

Advanced Project Management APM

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جامعة الجميع الذكية

تسعى لتكون الكيان الأول الذي يتبنى مبدأ المجتمع التعليمي
التعاوني ويقدم العلم مقابل العمل لتنمية وبناء المجتمعات.

PMG 506

Advanced Project Management (APM)



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EVERYONE'S SMART UNIVERSITY

Advanced Project Management

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Lecture 11



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PMG 506
Project Control

PMG506 Advanced Project Management (APM)



Introduction:

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Project Initiation:

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Project planning

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Project Control

Control is the last element in the implementation cycle of planning–monitoring–controlling. Information is collected about system performance, compared with the desired (or planned) level, and action taken if actual and desired performance differ enough that the controller (manager) wishes to decrease the difference. In essence, control is the act of reducing the difference between plan and reality.

The exercise of control done by the project manager, we must note that the PMO, or other project overseer reporting to upper management, also has a project control function. Using the information gained from monitoring the project, as well as information concerning changes in the organizational goals, resources, and strategy, this group may need to take some form of action (control) regarding the project, such as redirecting it, getting it back on track, or perhaps even terminating it.

A special kind of control is exercised through risk management. As you will see, a great many of the things that can go wrong with project performance, cost, or schedule are the result of uncertainty. And the lion's share of the uncertainty has its source in systems that lie outside the project, its environment.

Project Control

11.1 THE FUNDAMENTAL PURPOSES OF CONTROL

The two fundamental objectives of control are:

1. The regulation of results through the alteration of activities.
2. The stewardship of organizational assets.

The PM must guard the physical assets of the organization, its human resources, and its financial resources.

Physical Asset Control

Physical asset control requires control of the use of physical assets. It is concerned with asset maintenance, whether preventive or corrective. At issue also is the timing of maintenance or replacement as well as the quality of maintenance.

If the project uses considerable amounts of physical equipment, the PM also has the problem of setting up maintenance schedules in such a way as to keep the equipment in operating condition while minimizing interference with ongoing work.

Project Control

11.1 THE FUNDAMENTAL PURPOSES OF CONTROL

Physical inventory, whether equipment or material, must also be controlled. It must be received, inspected (or certified), and possibly stored prior to use. Records of all incoming shipments must be carefully validated so that payment to suppliers can be authorized.

Human Resource Control

Stewardship of human resources requires controlling and maintaining the growth and development of people. Projects provide particularly fertile ground for cultivating people. Measurement of physical resource conservation is accomplished through the familiar audit procedures. The measurement of human resource conservation is far more difficult.

Financial Resource Control

It is difficult to separate the control mechanisms aimed at conservation of financial resources from those focused on regulating resource use. Most financial controls do both.

Project Control

11.1 THE FUNDAMENTAL PURPOSES OF CONTROL

The mind-set of the conservationist is often antithetical to the mind-set of the PM, whose attention is focused on the use of resources rather than their conservation. The PM, often the manager and controller at one and the same time, is subject to this conflict and has no choice but to live with it. The warring attitudes must be merged and compromised as best they can.

Project Control

11.2 THREE TYPES OF CONTROL PROCESSES

We must decide at what points in the project we will try to exert control, what is to be controlled, how it will be measured, how much deviation from plan will be tolerated before we act, what kinds of interventions should be used, and how to spot and correct potential deviations before they occur. In order to keep these and other such issues sorted out, it is helpful to begin a consideration of control with a brief exposition on the theory of control. There are three basic types of control mechanisms we can use: *cybernetic control*, *go/no-go control*, and *postcontrol*

Cybernetic Control

Cybernetic, or steering, control is by far the most common type of control system. (Cyber is the Greek word for “helmsman.”) The key feature of cybernetic control is its automatic operation.

11.2 THREE TYPES OF CONTROL PROCESSES

As Figure 11-1 shows, a system is operating with inputs being subjected to a process that transforms them into outputs. It is this system that we wish to control. In order to do so, we must monitor the system output. This function is performed by sensors that measure one or more aspects of the output, presumably those aspects one wishes to control. Measurements taken by a sensor are transmitted to the comparator, which compares them with a set of predetermined standards. The difference between actual and standard is sent to the decision maker, which determines whether or not the difference is of sufficient size to deserve correction. If the difference is large enough to warrant action, a signal is sent to the effector, which acts on the process or on the inputs to produce outputs that conform more closely to the standard.

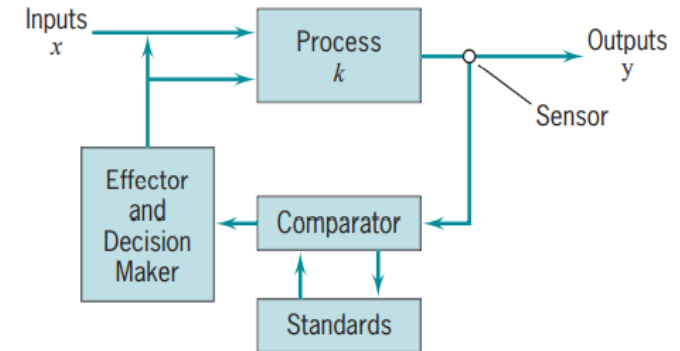


Figure 11-1 A cybernetic control system.

11.2 THREE TYPES OF CONTROL PROCESSES

A cybernetic control system that acts to reduce deviations from standard is called a negative feedback loop. If the system output moves away from standard in one direction, the control mechanism acts to move it in the opposite direction. The speed or force with which the control operates is, in general, proportional to the size of the deviation from standard. The precise way in which the deviation is corrected depends on the nature of the operating system and the design of the controller. Figure 11-2 illustrates three different response patterns. Response path A is direct and rapid, while path B is more gradual. Path C shows oscillations of decreasing amplitude.

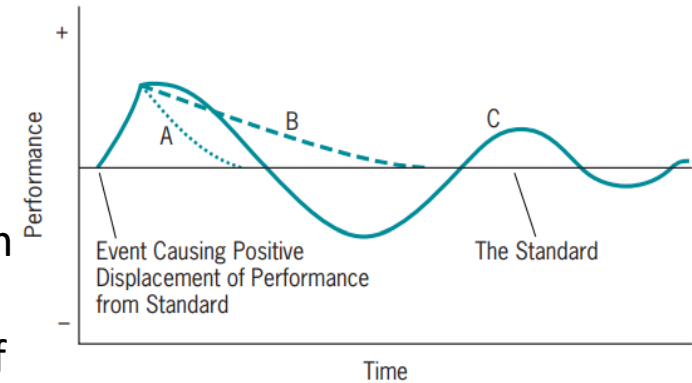


Figure 11-2 Typical paths for correction of deviation of performance from standard.

Information Requirements for Cybernetic Controllers

In order to establish total control over a system, the controller must be able to take a counteraction for every action the system can take.

11.2 THREE TYPES OF CONTROL PROCESSES

Given the decisions about what to control, the information requirements of a cybernetic controller are easy to describe, if not to meet.

First, the PM must define precisely what characteristics of an output are to be controlled.

Second, standards must be set for each characteristic.

Third, sensors must be acquired that will measure those characteristics at the desired level of precision.

Fourth, these measurements must be transformed into a signal that can be compared to a “standard” signal.

Fifth, the difference between the two is sent to the decision maker, which detects it, if it is sufficiently large.

sixth, transmits a signal to the effector that causes the operating system to react in a way that will counteract the deviation from standard.

If the control system is designed to allow the effector to take one or more of several actions, an additional piece of information is needed. There must be built-in criteria that instruct the effector on which action(s) to take.

Project Control

11.2 THREE TYPES OF CONTROL PROCESSES

Go/No-go Controls

Go/no-go controls take the form of testing to see if some specific precondition has been met. Most of the control in project management falls into this category. This type of control can be used on almost every aspect of a project. For many facets of performance, it is sufficient to know that the predetermined specifications for project output have been met. The same is often true of the cost and time elements of the project plan.

It is, of course, necessary to exercise judgment in the use of go/no-go controls. Certain characteristics of output may be required to fall within precisely determined limits if the output is to be accepted by the client. Other characteristics may be less precisely defined. In regard to time and cost, there may be penalties associated with nonconformance with the approved plans. Penalty clauses that make late delivery costly for the producer are often included in the project contract. At times, early delivery can also carry a penalty (e.g., when a just-in-time supply system is involved).

Phase-Gated Processes

One form of go/no-go control that has gained popularity is that of phase-gated processes (also known as stage gates, toll gates, quality gates)

Project Control

11.2 THREE TYPES OF CONTROL PROCESSES

Rather than waiting until the project is completed, and then finding out that it doesn't achieve the objectives of the organization, the phase-gate process controls the project at various points throughout its life cycle to make sure it remains on course and of value to the organization. This process is most commonly used for new product/service development projects where it is important to constantly evaluate the match between the changing, dynamic market and the changing nature of the new product/service under development.

Discovery-Driven Planning

A more recent type of go/no-go control has been proposed by McGrath et al. (1995) which reverses the evaluation process. Instead of trying to determine whether the project is achieving the numbers it needs to at this stage of the project, it looks at how valid the initial assumptions now appear to be regarding the project: the market, the customer's needs, the progress that has been made, performance expected in the future, costs to date and expected at completion, schedule to date and expected at completion, and so on. If a critical assumption is not met, the project must be replanned or the assumptions revised as appropriate. If no plan can satisfy all the revised assumptions, the project is terminated.

Project Control

11.2 THREE TYPES OF CONTROL PROCESSES

Information Requirements for Go/No-Go Controls

The project proposal, plans, specifications, schedules, and budgets (complete with approved change orders) contain all the information needed to apply go/no-go controls to the project. Milestones are the key events that serve as a focus for ongoing control activity. These milestones are the project's deliverables in the form of in-process output or final output.

Postcontrol

Also known as postperformance controls or reviews, or postproject controls or reviews are applied after the fact. Postcontrol is not a vain attempt to alter what has already occurred. Instead, it is a full recognition of the observation that “Those who cannot remember the past are condemned to repeat it.” Cybernetic and go/no-go controls are directed toward accomplishing the goals of an ongoing project. Postcontrol is directed toward improving the chances for future projects to meet their goals.

Postcontrol is applied through a relatively formal document that is usually constructed with four distinct sections.

Project Control

11.2 THREE TYPES OF CONTROL PROCESSES

➤ *The Project Objectives*

The report will contain a description of the objectives of the project. This description is taken from the project proposal. Project objectives include the effects of all change orders issued and approved during the project.

➤ *Milestones, Checkpoints, and Budgets*

This section of the postcontrol document starts with a full report of project performance against the planned schedule and budget. Significant deviations of actual schedule and budget from planned schedule and budget should be highlighted.

➤ *The Final Report on Project Results*

When significant variations of actual from planned project performance are indicated, no distinction is made between favorable and unfavorable variations. Both sides, the good and the bad, should be chronicled here.

Not only do most projects result in outputs that are more or less acceptable, most projects operate with a process that is more or less acceptable. The concern here is not on what the project did but rather on how it did it.

11.2 THREE TYPES OF CONTROL PROCESSES

Basically descriptive, this part of the final report should cover project organization, an explanation of the methods used to plan and direct the project, and a review of the communication networks, monitoring systems, and control methods, as well as a discussion of intraproject interactions between the various working groups.

➤ *Recommendations for Performance and Process Improvement*

The culmination of the postcontrol report is a set of recommendations covering the ways that future projects can be improved. The process of organizing and conducting projects can be improved by recommending the continuation of managerial methods and organizational systems that appear to be effective, together with the alteration of practices and procedures that do not.

11.3 THE DESIGN OF CONTROL SYSTEMS

If the control system is to be acceptable to those who will use it and those who will be controlled by it, the system must be designed so that it appears to be sensible. Standards must be achievable by the mechanical systems used. Control limits must be appropriate to the needs of the client—that is, not merely set to show “how good we are.” Like punishment, rewards and penalties should “fit the crime.” In addition to being sensible, a good control system should also possess some other characteristics:

- The system should be flexible. Where possible, it should be able to react to and report unforeseen changes in system performance.
- The system should be cost effective. The cost of control should never exceed the value of control. As we noted above, control is not always less expensive than scrap.
- The control system must be truly useful. It must satisfy the real needs of the project, not the whims of the PM.
- The system must operate in an ethical manner.
- The system must operate in a timely manner. Problems must be reported while there is still time to do something about them, and before they become large enough to destroy the project

11.3 THE DESIGN OF CONTROL SYSTEMS

- Sensors and monitors should be sufficiently accurate and precise to control the project within limits that are truly functional for the client and the parent organization.
- The system should be as simple as possible to operate.
- The control system should be easy to maintain. Further, the control system should signal the overall controller if it goes out of order.
- The system should be capable of being extended or otherwise altered.
- Control systems should be fully documented when installed, and the documentation should include a complete training program in system operation.

Critical Ratio Control Charts

On occasion it may be worthwhile, particularly on large projects, for the PM to calculate a set of critical ratios for all project activities. The critical ratio is:

$$(\text{actual progress/scheduled progress}) \times (\text{budgeted cost/actual cost})$$

11.3 THE DESIGN OF CONTROL SYSTEMS

The critical ratio is made up of two parts—the ratio of actual progress to scheduled progress, and the ratio of budgeted cost to actual cost. A ratio of actual to scheduled progress greater than one is “good.” If the ratio is less than one, it is “bad.” Similarly with the ratio of budgeted to actual cost.

Benchmarking

Or making comparisons to “best in class” practices across organizations. Benchmarking controls the project management process rather than the project itself.

Benchmarked of 500 firms in terms of best practices and key success factors for projects concluded four major areas. These areas are the responsibility of the Project Management Office.

- ***Promoting the benefits of project management***

Have the project manager report to a senior executive with multifunctional authority. Identify and nurture senior officers who champion project management. Conduct training in project management. Participate in project management benchmarking forums. Partner with educational and professional project management organizations. Use a variety of sources to communicate the benefits of project management to senior management.



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11.3 THE DESIGN OF CONTROL SYSTEMS

- *Personnel*

Pay for project management skills and high-risk projects through bonuses, stock options, and other incentives. Employ team-based pay. Create job descriptions and career paths for project managers. Develop a checklist for project manager selection and evaluation criteria. Offer project manager development programs. Design project manager retention programs. Offer advanced training and continuing education for project managers. Design a broadly based project manager evaluation process based on project skills, customer satisfaction, negotiation skills, and so on.

- *Methodology*

Standardize the organization's project management methods. Integrate the project management processes. Develop project management into a core competence of the organization. Develop a standard process for change management. Develop a standard process for conflict management.

- *Results of project management*

Measure project performance and the impact of the project on the organization. Measure the value received from the project. Measure the riskiness of the project. Identify the lessons learned from the project.

11.3 THE DESIGN OF CONTROL SYSTEMS

We are adding another “best practice” to be handled by the PMO:

- *On-course improvement in project management practices*

When improvements are suggested to the current project management protocol, the PMO should review them immediately and, if approved, institute them as soon as possible.

11.4 CONTROL: A PRIMARY FUNCTION OF MANAGEMENT

Control of projects is always exercised through people. Senior managers in the organization are governed by the CEO who is directed by such groups as the executive committee and/or board of directors/trustees. Senior managers, in turn, try to exercise governance of project managers, and project managers try to exert control over the project team and others representing functions that are involved with the project. The purpose is always the same—to bring the actual schedule, budget, and deliverables of the project into reasonably close congruence with the planned schedule, budget, and deliverables.

Though control does not ensure motivated behavior, individual reactions to the various types of control systems do affect levels of motivation. By and large, people respond to the goal-directedness of control systems in one of three general ways: (1) by active and positive participation and goal seeking; (2) by passive participation in order to avoid loss; and (3) by active but negative participation and resistance—usually not active resistance to the goal, but failure to undertake those activities that will result in goal achievement. Which of the three resemble a given individual's reaction to control depends on several variables, including such things as the specific control mechanism used, the nature of the goal being sought, the individual's self-image, assessment of the value of the goal, expectation of being able to achieve the goal, and basic tolerance for being controlled.

11.4 CONTROL: A PRIMARY FUNCTION OF MANAGEMENT

Cybernetic Controls

Human response to steering controls tends to be positive. Steering controls are usually viewed as helpful rather than as a source of unwelcome pressure if the controlees perceive themselves as able to perform inside the prescribed limits. It is not the “impossible dream” that motivates goal-seeking behavior, but rather a moderately good chance of success.

Go/No-Go Controls

Response to go/no-go controls tends to be neutral or negative. The reason appears to be related to the inherent nature of this type of control system. With go/no-go control systems, “barely good enough” results are just as acceptable as “perfect” results. The control system itself makes it difficult for the worker to take pride in high-quality work because the system does not recognize gradations of quality. In addition, it is all too common to be rather casual about setting the control limits for a go/no-go control; the limits should be very carefully set. The fact that this kind of control emphasizes “good enough” performance is no excuse for the nonchalant application of careless standards.

11.4 CONTROL: A PRIMARY FUNCTION OF MANAGEMENT

Postcontrols

Postcontrols are seen as much the same as a report card. They may serve as a basis for reward or punishment, but they are received too late to change current performance. Whether reaction to postcontrol is positive, neutral, or negative seems to depend on the “grade” received. In cases where a series of similar projects must be undertaken, postcontrols are regarded as helpful in planning for future work, but considerable care must be devoted to ensuring that controls are consistent with changing environmental conditions.

Balance in a Control System

When developing a control system, it is important that the system be well balanced. Unfortunately, the concept of balance is fuzzy—difficult to explain, difficult to achieve, and difficult to recognize. Though precise definition is impossible, we can describe some general features of a balanced control system, and also indicate some of the things a controller can do to achieve good balance in a system.

11.4 CONTROL: A PRIMARY FUNCTION OF MANAGEMENT

- A balanced control system is built with cognizance of the fact that investment in control is subject to sharply diminishing returns. Costs increase exponentially as the degree of control increases linearly and the optimal level of control varies with project size.
- A balanced control system recognizes that as control increases past some point, innovative activity is more and more damped, and then finally shut off completely.
- A balanced control system is directed toward the correction of error rather than toward punishment. This requires a clear understanding of the fact that the past cannot be changed, no matter how loudly the manager yells.
- A balanced system exerts control only to the degree required to achieve its objectives. It rarely pays to spend dollars to find lost pennies, nor is it sensible to machine a part to the ten-thousandth if the client's requirements are to the tenth.
- A balanced system utilizes the lowest degree of hassle consistent with accomplishing its goals. The controller should avoid annoying those people whose cooperation is required to reach system objectives.

11.4 CONTROL: A PRIMARY FUNCTION OF MANAGEMENT

Common causes of imbalance are these:

1. Placing too much weight on easy-to-measure factors and too little weight on difficult-to-measure, soft factors (the so-called intangibles).
2. Emphasizing short-run results at the expense of longer-run objectives—possibly one of the most serious problems facing industry today.
3. Ignoring the changes in the structure of organizational goals that result from the passage of time or changes in the firm's circumstances. For example, high quality and strict adherence to delivery schedules might be extremely important to a new firm. Later, perhaps, expense control might be more important.
4. Overcontrol by an aggressive executive often causes trouble. In an attempt to create a reputation for on-time delivery, one overly zealous PM put so much pressure on the project team that on-time shipments took precedence over proper test procedures. The result was serious malfunctions of the product and its subsequent recall.
5. Monitoring and controlling items may lead some people to ignore anything that is not measured. "If it isn't counted, it doesn't count," is the attitude. This factor was responsible for the failure of many attempts at Management-by-Objectives.

11.4 CONTROL: A PRIMARY FUNCTION OF MANAGEMENT

Controlling Creative Activities

Some brief attention should be paid to the special case of controlling research and development projects, design projects, and similar processes that depend intimately on the creativity of individuals and teams. First, the more creativity involved, the greater the degree of uncertainty surrounding outcomes. Second, too much control tends to inhibit creativity. But neither of these dicta can be taken without reservation. Control is not necessarily the enemy of creativity; nor, popular myth to the contrary, does creative activity imply complete uncertainty. While the exact outcomes of creative activity may be more or less uncertain, the process of getting the outcome is usually not uncertain. If the potential payoff for the creative activity is high, the need for careful risk management is also high. In order to control creative projects, the PM must adopt one or some combination of three general approaches to the problem: (1) process review, (2) personnel reassignment, and (3) control of input resources.

Process Review

Focuses on the process of reaching outcomes rather than on the outcomes per se. Because the outcomes are partially dependent on the process used to achieve them, uncertain though they may be, the process is subjected to control.

11.4 CONTROL: A PRIMARY FUNCTION OF MANAGEMENT

Personnel Reassignment

Individuals who are productive are kept; those who are not are moved to other jobs or to other organizations. Problems with this technique can arise because it is easy to create an elite group. While the favored few are highly motivated to further achievement, everyone else tends to be demotivated. It is also important not to apply control with too fine an edge. While it is not particularly difficult to identify those who fall in the top and bottom quartiles of productivity, it is usually quite hard to make clear distinctions between people in the middle quartiles

Control of Input Resources

The focus is on efficiency. The ability to manipulate input resources carries with it considerable control over output. Obviously, efficiency is not synonymous with creativity, but the converse is equally untrue. Creativity is not synonymous with extravagant use of resources

11.5 CONTROL OF CHANGE AND SCOPE CREEP

The original plans for projects are almost certain to be changed before the projects are completed. Project changes result from three basic causes:

- (1) uncertainty about the technology on which the work of the project or its output is based;
 - (2) an increase in the knowledge base or sophistication of the client/user leading to scope creep; and
 - (3) a modification of the rules applying to the process of carrying out the project or to its output.
- All three of these causes are especially common in software projects, where scope creep is legendary. When either the process or output of a project is changed, there is almost always a concomitant change in the budget and/or schedule.

Change is accomplished with a formal *change control system* which, in some industries, is a part of their *configuration management system* responsible for integrating and coordinating changes throughout the systems development cycle. The purpose of the formal change control system is to:

- review all requested changes to the project (both content and procedures)
- identify all task impacts
- translate these impacts into project performance, cost, and schedule
- evaluate the benefits and costs of the requested changes
- identify alternative changes that might accomplish the same ends

11.5 CONTROL OF CHANGE AND SCOPE CREEP

- accept or reject the requested changes
- communicate the changes to all concerned parties
- ensure that the changes are implemented properly
- prepare monthly reports that summarize all changes to date and their project impacts

The following simple guidelines can be used to establish an effective change control procedure. The guidelines can also be integrated into the risk management system as a way to manage the risks imposed by scope creep.

1. All project contracts or agreements must include a description of how requests for a change in the project's plan, budget, schedule, and/or deliverables will be introduced and processed.
2. Once a project is approved, any change in the project will be in the form of a change order that will include a description of the agreed-upon change together with any changes in the plan, budget, schedule, and/or deliverables that result from the change. For any but minor changes, a risk identification and analysis study should be performed. In order to study the potential impact of change, it is often possible to conduct a simulation study.
3. The project manager must be consulted on all desired changes prior to the preparation and approval of the change order. The project manager's approval, however, is not required.

11.5 CONTROL OF CHANGE AND SCOPE CREEP

4. Changes must be approved, in writing, by the client's agent as well as by an appropriate representative of senior management of the firm responsible for carrying out the project.
5. Once the change order has been completed and approved, the project master plan should be amended to reflect the change, and the change order becomes a part of the master plan.

SUMMARY

As the final subject in the project implementation part of the text, this chapter described the project control process in the planning-monitoring-controlling cycle. The need for control was discussed and the three types available were described. Then the design of control systems was addressed, including management's role, achieving the proper balance, and attaining control of creative activity as well as handling changes.

- Control is directed to performance, cost, and time.
- The two fundamental purposes of control are to regulate results through altering activity and to conserve the organization's physical, human, and financial assets.
- The three main types of control processes are cybernetic (either first-, second-, or third-order), go/no-go, and postcontrol.
- The postcontrol report contains four sections:
 - Project objectives
 - Milestones and budgets
 - Final project results
 - Recommendations for improvement
- The trend projection curve, critical ratios, and the control chart are useful control tools.

Project Control

SUMMARY

- Control systems have a close relationship to motivation and should be well-balanced; that is, cost-effective, appropriate to the desired end results, and not overdone.
- Three approaches to the control of creativity are process review, personnel reassignment, and control of inputs.
- The most irritating problem facing a PM is the control of change.

In the next chapter, we initiate the project termination part of the text, beginning with evaluation and auditing. This topic is closely related to the postcontrol topics in this chapter.

GLOSSARY

Champion A person with organizational clout who takes on personal responsibility (though not usually day-to-day management) for the successful completion of a project for the organization.

Control Assuring that reality meets expectations or plans. Usually involves the process of keeping actions within limits to assure that certain outcomes will in fact happen.

Control Chart A chart of a measure of performance— commonly a quality characteristic—over time, showing how it changes compared to a desired mean and upper and lower limits.

Critical Ratio A ratio of progress (actual/scheduled) times a cost ratio (budgeted/actual).

Cybernetic An automatic control system containing a negative feedback loop.

Early Warning System A monitoring system that forewarns the project manager if trouble arises.

Go/No-Go Initially, a type of gauge that quickly tells an inspector if an object's dimension is within certain limits. In the case of project management, this can be any measure that allows a manager to decide whether to continue, change, or terminate an activity or a project.

Thank you

