Essentials of PROJECT CONTROL

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EDITORS' CHOICE SERIES

Series Editors:

Jeffrey *K. Pinto*
Jeffrey W. Trailer

Project Management Institute

Library of Congress Cataloging-in-Publication Data

Essentials of project control I edited by Jeffrey K. Pinto, Jeffrey W. Trailer
p. cm. -- (Vol. 2 in the Editors' choice series from PMI)
Articles selected from Project management journal and PM network.
Includes bibliographical references.
ISBN: 1–880410–64–8 (pbk. : alk. paper)
1. Industrial project management. I. Pinto, Jeffrey K.
II. Trailer, Jeffrey W. III. Project Management Institute.
IV. Project management journal. V. PM network. VI. Series:
Editors' choice series ; vol. 2.
HD69.P75E85 1999
658.4'04 -- dc21 99–41753
CIP

ISBN: 1-880410-64-8

Published by: Project Management Institute, Inc.
Four Campus Boulevard
Newtown Square, Pennsylvania 19073-3299 USA
Phone: 610-356-4600 or Visit our website: www.pmi.org

PMI® books are available at quantity discounts. For more information, please write to the Publisher, PMI Publishing, Four Campus Boulevard, Newtown Square, PA **19073-3299** USA. Call: **(610) 356-4600** or visit your local bookstore.

The paper used in this book complies with the Permanent Paper Standard issued by the National Information Standards Organization (Z39.48-1984).

10 9 8 7 6 5 4 3

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Scope Creep ... Not Necessarily a Bad Thing

S. Craig Keifer, PMP

PM Network (May 1996)

This article was first published in the October 1995 issue of the Western Michigan PMI Chapter Newsletter, On Target.

WE HAVE ALL heard horror stories of a project's scope growing out of control, and more than a few of us have lived through such experiences. Timing gets later and later, costs keep growing, management is unhappy, and customers are dissatisfied. Essentially, more work than originally planned is added to a program, and the project cannot absorb it without missing one or more objectives (or passing up opportunities). In the latter stages of a project, when changes require modifications to hard tools or brick and mortar, scope creep is obvious. But in the early stages, a project's scope can easily grow through changes in customer wants, miscommunication, poor assumptions, and successive minor additions to design. Even though scope creep can be devastating to a project, the pressure to increase the scope of a project will always be there and, if properly managed, provides significant opportunities for the performing organization.

Scope creep can be defined as the slow, insidious growth of a project beyond its original work content and objectives. Several key indicators put up *red flags* when scope starts to creep. But because these same red flags can also be indicative of other problems in the project, take care when reaching a conclusion as to the root cause of a particular condition.

One of the key indicators is, of course, project timing. When timing starts to slip for no identifiable reason, growth in the scope of the program should be suspected. Similarly, if the project budget starts to overrun, without other identified reasons, you should determine if more work is being done than was originally agreed to and budgeted.

CHANGE = OPPORTUNITY

Major changes in project direction are usually well recognized and accounted for, but day-to-day interaction with your customer results in many small compounding refinements to the project direction. Properly recognized and properly handled, these can represent an opportunity for your organization to increase sales, build a reputation, and solidify relationships.

- Adding content to your final product can enhance sales—and profits. If addressed appropriately and incorporated only after assessing its impact on the rest of the project's objectives, every change represents a pricing opportunity.
- Some changes, while they may not provide a direct product-pricing opportunity, may well provide the chance to demonstrate to your customer and other potential customers the capabilities of your organization. This positions you for future business with the current customer and also enhances your company's reputation in the industry. Such changes must be well evaluated in terms of the cost versus the anticipated benefit.
- Even at increased cost, absorption of some changes may benefit the development of a long-term relationship with your customer. Helping your customers get their jobs done usually helps you get your job done! Again, any such changes need to be evaluated in the context of the present and projected long-term relationship.

CHANGE CAN DRIVE YOU NUTS

Among the primary sources of scope creep, one of the clearest is the continual refinement of product direction. In the automotive industry, projects are often initiated with very minimal definition of the final product. Even when a fairly good initial definition exists, the product evolves through the development process with successive additions and changes to design features, colors, materials, option complexity, and so forth.

Assumptions regarding the development process and the relative responsibilities are also refined as the project proceeds. As confusion about who is responsible for various aspects (e.g., testing, documentation) and to what level each task needs to be performed (e.g., types of tests, level of drawing or CAD detail) is clarified, it impacts the performing organization's ability to achieve its internal and customer objectives.

Large customer organizations with various supporting departments may not develop requirements in time to support the initial definition of work. Yet these requirements will subsequently be universally applied to all suppliers or contractors. Because the requiring department doesn't deal directly with the suppliers in a timing and pricing mode, these additional requirements may be issued as a decree, leaving others to sort out the implications.

If the customer organization cannot complete its tasks on time to support you, it may be necessary to help out. Taking on additional tasks because it's the only way to keep the project moving at the required pace builds relationships and demonstrates capability, but, unfortunately, it's difficult to convert such changes into additional sales.

Whether major shifts in direction or minor refinements to the present course of the project, changes should be implemented in the least disruptive way possible, retaining the maximum opportunity to meet project objectives (either original or revised). This means complete evaluation of the impacts on the total project, not just on the immediate task. A review of project-level cost and timing is, of course, a first step, but the implications to project risk must also be considered. For example, in the automotive industry, where vehicle builds are scheduled years in advance and thousands of suppliers are all working to the same deadline, a change to your project schedule that consumes all available schedule contingency prior to the vehicle builds should be looked at as a substantial risk. Missing a vehicle build is not an alternative, so eliminating schedule contingency increases the risk that compression costs (overtime, expedited freight, and priority rates) will be needed if any critical tasks exceed their duration estimates.

When dealing with these changes, don't overlook the impact on the project team. Frequent or significant changes in direction or tear-ups in design have a demoralizing effect on all the people involved. No matter how dedicated, a team's energy, creativity, and enthusiasm wanes when its members begin to feel that they have completed the same task three or four times. Factor in the human aspect when considering changes of any level.

So much for some of the causes, effects, and opportunities of scope changes; now, let's examine some guidelines for controlling scope change and implementing scope creep as an opportunity and not a risk

CONTROL IS THE KEY

First, it is vitally important to establish a written, detailed baseline. The baseline should encompass both the final products and the work process that will be used to deliver that product. In some industries, a quotation package or a formal contract would determine the baseline. In the automotive industry, under the present philosophy of early supplier selection, the product may not be well defined at the time that you are selected as a supplier and expected to commit to some form of cost and timing. This puts more pressure on you to delineate what you intend to provide and all the assumptions used to develop your costs and timing. Although this baseline will probably not represent the final product and process, it does represent the starting point or ***stake in the ground*** from which all scope changes can be tracked.

Your customers need to be well informed of the content of your baseline, as any discrepancies between what you think you are selling and what they think they are buying need to be resolved as early as possible. A joint agreement on the stake in the ground is crucial to assure appropriate incorporation of subsequent changes, as well as to prevent major disagreements over pricing at a later stage in the project.

When establishing the baseline with your customer, also establish how the baseline will be changed. All changes should be documented in a format acceptable to both your own organization and your customer organization. This reduces the total workload necessary for completing multiple forms for the same change and also eliminates a potential for translation error. The format should be individually tailored to the particulars of your own organization, the customer organization, and to the project. Thus, though some differences may exist from project to project within your organization, the overall communication on a particular project will be maximized. Even though additional, more formal documentation may be required later (such as purchase-order modifications), a joint direction and communication document maintains the pace of the project.

A change document should include all significant factors. For most projects, this includes items such as project costs, investment in tooling and facilities, product costs, and timing. However, specific projects or industries may have other requirements that must also be closely tracked (product weight, environmental concerns, risk levels). By including **all** of the significant factors (with justifications), the product-change documentation becomes a stand-alone document that requires no further explanation. All variances should be measured against the present approved level of the baseline.

When defining the change documentation format, the individuals with the responsibility for authorizing the change must be identified. This authority may be different, depending on the nature or level of the change, and it may mean that more than one individual from each organization must be involved. It is imperative that authorizing individuals for both organizations acknowledge (sign) the change document so that the document can be recognized as official direction.

After approval of a change, two significant tasks must be completed. The first is the updating of the baseline to incorporate the changes. The updated baseline is then used as the basis for any future changes. All change documents should be retained so that the project-change history can be traced from the initiation of the project to the termination, and postproject analyses can use this history as a guide for future similar projects.

Finally, the change must be communicated to all parties involved in the project so that the entire team is working toward the same direction. Slow dissemination of direction changes causes confusion on the project team, with subsequent loss of efficiency and morale. Everyone needs to be working on the same thing, with the most up-to-date direction.

Changes to the work content and objectives of a project, whether small creeping changes or large shifts in direction, are to be expected. With careful attention to detail, changes can be implemented as opportunities for the performing organization. Recognizing the sources and impact of changes and instituting appropriate controlling measures ensures that a project meets all of its objectives.

Best Practices for Controlling Technology-Based Projects

Hans J. Thamhain, Bentley *College,* Waltham, Massachusetts

Project Management Journal (Dec. *1996)*

CHALLENGES OF MANAGING PROJECTS TODAY

For world-class companies, project management is a powerful competitive tool, crucial for achieving desired business performance (Berman and Vasconcellos 1994; Raz 1993; Thamhain 1994b). Although the basic concepts of project management have been known for a long time (Randolph and Posner 1988; Tharnhain and Wilemon, 1986), its discipline expands continuously (Knutson 1996). As a result, the tools, techniques, and management practices needed to run projects successfully in today's challenging business environment have changed considerably (Cespedes 1994; Clark and Wheelwright 1992a; Davis 1994; Ramping up 1995; Hofman and Rochart 1992; Moder 1994; Thamhain 1994b). Until the 1980s, project management focused on administrating schedule and resource data. This tracking of project metrics is still an important part of project management (Cunningham 1994; Rigby 1995; Thamhain and Wilemon 1986). However, the business environment of the 1990s is quite different from what it used to be. New technologies have become a significant factor for almost every business, affecting project activities from small to large and from service to manufacturing (Berman and Vasconcellos 1994; Deschamps and Nayak 1995; Rigby 1995; Thamhain 1996b). Computers and communications have radically changed the workplace and have transformed our global economy more and more toward service and knowledge work with a high mobility of resources, skills, processes, and technology itself.

Technology—What Is Different? Despite the difficulty of measuring technology content of a business, or separating high-technology from low-technology projects, many managers clearly identify their projects as high technology. They see themselves in a different, more challenging environment. When describing their operations—whether product, process, or service oriented—these managers strike some common ground. Supported by considerable research (Archibald 1992; Berman and Vasconcellos 1994; Clark and Wheelwright 1992b; DeMaio 1994; Gobeli and Brown 1993; Martinez 1995; Raz 1993; Slevin and Pinto 1987; Thamhain 1990, 1994b, 1996b; Thamhain and Wilemon 1996), these managers identify specific characteristics that make their work environment unique:

- high degrees of work complexity
- evolving solutions
- high levels of innovation and creativity
- intricate technology transfer processes
- multidisciplinary teamwork and decision-making
- complex support systems such as CAD, CAM, ERP, and DFM/A
- sophisticated multicompany alliances
- highly complex forms of work integration.

In addition, self-directed teams are gradually replacing the traditional, more hierarchically structured project team (Sprague and Greenwell 1992; Thamhain and Wilemon 1996), and are seen as a significant tool for orchestrating and eventually controlling complex projects. However, they also require a more sophisticated management style that relies strongly on group interaction, resource and power sharing, individual accountability, commitment, self-direction, and control (Bahrami 1992; Higgins and Watts 1986; Larsen and Gobeli 1987; Mintzberg 1994; Thamhain 1990). These complex projects and their integration also rely to a considerable extent on member-generated performance norms and evaluations rather than hierarchical guidelines, policies, and procedures (Thamhain and Wilemon 1996). While this paradigm shift is the result of changing organizational complexities, capabilities, demands, and cultures, it also requires radical departures from traditional management philosophy on organizational structure, motivation, leadership, and project control. As a result, traditional management tools, designed largely for top-down control and centralized command and communications, are no longer sufficient for generating satisfactory results.

New Management Tools. In response to these challenges, new project management tools and techniques have evolved, which are often more integrated with the business process, offering more sophisticated capabilities for project tracking and control in an environment that is not only different in culture, but also has to deal with a broad spectrum of contemporary challenges such as time-to-market, accelerating technologies, innovation, resource limitations, technical complexities, project metrics, operational dynamics, risk, and uncertainty (Dean et al. 1992; Thamhain 1994b; Thamhain and Weiss 1992; Thomasen and Butterfield 1993). Using these modern tools requires new skills and a more sophisticated management style. All of this has a profound impact on the way project leaders must manage to get desired results. The methods of communication, decision-making, soliciting commitment, and risk sharing are constantly shifting away from a centralized, autocratic management style toward a team-centered, more self-directed form of project control (Cash and Fox 1992; Cespedes 1994; Jackman 198911990; Kernaghan 1986; Thamhain and Wilemon 1986). Equally important, project control has radically departed from its narrow focus of satisfying schedule and budget constraints to a much broader and more balanced managerial approach, which focuses on the effective search for solutions to complex problems (Abdel-Hamid and Madnick 1990; Dean et al. 1992; Greiner and Schein 1981; Hatfield 1995; Lewis 1990). This requires tradeoffs among many parameters such as creativity, change-orientation, quality, and traditional schedule and budget constraints (Lovitt 1996; Oberlender and Abel 1995; Tippett and Waits 1994). Control also requires accountability and commitment from the team members toward the project objectives.

WHAT WE KNOW ABOUT CONTROLLING TECHNICAL PROJECTS

The importance of project control and its impact on business performance has long been recognized (Cash and Fox 1992; Lewis

1991; Thamhain 1990a). Effective control helps run the project according to plan, often in spite of changes, contingencies, and work-related complexities especially common to technology-based businesses. Considerable research has been conducted on the methods and practices of conventional project control, related primarily to schedule and budget administration, with results extensively discussed in the literature (Anbari 1985; Archibald 1992; Cash and Fox 1992; Christensen 1994; Cunningham 1994; Drigani 1989; "1995 Project Management Software Survey"; Lewis 1991; Randolph and Posner 1988). However, conventional tools and methods of project control seldom produce satisfactory results in today's environment. Today's technology projects especially require innovative solutions to complex problems and flexible change-oriented implementation of the project plan. Traditional methods of schedule and budget control are often useless and sometimes even counterproductive to overall project performance (Anbari 1985; Cleland 1985; Lovitt 1996; Manganelli and Klein 1994; Prasad 1995; Roberts and Hughes 1996).

Competing effectively in such a complex marketplace requires more than just technological parity and resources. It also requires the ability to manage these projects through today's complex, fast-changing organizations, its people, processes, and operating systems, all working together in an intricate, integrated fashion (Bahrami 1992; Thamhain 1994b). Yet, especially for technology-intensive work, our project management systems have not kept up with the vastly changing organizational needs (Adler, McDonald and MacDonald 1992; Beacon et al. 1994; Descharnps and Nayak 1995).

Trying to Climb Out of Quandaries. On the other side, many companies in recent years have invested heavily in new management tools and techniques that promise more effective alternatives and enhancements to traditional forms of project control. Tables 1–3 summarize the more popular methods, including both traditional and contemporary tools used today These tools are grouped into three categories: analytical tools and techniques, procedural tools and techniques, and people-oriented tools and techniques.

Applications overlap a great deal among these tools within each category as well as among the three classifications. However, each group provides some descriptive focus and a convenient way to partition and catalog the long list of control tools.

So much for the tool box! The problem is that these management tools do not come with users' manuals. For starters, there has

Analytical Management Technique	**Description**	Elements **of Control**	Conditions for Successful **Control**
Action Item/ Report	A memo or report defining specific items agreed upon with the resolver, necessary to move the project forward or to correct a deficiency.	Responsibility identification, personal commitment, peer pressure.	Individual commitment, management support, incentives.
Computer **Software**	Computer **software** to support project planning, tracking. and control. Provides various reports of project status and performance analysis, and documentation.	Schedule, budget, **PERT/CPM,** resource leveling scheduling, cost-time tradeoff.	**Ability** to measure status. Valid input data. Willingness to correct deviations. Leadership.
Critical **Path** Analysis	Analysis of the longest paths within a network schedule with the **objective** of 1) determining the impact of task delays, problems, contingencies, and organizational dependencies, 2) **finding** solutions, and, 3) optiminngschedule performance.	Schedule, budget, **deliverables,** cost-time **tradeoff.**	Accurate estimates of effort, cost, and duration.
Budget Tracking	**Analysis** of planned versus actual budget expenditures relative to work performed. The objective is to detect and correct project performance problems and to deal with projected **cost** variances in their early developments.	Cast, budget. **deliverables,** project status.	
Deficiency Report	Description of an emerging deficiency (work, timing, or budget), including impact analysis and recommended resolution.	Schedule, costs, configuration management, impact analysis.	Candor. Commitment to plan. Management direction.
Earned Value Analysis	Comparison of project completion status to budget expenditure. The regular calculation and analysis of **earned** value and performance index **allows** projections of cost variances and schedule slips and **serves** as an early **warning** system of project performance problems.	Schedule, budget, **deliverables,** cost-time tradeoff.	Measurable milestones. Ability to estimate cast and time-to-complete. **Trust.** Risk sharing. Ownership.
Interface Chart	A chart of N x N elements defining the inputs, outputs, and timing to and from N interfacing work groups. Chart can also be used as part of QFD to define and manage the 'customers" of the business process.	Task leaders, cross-functional communications, QFD framework.	Established cross-functional linkages. Management support and leadership.
PERT/CPM	Time-activity network showing task flow, interfaces and dependencies. Used for comprehensive analysis of project schedules and schedule changes.	Schedule, budget. **deliverables,** cost-time tradeoff.	Accurate cost, time and technical performance data. Measurable milestones.

Table 1 Analytical Management Techniques for Project Control

Continued on next page

Analytical Management Technique	Description	Elements of Control	Conditions for Successful Control
Schedule Compression Analysis	Graphical technique for showing compression of overlapping activities due to slippage of earlier or preceding milestones. Serves as early warning system for runaway schedules and costs.	Milestones, deliverables.	Accurate cost, time and technical performance data. Measurable milestones.
Schedule Tracking	Incremental tracking of activities through time by measuring predefined partial results against plan.	Measurable milestone, deliverables, micro-schedule.	Accurate cost, time and technical performance data.
Simulation	Simulation of a technical. business, or project situation based on some form of a model. Applications range from a simple test to computer-assisted analysis of complex business scenarios.	Advanced results, feasibility. technology transfer.	Relevant input data and appropriate model. Meaningful interpretation.
Status Assessment	Systematic comparison of technical progress with project schedule and budget data. Analysis of status against plan and possible revision of plan, scope, and business strategy.	Valid project plan, review process, earned value, variance analysis.	Accurate cost, time and technical performance data. Measurable milestones.
Variance Analysis	Analysis of causes of cost and schedule variances, cost-at-completion, earned value, percent of project completion and perfromance index. Applied to project status assessment. reporting and control.	Schedule, costs. configuration management, impact analysis, management.	

Table 1—*Continued*

been no universal evidence on the effectiveness of the more contemporary tools (Thamhain 1994b). Further, few guidelines have been published in the literature on how and where to use these new tools and techniques most appropriately Perhaps one of the greatest challenges for management is to seek management tools and techniques that meet the triple constraint:

- compatible with the business environment, processes, cultures, and values
- conducive to specific problem solving, which usually involves a whole spectrum of factors from innovation to decision-making, cross-functional communications, and dealing with risks and uncertainty
- useful for tracking and controlling the project according to established plans.