CHAPTER

12

Project Auditing

In the previous chapter, we discussed postcontrol. Postcontrol cannot change the past, but it tries to capture the essence of project successes and failures so that future projects can benefit from past experiences. To benefit from past experiences implies that one understands them, and understanding requires evaluation. But project evaluation is not limited to after-the-fact analysis. While the project as a whole is evaluated when it has been completed, project evaluation should be conducted at a number of points during the life cycle.

A major vehicle for evaluation (but by no means the only one) is the *project audit*, a more or less formal inquiry into any aspect of the project. We associate the word *audit* with a detailed examination of financial matters, but a project audit is highly flexible and may focus on whatever matters senior management desires. Note that there are also other types of audits such as *ethics audits* which can be helpful when employing project management in an organization. For example, as Schaefer et al. (1998, p. 40) note, "Ethics is not a matter of right or wrong; it is a process by which an organization evaluates decisions," a process that is most certainly relevant to project management! And in addition to project audits, there are also other kinds of project evaluations, such as project *reviews*; see Sangameswaran (1995) for more details.

The term *evaluate* means to set the value of or appraise. Project evaluation appraises the progress and performance of a project compared to that project's planned progress and performance, or compared to the progress and performance of other, similar projects. The comparison is made by measuring the project against several different types of standards. The evaluation also supports any management decisions required for the project. Therefore, the evaluation must be conducted and presented in a manner and format that assures management that all pertinent data have been considered. The evaluation of a project must have credibility in the eyes of the management group for whom it is performed and also in the eyes of the project team on whom it is performed. Accordingly, the project evaluation must be just as carefully constructed and controlled as the project itself.

In this chapter, we describe the project audit/review/evaluation, its various forms and purposes, and some typical problems encountered in conducting an audit/evaluation. For an excellent general work on evaluation, see Meyers (1981).

12.1 PURPOSES OF EVALUATION—GOALS OF THE SYSTEM

Certainly the major element in the evaluation of a project is its "success." In a study of a variety of different kinds and sizes of industrial projects (Shenhar et al., 1997), 127 project managers identified 13 factors constituting four independent dimensions of project success, from their perspective as project managers. The first and most straightforward dimension is the project's *efficiency* in meeting both the budget and the schedule. This has been the primary focus of our discussion of project management and control thus far, meeting the time, cost, and performance objectives of the project. The second and most complex dimension is that of *customer impact/satisfaction*. This dimension includes meeting the project's technical and operational specifications but also includes factors relating to loyalty and repurchase: fulfilling the customer's needs, actual use by the customer, solving a major operational problem of the customer, and the perennial challenge of customer satisfaction.

The third dimension is *business/direct success*, measured here primarily in terms of level of commercial success and market share. For internal projects, however, the factors might include such measures as yields, cycle times, processing steps, quality, and so on. The last dimension, somewhat more difficult and nebulous to ascertain, is *future potential*. This includes factors relating to opening a new market, developing a new line of products or services, or if an internal project, developing a new technology, skills, or competences. Next, we will note some additional dimensions for evaluating projects that go beyond those discussed by Shenhar et al. (1997).

Beyond the straightforward considerations of project success, another primary purpose of evaluation is to help translate the achievement of the project's goals into a contribution to the parent organization's goals. To do this, all facets of the project are studied in order to identify and understand the project's strengths and weaknesses. It is the equivalent of an application of Six-Sigma or TQM to project management. The result is a set of recommendations for improvements that can help both ongoing and future projects to:

- Identify problems earlier
- Clarify performance, cost, and time relationships
- Improve project performance
- Locate opportunities for future technological advances
- Evaluate the quality of project management
- Reduce costs
- Improve the process of risk identification and management
- Speed up the achievement of results
- Identify mistakes, remedy them, and avoid them in the future
- Provide information to the client
- Reconfirm the organization's interest in and commitment to the project

For brevity, we will refer to the stated project objectives, including customer satisfaction, as the project's "direct goals." They ignore, however, many costs and benefits to the project, to its team members, and to the parent organization that are not overtly established as objectives, such as the preceding list of project improvements. Evaluation often makes recommendations that relate to these ancillary, unplanned but important contributions to the project and its parent. Some examples of recommendations concerning these "ancillary goals" include attempts to:

- Improve understanding of the ways in which projects may be of value to the organization
- Improve the processes for organizing and managing projects

organizational objectives. For example, a person may seek to join a project in order to learn a new skill, one that increases that person's employment mobility. At times, the scientific direction taken by R & D projects is as much a function of the current interest areas of the scientists working on the project as it is the scientific needs of the project. While such purposes are not illegitimate or unethical, they are rarely admitted.

A third problem arises through lack of trust. Members of a project team are never quite comfortable in the presence of an auditor/evaluator. If the auditor/evaluator is an "outsider"—anyone who cannot be identified as a project team member—there is fear that "we won't be understood." While such fears are rarely specific, they are nonetheless real. If the auditor/evaluator is an "insider," fear focuses on the possibility that the insider has some hidden agenda, is seeking some personal advantage at the expense of the "rest of us." The motives of insider and outsider alike are distrusted. As a result, project team members have little or no incentive to be forthcoming about their individual or project ancillary goals.

Finally, a fourth problem exists. Projects, like all organizations that serve human ends, are multipurposed. The diverse set of direct and ancillary, project and individual goals do not bear clear, organizationally determined (or accepted) priorities. Various members of the project team may have quite different ideas about which purposes are most important, which come next in line, and which are least important. In the absence of direct questions about the matter, no one has to confront the issue of who is right and who is wrong. As long as the goals and priorities are not made explicit, project team members can agree on *what* things should be done without necessarily agreeing (or even discussing) *why* those things should be done. Thus, if some of the project's objectives are not openly debated, each member can tolerate the different emphases of fellow team members. No one is forced to pick and choose, or even to discuss such matters with co-workers.

All in all, the task of finding the ancillary goals of a project is difficult. Most evaluations simply ignore them, but the PM is well advised to take a keen interest in this area, and to request that evaluations include ancillary goals, the project's and the parent organization's, if not those of individuals. Even though one must usually be satisfied with rough, qualitative measures of ancillary-goal achievement, the information can be valuable. It may provide insight into such questions as: What sorts of things motivate people to join and work on projects? What sorts of rewards are most effective in eliciting maximum effort from project personnel? What are the major concerns of specific individuals working on the project?

In Chapter 5, we alluded to the importance of the project management "war room" (office, PMO) as a meeting place for the project team, a display area for the charts that show the project's progress, a central repository for project files and reports, and an office for the PM and other project administrators. The war room is also the "clubhouse" for the project team members and serves an important ancillary goal. It is to the project what the local pub was to "that old gang of mine." The camaraderie associated with a successful, well-run project provides great satisfaction to team members. The PMO, therefore, fills an emotional need as well as meeting its more mundane, direct administrative goals. The best PMOs (Baker, 2007) also, however, offer the best project leadership in the organization and are proud of it, enjoying strong executive support and the admiration of others in the organization who would love to be a part of this future-oriented, well-run learning team.

12.2 THE PROJECT AUDIT

The project audit is a thorough examination of the management of a project, its methodology and procedures, its records, its properties, its budgets and expenditures, and its degree of completion. It may deal with the project as a whole, or only with a part of the project. The

Project Management in Practice

Lessons from Auditing 110 Client/Server and Open Systems Projects

In an 11-year audit of 110 client/server and open systems projects, one auditor boiled the differences between success and failure down to four foundational concepts.

1. *Objectivity regarding scope, budget, deadlines, and solution design*. Lack of objectivity in these areas is one of the basic causes of project failure. Decisions concerning the business case for initiating the project and establishing all of its parameters need to be scrutinized for bias and inadequate diligence.
2. *Experienced people at all levels in the project*. Having experienced people on both the client side and the contractor side helps in a number of areas: maintaining a cooperative, problem-solving attitude, enforcing milestones and deliverables, using professional project management techniques, and maintaining continuous user involvement.
3. *Authority matched with responsibility*. Since a project is usually established with a certain scope but limited budget and schedule, the project manager needs to have the authority to make tradeoffs between these objectives. This level of authority needs to be present on both the client side as well as the contractor side.
4. *Accountability sufficient to ensure that all parties perform as promised or are definitely held responsible*. Accountability needs to be thoroughly detailed in the original contracts and purchase orders. It should include details concerning the project champion, the original estimator, suppliers, the client team and users, and the contractor team. Keeping projects short, such as under six months, keeps from diluting accountability through personnel turnover.

Source: T. Ingram, "Client/Server and Imaging: On Time, On Budget, As Promised," *PM Network*, December 1995, pp. 13–18.

formal report may be presented in various formats, but should, at a minimum, contain comments on the following points:

1. *Current status of the project*. Does the work actually completed match the planned level of completion?
2. *Future status*. Are significant schedule changes likely? If so, indicate the nature of the changes.
3. *Status of crucial tasks*. What progress has been made on tasks that could decide the success or failure of the project?
4. *Risk assessment*. What is the potential for project failure or monetary loss?
5. *Information pertinent to other projects*. What lessons learned from the project being audited can be applied to other projects being undertaken by the organization?
6. *Limitations of the audit*. What assumptions or limitations affect the data in the audit?

These six parts of the audit report will be discussed in more detail in the next section of this chapter.

Note that the project audit is not a financial audit. The audit processes are similar in that each represents a careful investigation of the subject of the audit, but the outputs of these processes are quite different. The principal distinction between the two is that the financial audit has a limited scope. It concentrates on the use and preservation of the organization's assets. The project audit is far broader in scope and may deal with the project as a whole or

- Provide a congenial environment in which project team members can work creatively together
- Identify organizational strengths and weaknesses in project-related personnel, management, and decision-making techniques and systems
- Identify and improve the response to risk factors in the firm's use of projects
- Allow access to project policy decision making by external stakeholders
- Improve the way projects contribute to the professional growth of project team members
- Identify project personnel who have high potential for managerial leadership

The identification of ancillary goals is a difficult and politically delicate task. Although the adjective "ancillary" is not a sufficient descriptor, it is the best single word we could find. Synonyms are "helpful," "subsidiary," "accessory," and the like, and we have all these things in mind. In addition, the ancillary goals are usually not overtly identified. Interviews with the individuals in charge of making decisions about projects will help to expose the ancillary goals that the firm is seeking by supporting the project. But for the most part, they are "hidden" by accident, not by purpose. Finding them often requires deductive reasoning. Organizational decisions and behaviors imply goals, often very specific goals, that are simply not spelled out anywhere in the organizational manuals. For example, most executives desire to operate their organizations in such a way that people enjoy the work they do and enjoy working together, but only occasionally do firms publish such statements. Few firms would disavow this objective, they simply do not *overtly* subscribe to it. Even so, this particular objective affects the decisions made in almost every firm we know.

At times, however, ancillary goals and the parties-at-interest that support them can be readily identified. Some examples are: goals that govern the treatment of animals that may be involved in a project, goals that demand highly specific processing of information about a project output (e.g., pharmaceutical drugs), or goals that control the production processes associated with a project (e.g., antipollution). Whether clearly identified or not, and whether measured or not, ancillary goals affect decisions made on all projects.

A reasonable attempt to identify as many goals as possible is valuable. Frequently, recognition of an ancillary goal is required to understand why certain decisions on projects are made. The desire to identify individuals who have high potential for leadership may explain why a given person with relatively little experience is given a specific project responsibility. Ancillary goals add several additional dimensions to project evaluation.

There are tough problems associated with finding the ancillary goals of a project. First, and probably the most important, is the obvious fact that one cannot measure performance against an unknown goal. Therefore, if a goal is not openly acknowledged, project team members need not fear that their performance can be weighed and found wanting. The result is that goals appearing in the project proposal must be recognized and are a source of some anxiety in members of the project team. But "unwritten" goals can often be ignored. Again, ancillary goals are rarely disclaimed; they are merely not mentioned.

Whether or not anxiety about meeting ancillary goals is deserved is not relevant. Particularly in this era of corporate "restructuring," anxiety is present. It is heightened by the fear that an evaluation may not be conducted "fairly," with proper emphasis on what is being accomplished rather than stressing shortcomings. If the self-image of the project team is very strong, this barrier to finding ancillary goals of the project may be weak, but it is never absent.

A second problem arises during attempts to find the ancillary goals of a project. Individuals pursue their own ends while working for organizations. At times, however, people may be unwilling to admit to personal goals—goals they may see as not entirely consistent with

Table 12-1. Comparison of Financial Audits with Project Audits

	Financial Audits	*Project Audits*
Status	Confirms status of business in relation to accepted standard	Must create basis for, and confirm, status on each project
Predictions	Company's state of economic well-being	Future status of project
Measurement	Mostly in financial terms	Financial terms plus schedule, progress, resource usage, status of ancillary goals
Record-keeping system	Format dictated by legal regulations and professional standards	No standard system, uses any system desired by individual organization or dictated by contract
Existence of information system	Minimal records needed to start audit	No records exist, data bank must be designed and used to start audit
Recommendations	Usually few or none, often restricted to management of accounting system	Often required, and may cover any aspect of the project or its management
Qualifications	Customary to qualify statements if conditions dictate, but strong managerial pressure not to do so	Qualifications focus on shortcomings of audit process (e.g., lack of technical expertise, lack of funds or time)

any component or set of components of the project. Table 12-1 lists the primary differences between financial and project audits.

While the project audit may be concerned with any aspect of project management, it is not a traditional management audit. Management audits are primarily aimed at ensuring that the organization's management systems are in place and operative. The project audit goes beyond this. Among other things, it is meant to ensure that the project is being *appropriately* managed. Some managerial systems apply fairly well to all projects; for example, the techniques of planning, scheduling, budgeting, and so forth. On the other hand, some management practices should differ with different types of projects. See Ruskin et al. (1985) for an interesting discussion of the project management audit and Sangameswaran (1995) and Corbin et al. (2001) for some guidance on auditing do's and don'ts.

In the previous chapter, we argued that software projects were not *significantly* different from other types of projects. We stand on that position, but we also note that they possess some unique characteristics worthy of recognition and response. For example, computer-based projects are ordinarily very labor-intensive while many manufacturing projects, for instance, are highly capital intensive. A thoughtful manager will simply not adopt the same managerial approach to each. The need for and value of a participative style (Six-Sigma, TQM, EI, etc.) is well established in the case of labor-intensive projects where problems are often ill-structured. If the project is capital intensive and characterized by well-structured problems, the need for and value of a participative style is *relatively* diminished. (The reader must not read these statements as degrading the value of participative management. It is simply more valuable and relevant in some cases than others.)

To sum up, the management audit looks at managerial systems and their use. The project audit studies the financial, managerial, and technical aspects of the project as an integrated set applied to a specific project in a specific organizational environment.

Depth of the Audit

There are several practical constraints that may limit the depth of the project auditor's investigation. Time and money are two of the most common (and obvious) limits on the depth of investigation and level of detail presented in the audit report. Of course, there are costs associated with the audit/evaluation process over and above the usual costs of the professional and clerical time used in conducting the audit. Accumulation, storage, and maintenance of auditable data are important cost elements. Remember that such storage may be critically important in meeting the test of "due diligence" noted in Chapter 11. (Remember, too, that destruction of business data may be illegal under certain circumstances.)

Also serious, but less quantifiable, are two often overlooked costs. First, no matter how skilled the evaluator, an audit/evaluation process is always distracting to those working on the project. No project is completely populated with individuals whose self-esteem [defined by Ambrose Bierce (1991) as "an erroneous appraisement"] is so high that evaluation is greeted without anxiety. Worry about the outcome of the audit tends to produce an excessive level of self-protective activity, which, in turn, lowers the level of activity devoted to the project. Second, if the evaluation report is not written with a "constructive" tone, project morale will suffer.* Depending on the severity of the drop in morale, work on the project may receive a serious setback.

It is logical to vary the depth of the investigation depending on circumstances and needs unique to each project. While an audit can be performed at any level the organization wishes, three distinct levels are easily recognized and widely used: the general audit, the detailed audit, and the technical audit. The general audit is normally most constrained by time and resources and is usually a brief review of the project, touching lightly on the six concerns noted earlier. A typical detailed audit is conducted when a follow-up to the general audit is required. This tends to occur when the general audit has disclosed an unacceptable level of risk or malperformance in some part(s) of the project.

At times, the detailed audit cannot investigate problems at a satisfactory technical level because the auditor does not possess the technical knowledge needed. In such cases, a technical audit is required. Technical audits are normally carried out by a qualified technician under the direct guidance of the project auditor. In the case of very advanced or secret technology, it may be difficult to find qualified technical auditors inside the organization. In such cases, it is not uncommon for the firm to use academic consultants who have signed the appropriate nondisclosure documents. Although not a hard and fast rule, the technical audit is usually the most detailed.

Timing of the Audit

Given that all projects of significant size or importance should be audited, the first audits are usually done early in the project's life. The sooner a problem is discovered, the easier it is to deal with. Early audits are often focused on the technical issues in order to make sure that key technical problems have been solved or are under competent attack. Ordinarily, audits done later in the life cycle of a project are of less immediate value to the project, but are of more value to the parent organization. As the project develops, technical issues are less likely to be matters of concern. Conformity to the schedule and budget becomes the primary interest. Management issues are major matters of interest for audits made late in the project's life (e.g., disposal of equipment or reallocation of project personnel).

Postproject audits are conducted with several basic objectives in mind. First, a postproject audit is often a legal necessity because the client specified such an audit in the contract.

*The evaluator is well advised to remember two fundamental principles: (1) Constructive criticism does not feel all that constructive to the criticizee; and (2) Fix first, then blame—if you have any energy left.

Table 12-2. Timing and Value of Project Audits/Evaluations

Project Stage	*Value*
Initiation	Significant value if audit takes place early—prior to 25 percent completion of initial planning stage
Feasibility study	Very useful, particularly the technical audit
Preliminary plan/schedule budget	Very useful, particularly for setting measurement standards to ensure conformance with standards
Master schedule	Less useful, plan frozen, flexibility of team limited
Evaluation of data by project team	Marginally useful, team defensive about findings
Implementation	More or less useful depending on importance of project methodology to successful implementation
Postproject	More or less useful depending on applicability of findings to future projects

Second, the postproject audit is a major part of the Postproject Report, which is, in turn, the main source of managerial feedback to the parent firm. Third, the postproject audit is needed to account for all project property and expenditures.

Additional observations on the timing and value of audits are shown in Table 12-2.

12.3 CONSTRUCTION AND USE OF THE AUDIT REPORT

The type of project being audited and the uses for which the audit is intended dictate some specifics of the audit report format. Within any particular organization, however, it is useful to establish a general format to which all audit reports must conform. This makes it possible for project managers, auditors, and organizational management all to have the same understanding of, and expectations for, the audit report as a communication device. If the audit report is to serve as a communication device, there must also be a predetermined distribution list for such documents. When distribution is highly restricted, the report is almost certain to become the focus for interpersonal and intergroup conflict and tension.

While a few PMs insist on a complicated format for evaluation reports tailored to their individual projects, the simpler and more straightforward the format, the better. The information should be arranged so as to facilitate the comparison of predicted versus actual results. Significant deviations of actual from predicted results should be highlighted and explained in a set of comments. This eases the reader's work and tends to keep questions focused on important issues rather than trivia. This arrangement also reduces the likelihood that senior managers will engage in "fishing expeditions," searching for something "wrong" in every piece of data and sentence of the report. Once again, we would remind PMs of the dictum "Never let the boss be surprised."

Negative comments about individuals or groups associated with the project should be avoided. Write the report in a clear, professional, unemotional style and restrict its content to information and issues that are relevant to the project. The following items cover the *minimum* information that should be contained in the audit report.

1. *Introduction* This section contains a description of the project to provide a framework of understanding for the reader. Project objectives (direct goals) must be clearly delineated. If the objectives are complex, it may be useful to include explanatory parts of the project proposal as an addendum to the report.

2. *Current Status* Status should be reported as of the time of the audit and, among other things, should include the following measures of performance:

   Cost: This section compares actual costs to budgeted costs. The time periods for which the comparisons are made should be clearly defined. As noted in Chapter 7, the report should focus on the *direct* charges made to the project. If it is also necessary to show project *total* costs, complete with all overheads, this cost data should be presented in an *additional* set of tables.

   Schedule: Performance in terms of planned events or milestones should be reported (see Figures 10-15 and 11-5 as examples). Completed portions of the project should be clearly identified, and the percent completion should be reported on all unfinished tasks for which estimates are possible. Make sure that the method used for estimating percent completion does not mislead readers (c.f. Section 10.3).

   Progress: This section compares work completed with resources expended. Earned value charts or tables (see Figures 10-7 and 10-13) may be used for this purpose if desired, but they may lack the appropriate level of detail. The requirement here is for information that will help to pinpoint problems with specific tasks or sets of tasks. Based on this information, projections regarding the timing and amounts of remaining planned expenditures are made.

   Quality: Whether or not this is a critical issue depends on the type of project being audited. Quality is a measure of the degree to which the output of a system conforms to prespecified characteristics. For some projects, the prespecified characteristics are so loosely stated that conformity is not much of an issue. At times, a project may produce outputs that far exceed original specifications. For instance, a project might require a subsystem that meets certain minimum standards. The firm may already have produced such a subsystem—one that meets standards well in excess of the current requirements. It may be efficient, with no less effectiveness, to use the previously designed system with its excess performance. If there is a detailed quality specification associated with the project, this section of the report may have to include a full review of the quality control procedures, along with full disclosure of the results of quality tests conducted to date.

3. *Future Project Status* This section contains the auditor's conclusions regarding progress together with recommendations for any changes in technical approach, schedule, or budget that should be made in the remaining tasks. Except in unusual circumstances, for example when results to date distinctly indicate the undesirability of some preplanned task, the auditor's report should consider only work that has already been completed or is well under way. No assumptions should be made about technical problems that are still under investigation at the time of the audit. Project audit/evaluation reports are not appropriate documents in which to rewrite the project proposal.

4. *Critical Management Issues* All issues that the auditor feels require close monitoring by senior management should be included in this section, along with a brief explanation of the relationships between these issues and the objectives of the project. A brief discussion of time/cost/performance trade-offs will give senior management useful input information for decisions about the future of the project.

5. *Risk Management* This section should contain a review of major risks associated with the project and their projected impact on project time/cost/performance. If alternative decisions exist that may significantly alter future risks, they can be noted at this point in the report. Once again, we note that the audit report is not the proper place to second-guess those who wrote the project proposal. The Postproject Report, on the other hand, will often contain sections on the general subject of "If only we knew then what we know now."

6. *Caveats, Limitations, and Assumptions* This section of the report may be placed at the end or may be included as a part of the introduction. The auditor is responsible for the accuracy

and timeliness of the report, but senior management still retains full responsibility for the interpretation of the report and for any action(s) based on the findings. For that reason, the auditor should specifically include a statement covering any limitations on the accuracy or validity of the report.

Responsibilities of the Project Auditor/Evaluator

First and foremost, the auditor should "tell the truth." This statement is not so simplistic as it might appear. It is a recognition of the fact that there are various levels of truth associated with any project. The auditor must approach the audit in an objective and ethical manner and assume responsibility for what is included and excluded from consideration in the report. Awareness of the biases of the several parties interested in the project—including the auditor's own biases—is essential, but extreme care is required if the auditor wishes to compensate for such biases. (A note that certain information *may* be biased is usually sufficient.) Areas of investigation outside the auditor's area of technical expertise should be acknowledged and assistance sought when necessary. The auditor/evaluator must maintain political and technical independence during the audit and treat all materials gathered as confidential until the audit is formally released.

Walker et al. (1980) develop an even stronger case for the "independence" of the auditor. They argue that independence is essential for management's ability to assemble information that is both timely and accurate. They also list the following steps for carrying out an audit:

- Assemble a small team of experienced experts
- Familiarize the team with the requirements of the project
- Audit the project on site
- After completion, debrief the project's management
- Produce a written report according to a prespecified format
- Distribute the report to the PM and project team for their response
- Follow up to see if the recommendations have been implemented

If senior management and the project team are to take the audit/evaluation seriously, all information must be presented in a credible manner. The accuracy of data should be carefully checked, as should all calculations. The determination of what information to include and exclude is one that cannot be taken lightly. Finally, the auditor should engage in a continuing evaluation of the auditing process in a search for ways to improve the effectiveness, efficiency, and value of the process.

12.4 THE PROJECT AUDIT LIFE CYCLE

Thus far, we have considered the project audit and project evaluation as if they were one and the same. In most ways they are. The audit contains an evaluation, and an evaluator must conduct some sort of audit. Let us now consider the audit as a formal document required by contract with the client. If the client is the federal government, the nature of the project audit is more or less precisely defined, as is the audit process.

Like the project itself, the audit has a *life cycle* composed of an orderly progression of well-defined events. There are six of these events.

1. *Project Audit Initiation* This step involves starting the audit process, defining the purpose and scope of the audit, and gathering sufficient information to determine the proper audit methodology.

Project Management in Practice

Auditing a Troubled Project at Atlantic States Chemical Laboratories

In the late 1990s, Atlantic States Chemical Laboratories (ASCL) received a contract from an entrepreneurial firm, Oretec, to conduct a unique type of chemical analysis on special alloys they had created in their own laboratories in the interest of identifying potentially successful commercial alloys. The contract emphasized quality of the effort and speed of continuing laboratory analyses. The contract duration would be open-ended, with payment at the monthly rate of $100,000. The liaison officer from Oretec would have access to ASCLs laboratory work for observation.

As work progressed, the liaison officer became more involved in the project, pressuring the team to alter their approach and skip the usual repeat-verification procedures in the interest of time. On two occasions, the ASCL team devised an analysis indicating that a commercially successful product could be produced. The liaison officer was gratified with the effort and asked for suggestions on how to produce the product commercially. However, tests at Oretec indicated that these approaches would not work. As the project mid-point passed, the pressure for more and faster analyses increased even more, with the liaison officer becoming more belligerent and difficult to please. Soon thereafter, the president of ASCL received a letter from Oretec voicing a number of complaints and terminating the contract effective immediately. Puzzled by the unexpected displeasure of their client with no indication of trouble on the project from internal sources, the president requested a comprehensive audit of the project.

The audit reported the following:

1. *Overview Points:*
   - The original approach to the project was sound but was altered by the client's liaison officer; nevertheless, significant findings were still made.
   - The analyses themselves were conducted properly.
   - There were several analytical successes during the project (each identified).
   - Commercialization was not ASCL's responsibility but the client's, even if ASCL suggested some possible processes.
   - There was excessive involvement of the liaison officer in the management of the project, including frequent changes of direction.
   - Ongoing project management decisions and changes were not documented by ASCL, nor communicated to the client.
2. *Analysis of Client's Criticism* (about half of the criticisms were valid, details described).
3. *Further Points of Note:*
   - The commercialization processes proposed by ASCL have, in fact, been successfully used in similar instances. The client's tests indicating their unacceptability are incorrect.
   - The reports provided by ASCL and criticized by the client as incomplete were redirected by the liaison officer to be prepared quickly and informally. The reports of project analysis success would not have been understandable to the client's management, only to technical personnel or the liaison officer.
   - Management gave insufficient guidance/support to the project leader in his relations with the client.
4. *Recommendation:* Establish a formal procedure for identifying high-risk projects at the contract stage and monitoring them carefully for deviations from plan. The factors contributing to making this a high-risk project were inadequate funding, insufficient time, low chance of success, an unsophisticated client, and excessive access to ongoing project activities by the client.

Source: J. Meredith, consulting project.

2. *Project Baseline Definition* This phase of the cycle normally consists of identifying the performance areas to be evaluated, determining standards for each area through benchmarking or some other process, ascertaining management performance expectations for each area, and developing a program to measure and assemble the requisite information.

Occasionally, no convenient standards exist or can be determined through benchmarking. For example, a commodity pricing model was developed as part of a large marketing project. No baseline data existed that could serve to help evaluate the model. Because the commodity was sold by open bid, the firm used its standard bidding procedures. The results formed baseline data against which the pricing model could be tested on an "as if" basis. Table 12-3 shows the results of one such test. CCC is the firm and the contracts on which it bid *and won*, together with the associated revenues (mine net price × tonnage), are shown. Similar information is displayed for Model C, which was used on an "as if" basis, so the Model C Revenue column shows those bids the model *would have won*, had it actually been used.

3. *Establishing an Audit Database* Once the baseline standards are established, execution of the audit begins. The next step is to create a database for use by the audit team. For example, consider the database required by the CCC pricing model test in Table 12-3. Depending on the purpose and scope of the audit, the database might include information needed for assessment of project organization, management and control, past and current project status,

Table 12-3. Performance against Baseline Data

19xx Bid Performance for Model "C"—State of _____

		Award				
Destination	***Tonnage***	***CCC Bid***	***Model "C" Bid***	***Mine Net Price***	***CCC Revenue***	***Model "C" Revenue***
D1-2	3800		X	$4.11		$15,618
D1-7	1600		X	3.92		6,272
D2-7	1300		X	4.11		5,343
D3-2	700		X	5.13		3,591
D3-3	500	X		5.22	$2,610	
D3-4	600		X	5.72		3,432
D3-5	1200		X	5.12		6,144
D3-6	1000		X	5.83		5,830
D4-6	700		X	4.88		3,416
D4-8	600		X	5.34		3,204
D5-1	500	X		3.54	1,770	
D6-1	1000	X	X	4.02–3.92	4,020	3,920
D6-2	900	X		4.35	3,915	
D6-5	200	X		3.75	750	
D6-6	800		X	3.17		2,536
D7-5	1600		X	5.12		8,192
D7-8	2600		X	5.29		13,754
D8-2	1600	X	X	4.83	7728	7,728
D8-3	2400		X	4.32		10,368
				Total revenue	$20,793	$99,348
				Total tonnage	4700	21,500
				Average mine net	$4.42	$4.62

schedule performance, cost performance, and output quality, as well as plans for the future of the project. The information may vary from a highly technical description of performance to a behaviorally based description of the interaction of project team members.

Because the purpose and scope of audits vary widely from one project to another and for different times on any given project, the audit database is frequently quite extensive. The required database for project audits should be specified in the project master plan. If this is done, the necessary information will be available when needed. Nonetheless, it is important to avoid collecting "anything that might be useful," since this can place extraordinary information collection and storage requirements on the project.

4. *Preliminary Analysis of the Project* After standards are set and data collected, judgments are made. Some auditors eschew judgment on the grounds that such a delicate but weighty responsibility must be reserved to senior management. But judgment often requires a fairly sophisticated understanding of the technical aspects of the project, and/or of statistics and probability, subjects that may elude some managers. In such an event, the auditor must analyze the data and then present the analysis to managers in ways that communicate the real meaning of the audit's findings. It is the auditor's duty to brief the PM on all findings and judgments *before* releasing the audit report. The purpose of the audit is to improve the project being audited as well as to improve the entire process of managing projects. It is not intended as a device to embarrass the PM.
5. *Audit Report Preparation* This part of the audit life cycle includes the preparation of the audit report, organized by whatever format has been selected for use. A set of recommendations, together with a plan for implementing them, is also a part of the audit report. If the recommendations go beyond normal practices of the organization, they will need support from the policy-making level of management. This support should be sought and verified *before* the recommendations are published. If support is not forthcoming, the recommendations should be modified until satisfactory. Figure 12-1 is one page of an extensive and detailed set of recommendations that resulted from an evaluation project conducted by a private social service agency.
6. *Project Audit Termination* As with the project itself, after the audit has accomplished its designated task, the audit process should be terminated. When the final report and recommendations are released, there will be a review of the audit process. This is done in order to improve the methods for conducting the audit. When the review is finished, the audit is truly complete and the audit team should be formally disbanded.

12.5 SOME ESSENTIALS OF AN AUDIT/EVALUATION

For an audit/evaluation (hereinafter, simply a/e) to be conducted with skill and precision, for it to be credible and generally acceptable to senior management, to the project team, and to the client, several essential conditions must be met. The a/e team must be properly selected, all records and files must be accessible, and free contact with project members must be preserved.

The A/E Team

The choice of the a/e team is critical to the success of the entire process. It may seem unnecessary to note that team members should be selected because of their ability to contribute to the a/e procedure, but sometimes members are selected merely because they are available. The size of the team will generally be a function of the size and complexity of the project. For a small project, one person can often handle all the tasks of an a/e audit, but for a large project,

Final Report, Agency Evaluation, Sub-Committee II
Physical Plant, Management of Office, Personnel Practices

Summary of Recommendations

Recommendations which require Board action.

1. The Board of _____ should continue its efforts to obtain additional funds for our salary item.
2. The cost of Blue Cross and Blue Shield insurance coverage on individual employees should be borne by _____.

Recommendations which can be put into effect by *Presidential Order* to committees, staff, or others.

3. The House Committee should activate, with first priority, the replacement of the heating/air conditioning system. Further, this committee should give assistance and support to the Secretary to the Executive Director in maintenance and repair procedures.
4. A professional library should be established even if part time workers must share space to accomplish this.
5. Our insurance needs should be re-evaluated.
6. All activities related to food at meetings should be delegated to someone other than the Secretary to the Executive Director.
7. Majority opinion—positions of Administrative Assistant and Bookkeeper will need more time in the future. Minority opinion—positions of Administrative Assistant, Bookkeeper, and Statistical Assistant should be combined.
8. The Personnel Practices Committee should review job descriptions of Bookkeeper and Statistical Assistant and establish salary ranges for those two positions and that of the Administrative Assistant.
9. Dialogue between the Executive Director, his secretary, and the Administrative Assistant should continue in an effort to streamline office procedures and expedite handling of paperwork.
10. The written description of the Personnel Practices Committee should include membership of a representative of the nonprofessional staff.
11. The Personnel Practices Committee should study, with a view toward action, the practice of part-time vs. full-time casework staff.

Figure 12-1 Sample recommendations for a social service agency.

the team may require representatives from several different constituencies. Typical areas that might furnish a/e team members are:

- The project itself
- The accounting/controller department
- Technical specialty areas
- The customer
- The marketing department

- Senior management
- Purchasing/asset management
- The personnel department
- The legal/contract administration department

The main role of the a/e team is to conduct a thorough and complete examination of the project or some prespecified aspect of the project. The team must determine which items should be brought to management's attention. It should report information and make recommendations in such a way as to maximize the utility of its work. The team is responsible for constructive observations and advice based on the training and experience of its members. Members must be aloof from personal involvement with conflicts among project team staff and from rivalries between projects. The a/e is a highly disciplined process, and all team members must willingly and sincerely subject themselves to that discipline.

Access to Records

In order for the a/e team to be effective, it must have free access to all information relevant to the project. This may present some problems on government projects that may be classified for reasons of national security. In such cases, a subgroup of the a/e team may be formed from qualified ("cleared") individuals.

Most of the information needed for an a/e will come from the project team's records and those of the Project Office, and/or from various departments such as accounting, personnel, and purchasing. Obviously, gathering the data is the responsibility of the a/e team, and this burden should not be passed on to the project management team, though the project team is responsible for collecting the usual data on the project and keeping project records up to date during the project's life.

In addition to the formal records of the project, some of the most valuable information comes from documents that predate the project—for example, correspondence with the customer that led to the RFP, minutes of the Project Selection Committee, and minutes of senior management committees that decided to pursue a specific area of technical interest. Clearly, project status reports, relevant technical memoranda, change orders, information about project organization and management methods, and financial and resource usage information are also important. The a/e team may have to extract much of these data from other documents because the required information is often not in the form needed. Data collection is time-consuming, but careful work is absolutely necessary for an effective, credible a/e.

As information is collected, it must be organized and filed in a systematic way. Systematic methods need to be developed for separating out useful information. Most important, stopping rules are needed to prevent data collection and processing from continuing far past the point of diminishing returns. Priorities must be set to ensure that important analyses are undertaken before those of lesser import. Also, safeguards are needed against duplication of efforts. The careful development of forms and procedures will help to standardize the process as much as possible.

Access to Project Personnel and Others

Contact between a/e team members and project team members, or between the a/e team and other members of the organization who have knowledge of the project, should be free. One exception is contact between the a/e team and the customer; such contacts are *not made without clearance* from senior management. This restriction would hold even when the customer is represented on the audit team, and should also hold for in-house clients.

In any case, there are several rules that should be followed when contacting project personnel. Care must be taken to avoid misunderstandings between a/e team members and project team members. Project personnel should always be made aware of the in-progress a/e. Critical comments should be avoided. Particularly serious is the practice of delivering on-the-spot, off-the-cuff opinions and remarks that may not be appropriate or represent the consensus opinion of the a/e team.

The a/e team will undoubtedly encounter political opposition during its work. If the project is a subject of political tension, attempts will most certainly be made by the opposing sides to co-opt (or repudiate) the a/e team. As much as possible, they should avoid becoming involved. At times, information may be given to a/e team members in confidence. Discreet attempts should be made to confirm such information through nonconfidential sources. If it cannot be confirmed, it should not be used. The auditor/evaluator must protect the sources of confidential information and must not become a conduit for unverifiable criticism of the project.

12.6 MEASUREMENT

Measurement is an integral part of the a/e process. Many issues of what and how to measure have been discussed in earlier chapters, particularly in Chapter 2. Several aspects of a project that should be measured are obvious and, fortunately, rather easy to measure. For the most part, it is not difficult to know if and when a milestone has been completed. We can directly observe the fact that a building foundation has been poured, that all required materials for a corporate annual report have been collected and delivered to the printer, or that all contracts have been let for the rehabilitation of an apartment complex. At times, of course, milestone completion may not be quite so evident. It may be difficult to tell when a chemical experiment is finished, and it is almost impossible to tell when a complex computer program is finally "bug free." Largely, however, milestone completion can be measured adequately.

Similarly, performance against planned budget and schedule usually poses no major measurement problems. We may be a bit uncertain whether or not a "nine-day" scheduled completion time should include weekend days, but most organizations adopt conventions to ease these minor counting problems. Measuring the actual expenditures against the planned budget is a bit trickier and depends on an in-depth understanding of the procedures used by the accounting department. It is common to imbue cost data with higher levels of reality and precision than is warranted.

When the objectives of a project have been stated in terms of profits, rates of return, or discounted cash flows, as in the financial selection models discussed in Chapter 2, measurement problems may be more obstinate. The problem does not often revolve around the accounting conventions used, though if those conventions have not been clearly established in advance, there may be bitter arguments about what costs are appropriately assigned to the individual project being evaluated. A far more difficult task is the determination of what revenues should be assigned to the project.

Assume, for example, that a drug firm creates a project for the development of a new drug and simultaneously sets up a project to develop and implement a marketing strategy for the potential new drug and two existing allied drugs. Assume further that the entire program is successful and large amounts of revenue are generated. How much revenue should be assigned to the credit of the drug research project? How much to the marketing project? Within the marketing project, how much should go to each of the subprojects for the individual drugs? If the entire program is treated as one project, the problem is less serious; but R & D and marketing are in different functional areas of the parent organization,

and each may be evaluated on the basis of its contribution to the parent firm's profitability. The year-end bonuses of divisional managers are determined in part (often in large part) by the profitability of the units they manage. Figure 12-2 illustrates project baseline data established for a new product. This figure shows the use of multiple measures including price, unit sales, market share, development costs, capital expenditures, and other measures of performance.

There is no theoretically acceptable solution to such measurement problems, but there are politically acceptable solutions. All the cost/revenue allocation decisions must be made when the various projects are initiated. If this is done, the battles are fought "up front," and the equity of cost/revenue allocations ceases to be so serious an issue. As long as allocations are made by a formula, major conflict is avoided—or, at least, mitigated.

If multiobjective scoring models rather than financial models are being used for project selection, measurement problems are somewhat exacerbated. There are more elements to

PRODUCT _____ DATE _____
MARKET _____
DATE OF FIRST SALE: U.S. _____
O.U.S. _____

	1ST YEAR			2ND YEAR			3RD YEAR			4TH YEAR			5TH YEAR			TOTAL		
	MIN	B.E.*	MAX	MIN	B.E.	MAX	MIN	B.E.	MAX	MIN	B.E.	MAX	MIN	B.E.	MAX	MIN	B.E.	MAX
1. Total Market Size:																		
2. Expected Market Share:																		
3. Kg. or Units:																		
4. Est. Selling Price:																		
5. Gross Sales:																		
6. Est. COPS %:																		
7. Gross Margin %:																		
8. Est. Marketing Expense %:																		
9. Marketing Margin %:																		
10. Loss on Profit from other Products List:																		
11. Est. Profit:																		
12. Development Expenses:																		
13. Capital Expenditures:																		

*Best estimate.

Figure 12-2 Baseline marketing data for a new product.

measure, some of which are objective and measured with relative ease. But some elements are subjective and require reasonably standard measurement techniques if the measures are to be reliable. Interview and questionnaire methods for gathering data must be carefully constructed and carried out if the project scores are to be taken seriously. Criteria weights and scoring procedures should be decided at the start of the project.

A Note to the Auditor/Evaluator

A kindly critic and colleague uses what he calls the "rules of engagement" to explain to his students how to schedule interviews, conduct interviews, get copies, limit the scope of activities, and handle the many mundane tasks included in auditing/evaluating projects. While the phrase "rules of engagement" seems a bit warlike to us, we do have some similar advice for the auditor/evaluator.

Above all else, the a/e needs "permission to enter the system." It is difficult to describe precisely what is meant by that phrase, but every experienced auditor or evaluator will know. Senior management can assign an individual to the job of heading an audit/evaluation team, but this does not automatically imply that project personnel will accept that person as a legitimate a/e. There will be several indicators if the a/e is not accepted. Phone calls from the a/e will be returned only at times when the a/e is not available. Requests for information will be politely accepted, but little or no information will be forthcoming—though copious, sincere apologies and semibelievable excuses will be. Interviews with project team members will be strangely contentless. Attempts to determine the project's ancillary goals will be unsuccessful, as will attempts to get team members to discuss intrateam conflict. Everyone will be quite pleasant, but somehow promises of cooperation do not turn into fact. Always, there are good excuses and looks of wide-eyed innocence.

If the a/e is reasonably likable and maintains a calm, relaxed attitude, the project team generally begins to extend limited trust. The usual first step is to allow the a/e qualified access to information about the project. Missing information from the official project files is suddenly found. The a/e has then been given tentative permission to enter the system. If the a/e deals gently with this information, neither ignoring nor stressing the project's shortcomings while recognizing and appreciating the project's strengths, trust will be extended, and the permission to enter the system will no longer be tentative.

Trust-building is a slow and delicate process that is easily thwarted. The a/e needs to understand the politics of the project team and the interpersonal relationships among its members, and must deal with this confidential knowledge respectfully. On this base is trust built and meaningful audit/evaluation constructed. There is an almost universal propensity for the a/e to mimic Jack Webb's Sgt. Friday on the old Dragnet TV show—"Just give me the facts, ma'am." It is not that simple, nor are any processes involving human beings that simple.

SUMMARY

This chapter initiated our discussion of the final part of the text, project termination. A major concluding step in the termination process is the evaluation of the project process and results, otherwise known as an audit. Here we looked at the purposes of evaluation and what it should encompass: the audit process and measurement considerations, the demands placed on the auditor, and the construction and design of the final report.

Specific points made in the chapter were these:

- The purposes of the evaluation are both goal-directed, aiding the project in achieving its objectives, and also aimed at achieving unspecified, sometimes hidden, yet firmly held, ancillary objectives.
- The audit report should contain at least the current status of the project, the expected future status, the