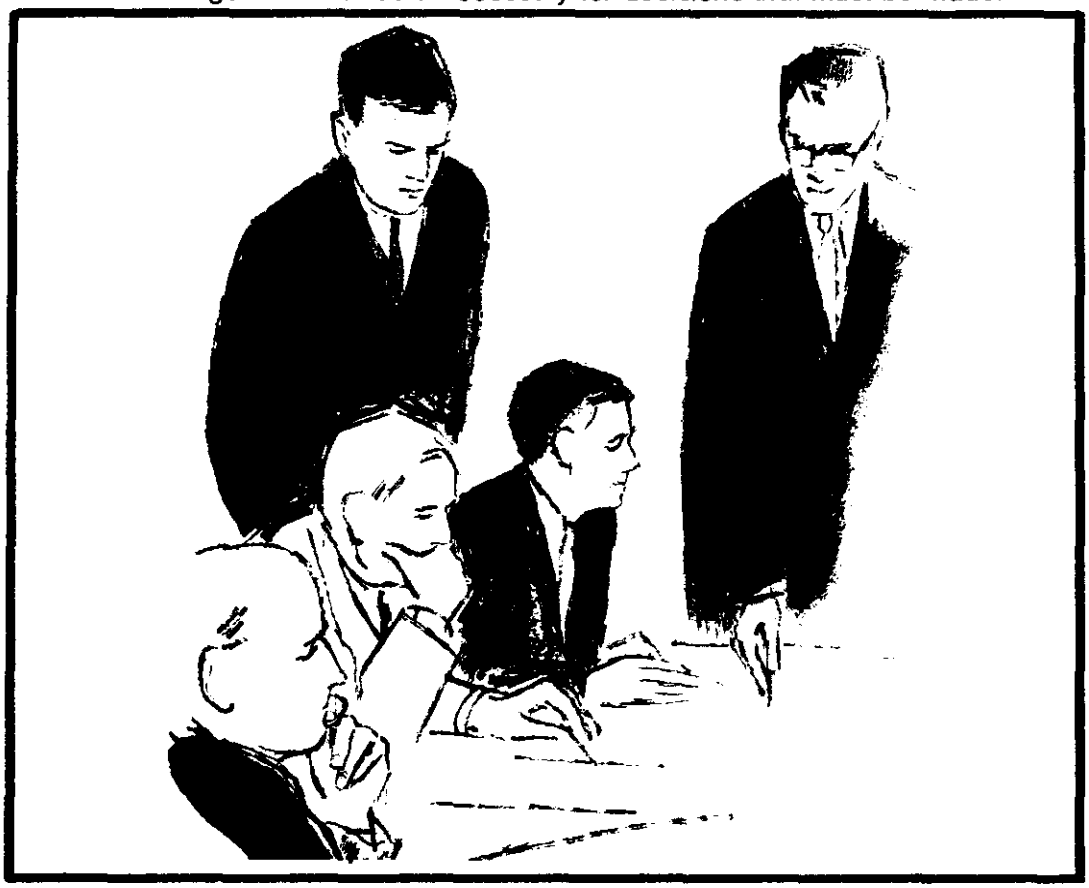
SECCION ESPECIAL
EN IDIOMA INGLES

Experience has shown that the skills and methodology used in financial auditing are adaptable to the review and audit needs of developmental projects and technical work. Assessments based on technical competence alone often fail to furnish management with data necessary for decisions that must be made.



Technical Reviews and Audits: Keeping Track of Progress in Development Projects

FRANZ E. ROSS

Management that has invested heavily in a development project or in technical work occasionally needs an independent, balanced assessment of just where the program stands. Here is an example of a company that can use this sort of help:

The company has been working on the development of an advanced product for three years at a cost of about $2 million. Under the original plans, the project should have been completed and the payback (new revenues and/or cost savings) should have started six months ago. So far, the delay has run up unanticipated additional costs of $500,000, and, with no end in sight, management is getting edgy. Should it terminate the project or budget additional funds to continue work?

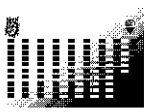
A management in this bind knows clearly that at some point somebody must decide whether or not to continue supplying funds, manpower, and facilities. But management probably will learn that no one in house really knows the score—that is, no one has sufficient, reliable information on what has been accomplished so far and what to expect in the future. And a decision on whether to kill the project or to proceed should be based on the present status of the development, an expert assessment of its technical validity and marketability, and a reliable estimate of the time and funds needed to complete it. In short, what's needed is some sort of competent status report—written and oral—stated in terms management can understand.

Assessments of this kind must be made by competent personnel who have not been associated with the project, its staff, or hierarchy of management (except at the general management level). The normal reporting channels of the pertinent technical activity (which is presumably under some management control) too often are simply inadequate or incapable of giving general management a balanced overview of the situation. The reason is that technical managers who have participated in intensive technical activities are usually too deeply and too personally involved to be capable of factually appraising the status, progress, and prognosis of their work.

Development managers, who usually can hold forth for hours on their technical problems, are often stumped when asked whether their project is meeting its objectives. In one case, a highly skilled group of project managers who believed they were only three weeks behind schedule were incredulous when an independent audit showed that they were really five months behind. Thus the use of an independent assessment team is a necessity; it must be recognized that people, however intelligent and skilled, are frequently incapable of assessing the results of their own efforts.

Application of financial techniques

Experience has shown that the skills and methodology used in financial auditing are adaptable to the review and audit needs of developmental projects and technical work. Assessments based on technical competence alone often fail to furnish management with the data necessary for decisions that must be made.



In general, persons with audit experience should lead and control the overall technical assessment, but much of the detail work, which requires technological understanding and techniques, can usually be done only by people with the appropriate expertise. Experience has shown, however, that it usually takes only a half day or a day to teach a group of technical people how to perform, under supervision, in a review or audit environment.

Review vs. audit

In a well-run company, the development of a new product or service normally is punctuated by progress reviews and assessments that continue virtually up to the point at which the final decision is made to take the product or service to market or commence its internal use. But if, during development or at any of the review sessions, it appears that management has lost control of the project, that schedules are slipping or costs overrunning or that end-objectives are being compromised, an audit of the project may be ordered. And therein lies the difference between the two types of examinations.

- A *review* is an inquiry in which independent examiners endeavor—by listening to presentations and through question-and-answer exchanges—to determine the status, quality of work, and significant issues of an activity or to find solutions to specified problems. A review, which is usually conducted in a conference room and not on the site of the activity, consists of presentations by project personnel and by functions such as finance, marketing, and manufacturing. It also includes question periods in which the solidity of the material presented and the possibility of significant omissions are probed. Reviews may be preset or instituted ad hoc to answer specific questions.
- A *technical audit* has basically the same meaning as in accounting. It is a detailed examination conducted *on the site* of the activity being probed; it includes—in addition to interviews, questionnaires, and observation of work and procedures—inspection of records, documents, correspondence, written instruction and guidelines, prototypes and models, manufacturing processes, and tests. As a matter of current practice in the technical domain, audits are not prescheduled; they are initiated when there is suspicion—and sometimes a lot more than suspicion—that a serious out-of-line condition exists. In the nonfinancial area, then, an audit connotes that something is badly wrong and that heads will roll.

Source material

The basic source materials for managerial control, briefing of review and audit personnel, and audit inspection are the plans, records, reports, and work products of the activity under examination. Without records, there is little control and almost no possibility of subsequent verification. Remember that technical personnel are often not very good about paper work and, in some

Agenda for a Technical Review:

The review discussion points outlined below will serve for most checkpoint reviews in the development of a computer application; however, the basic outline can stand as a practical example for project reviews in other technical fields. As in any dissertation of interacting aspects, the presentations move from the general to the detailed and specific. A review agenda on other than developmental work, such as the performance of a computer center, would be similar, but its focus would shift from attainment of technical requirements to evaluation of volume, quality, utility, costs of production, and productivity.

1. *Description of product being developed.* This discussion should center on the requirements of the user or market, the method of design employed to satisfy these requirements, and output and performance measures to be attained.
2. *Work plans, schedules, and resource budgets.* Work plans detail how project objectives are to be achieved. Accordingly, they itemize when individual technical milestones are to be accomplished and state when and how resources are to be employed and facilities used. Good work plans cover all needed resources and facilities and provide reasonable assurance that after allowance for contingencies, budgeted resources are used up to, but never beyond, their available limits.
3. *Work accomplished since the last review.* This summary details both planned and unforeseen work accomplished and milestones attained or missed.
4. *Ascertainment of project status.* This includes (A) work done versus work scheduled and (B) resources used versus resources budgeted. These juxtapositions are not as simple as they may appear: Unless planning has been done to a fair level of detail, work done or scheduled may have to be expressed as a percentage of completion, which is not easily ascertainable and often is a well-informed guess at best.
5. *Verification of technical objectives and specifications (and changes therein).* It is necessary to verify that the attainable characteristics of the product or service being developed are still meeting expected requirements of the market because, as development proceeds, estimates of the final characteristics of the product are liable to change. Such changes in expected characteristics may make the product being developed less marketable or otherwise a losing proposition. Therefore, the review should ensure that the reasons that justified development originally are still valid. (This significant aspect of a checkpoint

instances, show disdain for it. In any case, it is almost axiomatic that, when a technical activity goes out of control, the first area abandoned is record-keeping and documentation.

Objectives of the review

The quality of a review depends on the pertinence and completeness of the review agenda and on the ingenuity and incisiveness of the reviewers'

Key Checkpoints for Discussion

review is often forgotten.)

The review should also monitor the control of, and changes in, specifications. Design changes require detailed competent inquiry into all their effects upon development, testing, production, and operational use so that all implications are understood and all costs considered before mandatory design changes are initiated and optional ones approved. The follow-through on performing all aspects of an approved design change (such as test procedures, production, quality control, and documentation) is another significant requirement. The near disaster of Apollo XIII, for example, resulted from lack of complete performance of all parts of a design change.

6. *Verification of working plans and budgets and changes therein.* The review should establish that an up-to-date estimate of time and resources needed to complete development is available and that it is consistent with present plans and budgets. If not, the plans and budgets must be amended to conform to the estimate.

7. *Dependencies.* These are collateral developments on which the project depends from other organizations, or developmental facets in the project under review on which other units depend for their own activities. If the project is behind schedule or has technical problems, the review should address the problem of when to notify affected organizations of potential delays or technical changes in developments on which they depend.

8. *Problems that impede or are expected to impede the attainment of project objectives.* The review should be concerned with description of these problems, feasible remedies, and remedial actions taken or planned by project personnel. The project manager may also request the reviewers to recommend approval of certain remedies that cannot be applied without management concurrence, such as aid to the project room from the outside with temporary resources or special skills, adoption of some new policy, or specified deviations from technical standards.

9. *Detailed plans until next review.* If the date of the next review is not set, it should be approximated or determined in relation to project milestones. The project manager will describe the work he expects to see accomplished by the time of the next review. In general, this will conform to original plans but may have to be adapted to unanticipated circumstances. For instance, extra computer time or professionals may become temporarily available, an opportunity that an alert project manager would not miss.

questions. If a review of developmental work is prescheduled, most of the agenda can also be predetermined from the development cycle; other agenda items can be set just prior to the review in accordance with the problems and conditions of the moment. If a review is slated in response to an unanticipated situation, such as an ostensible cost overrun or schedule slippage, this situation per se will determine most of the review agenda.

A review that has been prescheduled in a development cycle has three basic objectives:

"The review is a brief and cost-effective method of controlling technical work, assessing progress, aiding in the solution of problems, and monitoring for technical and control failures."

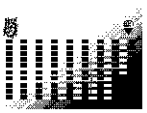
- To determine whether or not the development appears to meet technical requirements, is on schedule, and is within budget. (In most technical developments, no firm dictum on the accomplishment of technical goals can be made prior to the final testing of the finished product.)
- To determine whether plans, preparations, and resources for continuing work are ready. (Is there any reason why work should not proceed?)
- To clear exceptions remaining from any earlier reviews.

If the review is set at the end of a phase such as design or testing, or if it occurs at some other significant point in time, the following additional objectives may also be pertinent:

- Determination by the review team whether the purposes of the preceding phase have been accomplished.
- A recommendation or decision, depending on the authority vested in the review team, on the authorization of resources to commence the next phase.
- Making the *go/no go* decisions scheduled for that review. When used in this context, a *go/no go* decision arises when a development depends upon some collateral piece of work, usually from outside the project. At a certain predetermined point in time, a decision must be made whether this outside work product will be available when needed. Clearly, in the case of *go,* development can proceed as planned; in the case of *no go,* some contingency plan must be activated. In extreme situations, the contingency plan could be to delay or to stop development.

Preparation and conduct of the review

The strength of the review as a tool of control and as an independent source of information for management is its relative brevity (most reviews are completed in one-half to two days) and the impetus derived from an independent, simultaneous examination by reviewers with a diversity of skills and breadth of experience. The brevity of the examination and its location in a conference room rather than at the work site also mean a minimum investment of time by reviewers and minimum disruption of the activity being examined.



An obvious weakness of the review technique is that it normally does not include an on-site inspection of the work environment, prototypes, drawings, and other work products and a full examination of records and documentation. The review depends upon uncolored truthfulness in the presentations and on the adroitness of the questioning by the reviewers.

- The review team should include some permanent members who have attended prior reviews of the project and are expected to attend the future ones; this provides an ability to compare progress between successive reviews and to spot significant contradictions. On the other hand, a few new members should be added from time to time to help provide the advantage of a fresh approach. The body of reviewers should be composed of the various types of expertise required to evaluate the technical work and of some representatives of management, finance, and other appropriate functions.
- The review team should be briefed in advance; each member should receive as specific an agenda as possible and should be advised in which areas answers and assessments may be required of him.
- Management should insist on broad participation by project personnel in the presentations and question-and-answer sessions. This narrows the likelihood of a successful cover-up.
- There is nothing holy about our definition of the review concept. If it is believed that a brief inspection of, say, a breadboard model or some items of documentation would help the review process, then by all means make this part of the review. The danger is that when individual audit procedures are added indiscriminately, the review becomes long and costly without attaining the dependability of an audit.
- Depending on the circumstances, proceedings at the review should be recorded verbatim or minuted. The advantage of establishing a verbatim record is, of course, that subsequently when some long-festering problem surfaces, it can be shown that either project management did not know what was going on in their own project or that they were less than candid at the review.
- Question-and-answer sessions should have great latitude in time as well as in type of questions allowed. A fresh approach and incisive inquiry by independent professionals is a key strength of the review technique.
- Interruptions should be minimized by selecting a review location not too close to either the project site or to the offices of the reviewers. For the same reason, management of the review should be quite formal and tough-minded. This can make the difference between a concentrated, hard-working, punctual effort and the easy atmosphere of a Western saloon with constant comings and goings through the swinging doors.

The individual review, while significant in itself at times, usually attains its main importance as a link in a chain of successive reviews. Building such a chain, however, requires preservation of records of the particulars of each review and some continuity of personnel on the review team.

Summary

The review is a brief and cost-effective method of controlling technical work, assessing progress, aiding in the identification and solution of problems, and monitoring for technical and control failures. While the review is suitable for recognizing the existence of out-of-line situations, its tools are frequently not appropriate for gauging the extent of a problem or measuring its effects. When a review discloses the tell-tale signs of schedule slippage, cost overrun, technical trouble or attempts at concealment, management should call for an audit—a detailed examination of the activity.

This is the first of two articles on review and audit of technical and developmental projects. In next month's article, Mr. Ross will analyze technical audit procedures and techniques.

FRANZ E. ROSS, manager of data processing support services at IBM World Trade Americas/Far East Corp, is responsible for consultant, design, development, and programming services provided to IBM customers for a fee on the American continent (except the United States) and in the Far East. Before joining IBM over 20 years ago, Mr. Ross was employed in consulting, public accounting, and utility regulation. He is a certified public accountant with a bachelor's degree in statistics and a master s degree in mathematics.