
PROJECT MANAGEMENT: RECENT DEVELOPMENTS AND RESEARCH OPPORTUNITIES

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ABSTRACT

This paper studies the business process known as project management. This process has exhibited a remarkable growth in business interest over the last 15 years, as demonstrated by a 1000% increase in membership in the Project Management Institute since 1996. This growth is largely attributable to the emergence of many new diverse business applications that can be successfully managed as projects. The new applications for project management include IT implementations, research and development, new product and service development, corporate change management, and software development. The characteristics of modern projects are typically very different from those of traditional projects such as construction and engineering, which necessitates the development of new project management techniques. We discuss these recent practical developments. The history of project management methodology is reviewed, from CPM and PERT to the influential modern directions of critical chain project management and agile methods. We identify one important application area for future methodological change as new product and service development. A list of specific research topics within project management is discussed. The conclusions suggest the existence of significant research opportunities within project management.

KEYWORDS: *Project management, overview, recent practical developments, opportunities for research*

INTRODUCTION

A project is conventionally defined as a “temporary endeavor undertaken to create a unique product or service” (Project Management Institute 2008). Alternatively, a project can be thought of as a well defined set of tasks that must all be completed in order to meet the project’s goals (Klastorin 2004). In a typical project, many tasks are performed concurrently with each other. Another key feature of projects is the existence of precedence relations between the tasks. These relations typically define constraints that require one task to be completed before another starts.

Compared to many business processes, project management appears to be particularly difficult, from both theoretical and practical perspectives. From a theoretical perspective, the fundamental planning problem of resource constrained scheduling is highly intractable. From a practical perspective, the two standard objectives in project management are defined to Systems Engineering Society of China & Springer-Verlag Berlin Heidelberg 2012.be completion of the project on time and on budget. Yet, many projects fail to meet these two criteria, despite detailed planning before execution begins and the use of modern project management software. Further, the

failure rate of projects is higher in many modern applications than in traditional ones, due to less reliable data and the more challenging characteristics that are discussed in Section 2 below. Indeed, it can be said that, despite its recent massive growth in use, project management is a difficult to manage business process. As we discuss, this is creating extremely interesting research opportunities. The purposes of this work are to outline what those opportunities are, and to provide some specific examples.

WHAT IS THE TECHNIQUE

Project management emerged because of the growing demand for complex, sophisticated, customized goods and services and the exponential expansion of human knowledge. The former depends on the integration of product design with production / distribution and the latter allows a number of academic disciplines to contribute to the development of goods and services. Project Management is a set of principles, methods and techniques for effective planning of objective-oriented work, thereby establishing a sound basis for effective scheduling, controlling and re-planning in the management of programs and projects. In other words, it provides an organization with powerful tools that improve the organization's ability to plan, organize, implement and control its activities and the ways it uses its people and resources. A project is a non-repetitive one-of-a-kind activity normally with discrete time, financial and technical performance goals. Normally a complex effort, usually less than 3 years in duration and it is made up of interrelated tasks performed by various organizations. The project management tools and principles provide the means for

- project breakdown into tasks and sub-tasks
- finding interdependencies between the tasks
- allocating resources, human and material and smoothing resources
- estimation for total project duration and budget
- monitoring more efficiently project progress

Project management ideas are equally applicable to small as well as very large projects (with small and large number of tasks). However, the formal tools used are more appropriate for rather large projects.

OBJECTIVES OF THE TECHNIQUE

The basic purpose for initiating a project is to accomplish some goals. The reason for organizing the task as a project is to focus the responsibility and authority for the attainment of the goals on an individual (project manager) or a small group (project team).

Project Management is a means by which to fit the many complex pieces of the project puzzle together, both human and technical, by use of:

- Schedules
- Budgets, including resource allocation
- Scope (product) definition

Project Management fulfills two purposes:

- Technical: Documentation techniques to communicate
- The 'plan'
- Status which compares 'planned' versus 'actual' performance
- Human: Managerial skills to be a better 'manager' of people as well as the project.

METHODOLOGY

The methodology for setting up projects and applying Project Management principles follows the following guidelines:

1. Define the Objective

To minimize the risk of getting off the right track, management must clarify the objective of the project well in advance by

- a) defining management's intent in undertaking the project
- b) outlining the scope of the project, that is, identifying the departments, companies, functions and staff involved and their approximate degree of their involvement

- c) describing the end results of the project and its permanent effects, if any, on the company or division.
2. Establish a Project Organization
This includes
- a) appointment of an experienced manager to run the project full time
 - b) organization of the project management function in terms of responsibilities
 - c) assignment of a limited number of staff to the project team
 - d) maintenance of balance of power between functional heads of departments and the project manager
3. Install Project Controls
Special project controls over time, cost and quality are very different compared to routine reports. These include:
- a) Time Control: normally applied with network scheduling (Critical Path Method) which provides the best time control for the project. Other techniques such as Program evaluation and Review Technique (PERT) allows the use of multiple time estimates for each activity.
 - b) Cost Control: Project control techniques, though not formalized to the same degree as time controls, can be followed if these steps are followed:
 - break the comprehensive cost summary into work packages
 - devise commitment reports for technical decision makers
 - act on early, approximate data
 - concentrate talent on major problems and opportunities
 - c. Quality Control: It comprises three elements:
 - Defining performance criteria
 - Expressing the project objective in terms of quality standards
 - Monitoring progress towards these standards
- Project Management activities include:
- a) Work Breakdown Structure (WBS)
Decomposes project into various levels of detailed tasks
 - b) Dependency Analysis
Orders the project tasks established by WBS, determining those, which must be done in sequential order, and those, which can go on simultaneously
- c) Network Development
Portrays 'ordered' tasks graphically using a 'network' diagram
- d) Resource Commitment / Allocation
Commits the appropriate individual who has the proper skills and expertise to the tasks requiring those skills. Allocates those resources over time to determine the 'build up' and the 'phase out' of the resources over the life of the project
- e) Time Estimates
Estimates based on one of several techniques ranging from the forecast method to the quantitative method, the constraint method, or the unit of work method. No matter which method is used, two categories of time are considered:
 - Effort: Energy exerted
 - Calendar: Elapsed duration
- f) Budgeting
Allocates the project development costs spread over the duration of the project
- g) Status Reporting
Takes the baselines developed above (schedules, resource loading and budgets) and turns them into a work-in-progress reports which track the plan against the actual.
- With respect to organization, project management calls for the appointment of one man, the project manager, who has the responsibility for the detailed planning, coordination and ultimate outcome of the project. He is usually appointed from the middle management ranks of the company or organization and is supplied with a team, often numbering 3 - 10 persons depending on the budget and duration of a project.
- It is common that company staff itself implements project management principles once it adopts project management philosophy. However, it often happens that small (and

sometimes large organizations) subcontract project management to more experienced companies or individuals who practice project management.

ALTERNATIVES

In essence there are no alternatives to Project Management techniques. An organization would decide to formalize and implement project management to accomplish various tasks, or it may continue to work at random. Work done individually will be based on specific tasks assigned to the individual and the outcome of the work would be joined by other pieces of work by other individual.

BENEFITS

As mentioned above, project management is a powerful technique and it can be used to small as well as very large projects. Project management technique is very popular in several business activities, such as constructions, manufacturing, servicing, etc. because of multiple and useful benefits that can be achieved from its application.

Implementation of project management technique can have significant results such as:

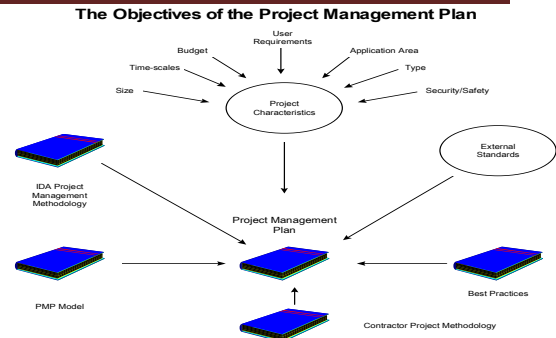
- Cost reduction
- Time reduction
- Recourses allocation
- Increased quality

These factors are the most important concerning the competitiveness and the profitability of any organization.

Using project management technique we can divide one large project in many isolated tasks (projects) and sub-tasks, so cost and time resources are more controllable, as well as quality.

Other benefits include:

- Failures reduction
- Reduction of inappropriate tasks
- Close examination of the sub-tasks
- Scheduling
- Integration
- Communication



CONCLUSIONS

Several conclusions can be drawn from this work.

1. We identify the following trends making project management harder: increased competition, shorter product and service life cycles, tighter budgets, unfamiliar and more complex applications, globally distributed and multicultural project teams.
2. In contrast, several trends are making project management easier: better project management training, publication of best practices information, and better software support. The relative impact of these two effects varies from application to application.
3. Underestimation of the value of project management as a planning methodology over the last 20 years has led research to fall behind recent business innovation and the growing range of applications.
4. Important recent developments on the business innovation side of project management are not yet well supported by research.
5. Leading journals in operations research and operations management have published few articles on project management in the last 10 years, compared to many other topics of comparable practical importance.
6. Practice and research have diverged, and few new researchers have entered the project management field.

Our overall conclusion is that a confluence of these factors has resulted in numerous interesting research opportunities in project management for at least the next 10 years.

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