from large U. S. Department of Defense weapon systems efforts and NASA aerospace endeavors. Typically these require a program manager at a high level of the governmental agency sponsoring the effort, with project managers identified within each of the private contractors that are carrying out the design, development, fabrication, assembly, test and other required operations for the portion of the program for which they have executed contracts with the government. In some cases these contracts are so large that they in turn are actually multi-project programs with a number of sub-contractors executing the projects.

In other economic and industrial sectors organizations have found it useful to group related projects within a program. Such projects might be related to a particular product line, operating division or geographic area. Projects within a program are usually closely related in some way, in addition to using common resources. Such interrelationships include logical dependencies like a test result or product from one project that is required before a task or activity within another project can be started or completed. Programs could conceivably be considered as being synonymous with small portfolios.

Program versus Project Managers: The program manager position carries essentially the same responsibilities for the program that a project manager has for her project. One major difference is that the scope of responsibility is usually broader since more than one project is involved in a program. In addition the program manager also directly supervises the project managers within his program. However, the manager of one major project may have broader responsibilities than the program manager of an effort consisting of several small projects.

Programs may not have a well-defined life cycle of their own since they are comprised of two or more projects that each has its own life cycle. Programs usually have longer durations than projects and may in fact continue for indefinite periods of time, as projects are completed and new projects added. As a result the program manager assignment will typically be more permanent or longer in duration than that of a project manager. That may in fact make it more difficult to maintain the continuity of responsibility in one program manager, and this in turn places more importance on establishing and maintaining adequate files and records for the program so that a newly assigned program manager will inherit the complete information needed for successfully completing the program.

4. MANAGING MULTIPLE SMALLER PROJECTS

Most of the project management literature is directed primarily to situations involving a number of major projects. However, of equal importance in many organizations are the project management needs in the situation where a large number of relatively small projects exist. This is typical of many high technology companies that

design, manufacture, and install complex products or systems. Even though a project manager may not be appointed to every project in this situation, management of the projects on an integrated basis is still of vital importance to meeting the contract cut-over dates. The division general manager typically retains the overall project management responsibilities. This places even greater emphasis on the need for organization, methods, and systems that enable truly integrated planning and control of all projects through all their life-cycle phases.

Centralized planning and control offices have been established in some companies to provide the needed marketing-engineering-manufacturing-installation planning and master scheduling where this multiple small project situation exists. Coordination of these plans and master schedules, and appropriate follow-up to assure compliance, are handled by a planning manager reporting to the division general manager. Such offices are useful in training and developing individuals with the special skills required for project management support personnel on major projects. Table 2 summarizes the key differences between these two commonly encountered situations.

Benefits of Using PERT/CPM/PDM Network-Based Project Management Systems in Multiproject Situations

Significant benefits are realized from the proper use of network-based systems in both the multiple major and multiple small project situations:
- Improved planning and scheduling of activities and forecasting of resource requirements.
- Identification of repetitive planning patterns that can be followed in a number of projects, thereby simplifying the planning process.
- Ability to reschedule activities to reflect interproject dependencies and resource limitations following known priority rules.
- Ability to use the computer effectively to produce timely, valid information for multiproject management purposes.
    The concept of multiproject operations planning and control is discussed later.

	Multiple Major Projects	**Multiple Small Projects**
Project manager role	Assigned to a manager who does not have a functional responsibility.	Retained within the line organization with integrated staff assistance in planning and coordination. Possibly several projects are assigned to a project (or program) manager or project coordinator.
Project team	Key team members may report to the project manager or may only be physically located together or may stay in their functional organizations	Project work always assigned to functional departments; in field phase full-time team is assigned to each project.
Integrated planning and control	Each project planned and controlled on an integrated basis; multi-project conflicts resolved above project manager level. Different systems often used on different projects.	All projects must be planned and controlled on an integrated basis within one multiproject operations planning and control system; conflicts resolved by multi project and/or functional managers.

Table 2. Key differences between multiple major and small projects.

Interdependencies Between and Within Projects: Projects and activities within projects can be interrelated in three basic ways:
1. **Result-of-action.** The results produced by completion of an activity in one project or task must be available before an activity in another project or task can begin.
2. **Common-unit-of-resource.** An engineer, for example, must complete an activity in one project or task before she can begin another activity in another project or task.
3. **Rate-of-use-of-common-resources.** Two or more projects or tasks are using one resource pool, such as a group of pipefitters; when the rate of use of the resource by the projects exceeds the supply, the projects or tasks become interdependent on each other through the limited resource pool.

The first interdependency can be represented in network plans by logical dependencies and/or interface events, the second by logical dependencies or using resource management methods, and the third must be managed through resource management methods.

5. MULTIPROJECT OPERATIONS PLANNING AND CONTROL

Situations involving many multiple projects, large or small, frequently require the establishment of an operations planning and control function. This may be set up within a division, a product line, or for an entire company. Operations planning and control integrates and controls, on a master plan level and for all contracts and/or projects, the functions of marketing, engineering, procurement, manufacturing, and installation, usually within a specific product line or division. Such a function within a particular organization will provide significant benefits to the organization's project management capabilities and to the project management office, resulting in improved:

- Project planning and control support to each project manager, with reduction in planning and control staff in each project office.
- Ability to resolve conflicts between projects and to control relative priorities of projects.
- Uniformity of project planning and control practices, enabling higher management to review all projects on a more consistent basis.
- Forecasting of resource requirements for all projects.

Operations Planning and Control: A typical operations planning and control function would:

- Optimize corporate and project performance goals by coordination of planning activities in the marketing, engineering, manufacturing, and installation functions through generation of corporate master schedules.
- Coordinate functional planning by means of continuous workload versus capacity evaluation, recognizing functional dependencies in project execution, with a planning horizon extending as far as firm, proposed, and forecasted project activities will allow.
- Continuously evaluate functional capabilities relative to requirements to (1) allow forecasting of performance against corporate and project goals and (2) highlight areas of deviation where management action is required to resolve cases of potential capacity shortage or surplus.
- Develop and maintain supporting systems for simulation purposes: to evaluate the likely consequences of alternative business strategies in order to offer possible solutions to senior management.

Potential Benefits: The potential benefits of the operations planning and control function are:

- Improving cross-functional communications with a positive effect on functional performance.
- Improving overall contract and project performance.
- Improving corporate performance by improved resource planning and utilization.

Examples of specific benefits include:

- Reduction of project cycle time.
- Increased direct labor efficiency.
- Increased utilization of tools, test equipment, and other facilities.
- Reduction of gross inventory.
- Reduced exposure to contract penalties.

The final effect of all these benefits is to enable the company to handle more projects, and produce more sales revenue and net income without increasing total personnel and capital investment.

Organization and System Interface: The concept of operations planning and control and the interface between the involved organizational functions and the supporting systems are illustrated in Figure 1. The operations planning and control function plans, schedules, monitors, reports, and controls, *at the master schedule level,* all orders and contracts (projects) through all contributing functions. The set of bridging networks integrates the functional plans and schedules for all projects. The networks are also linked to the supporting functional systems by the downward flow of master scheduling information, and the upward flow of progress and status information. This means that the bridging networks must incorporate milestone or interface events common to both the operations planning and control systems and the functional systems. These milestone/interface events must meet the needs of both types of systems.

Experience indicates that the two elements of operations planning and control—the organizational function and the system—must be developed and introduced concurrently. One element without the other simply will not

work. There are a number of ways to plan, schedule, track, and control multiple projects within an organization. The key to success is to have a coherent, integrated, consistent system for doing this, and to make sure that everyone is using the same system.
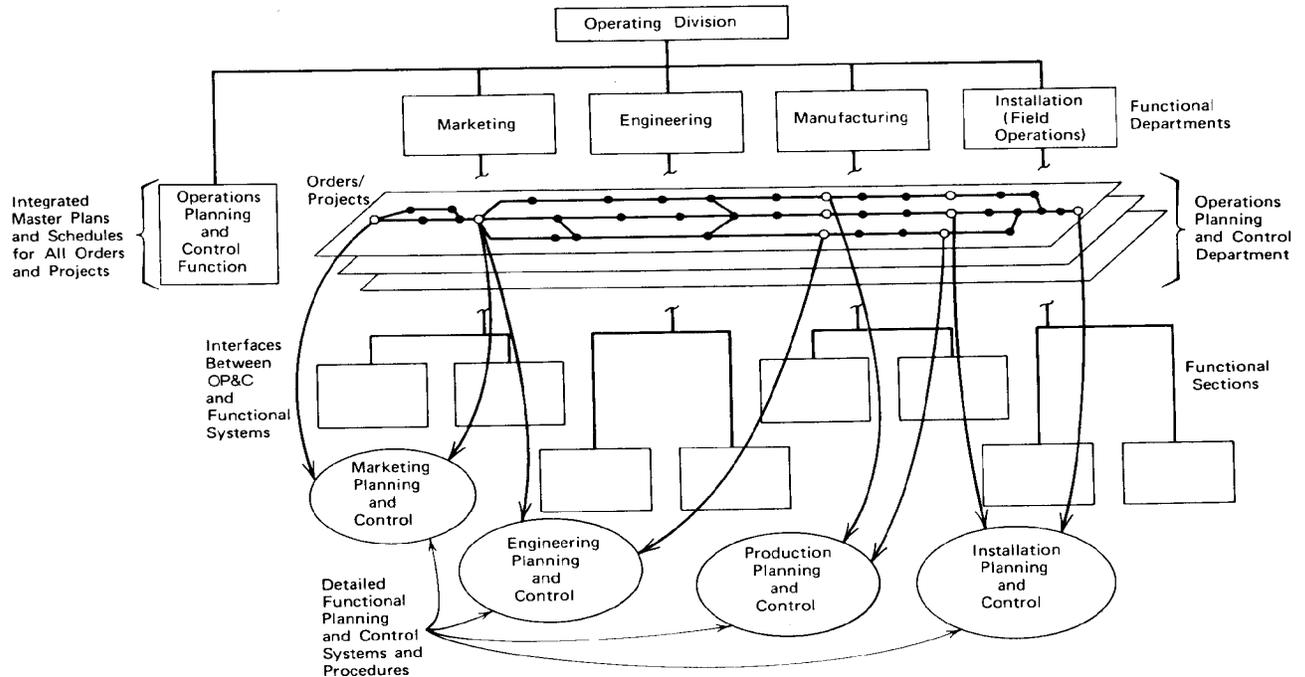

Figure 9.1. General Illustration of an Integrated Project/Operations Planning and Control System.

6. CONCLUSION

Today's complex organizations operating in this high-speed Internet Age must recognize and respond to the need to manage all of their projects within defined project portfolios, multi-project programs, and when appropriate on a multiproject basis as described, in addition to managing them as individual, unique projects. This paper has presented and discussed current concepts and practices that have emerged in response to these needs with the objective of expanding and accelerating their acceptance, wider use, and continued development in all areas of project management application.

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