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Even though many CPAs have made heavy use of PERT for their clients, comparatively few have used it for their own internal project management. Yet it lends itself perfectly to this—

USING PERT IN ACCOUNTING REPORTS

by Dan A. Bawly and Joseph M. Dotan

Horwath, Bawly, Millner & Co.

WITH THE development of the usage of PERT (Program Evaluation and Review Technique) and CPM (Critical Path Method) in the past decade, the CPA has often been asked to advise his clients on a variety of problems in which PERT could be used. There have been many cases where the CPA, especially in the framework of management services, initiated and developed PERT functions (networks) for his client. Where these plans were fully adhered to and followed up, results were often positive and quite successful.

Many of the large CPA firms have mechanized part of their

working procedures; they have all updated their methods of operation; they devote considerable thought to time-saving mechanics of operations; but only in rare cases do they plan their operations by using the relatively recent Critical Path Method.

There are several areas where the use of PERT/CPM may arise. These are usually where heavy pressure of work is expected; where teamwork may be anticipated; where there are great amounts of data to be collected, sorted, and put together again; and, last, where the time element is of great importance.

The use of PERT/CPM by

accountants has evolved with the experience gained through the planning of operations around and through the computer. With the increase in computerized operations in the past decade, much attention has been given to the efficiency of programing techniques. This brought about the development of "flow charts," which permit clear presentation of a flow of activities. Designed primarily as an aid in systems analysis and programing, they have also proven useful to picture operations that are not related to computers, ranging from an audit review technique to that for describing the system in, say, a purchasing

department. Then there occurred the development of the "decision table," which permits a clear presentation of the analysis of a problem—any problem—even on mundane subjects, ranging in variety from fiscal laws to audit programs.

With the increasing burdens of complicated and costly tasks, tight controls—more sophisticated than those existing heretofore—are required. Basically, the use of mechanics like the "decision table" or PERT/CPM means that the user follows a logical method to solve the problem he tackles. Even in the accounting profession, PERT can be used for multiple purposes. A case of its use in the planning of preparation of consolidated financial statements under pressure and in the carrying out of the work efficiently, effectively, and according to the time schedule is presented in the following description:

The PERT technique was developed for the Polaris submarine project of the United States Navy. In it, the expected sequence of operations is described, with an estimate of the time required to carry out

each of them and the spelling out of the sequence. PERT/CPM should be fulfilled before beginning each new stage. The most important factors in the implementation of any project are the time and often the cost element.

This article deals with a relatively simple case. As the time allowed for completion of the task was minimal and relatively small compared to the complete audit assignment, the cost element was not material and will therefore be disregarded. As the subject dealt with was a known quantity, unlike other PERT projects, it could be planned quite precisely in advance.

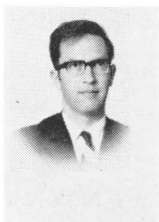
Averaging time

Most PERT networks deal with complicated types of tasks to be performed over a period of time that can range from a number of months to a number of years, often in a field where there has been no prior experience and where estimates may, therefore, be quite unreliable. To solve this problem, an average is often computed of optimistic, realistic, and pessimistic time estimates. Such an average cancels out extremes in time estimates. This problem diminishes if there is past experience to draw on, as was the case in the consolidation procedure described in this article. As the time of the total project was short, any discrepancies between estimated and actual time obviously had to be dealt with on the spot.

One major advantage of planning with PERT/CPM is the clear method of presentation of the critical path, that series of tasks to be performed which necessitates investment of resources and time during the entire period until completion of the project. Tasks not appearing on the critical path can be completed without prolonging the total time required.

The two basic qualities of PERT and CPM are: (1) a sophisticated programming and supervision system and (2) concurrent operation of several subdivisions in coordina-

Basically, the use of the decision table or PERT/CPM means that the user follows a logical method to solve the problem he tackles . . . in the accounting profession, PERT can be used for multiple purposes. A . . . preparation of consolidated financial statements under pressure . . . is presented. . . .



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served as secretary to various other Institute committees. Mr. Dotan has published articles in the journal of the Israeli Institute and in the *Israel Quarterly Banking Review*.

tion with the targets of the project of the capital surplus and the earned surplus.

Consolidated statements are usually prepared by the accounting division of the client or by its CPA firm. In both cases, the CPA expresses his opinion on the fairness of the presentation of the statements.

Basis of statements

Usually, the terms of reference for the consolidated financial statements are simple. They should be based on the financial statements of the parent company and its domestic and foreign subsidiaries, completed soon after the year end, and published as early as possible. It is, therefore, important to guarantee the flow of information as early as possible through the design of a method as complete as necessary to ensure that there are no last-minute hitches. The cost element, in such a case, is of minor importance.

The larger the number of subsidiaries in the group and the greater the number of intercompany transactions and minority shareholders, the more cumbersome (and at times lengthy) is the work concerned with the preparation of the consolidated statements. It is impossible in such a case to prepare the consolidation on one sheet of paper. In fact, to prepare the consolidation, a substantial number of schedules is required.

The schedules include: (1) a schedule which handles the statement of income and earned surplus; (2) an analysis of the investments in shares of the subsidiaries; (3) a schedule of investments in debentures of subsidiaries; (4) a schedule collating the other assets of the subsidiaries and the parent; (5) a schedule consolidating all the liabilities of the group; (6) a schedule of the dividends receivable and the proposed dividends at the end of the year; (7) a working paper relating to the rights of the minority shareholders; (8) a calculation of the net asset value at date of acquisition of each subsidiary; (9) an analysis of the development

The expertise required of the person responsible for preparation of such a consolidation includes not only a very profound knowledge and understanding of accounting; it also includes an administrative and organizational capacity for distributing the work among the staff and supervising the assembly of the required data.

Thanks to the planning of the work based on the network, it is at this stage that the advantages of PERT first begin to be felt. This becomes evident from the following section, which describes the actual work performed in the case dealt with in this article.

Work analysis

The first stage of the planning required an analysis of the work done on previous assignments, based on the working papers and other relevant data. A list was drawn up of all the steps to be performed, and it became clear that, in fact, the work consisted of the following stages:

- Obtaining the basic data, i.e., the financial statements of all companies to be consolidated and additional information such as questionnaires

- Analysis of the basic data and their compilation in the working papers

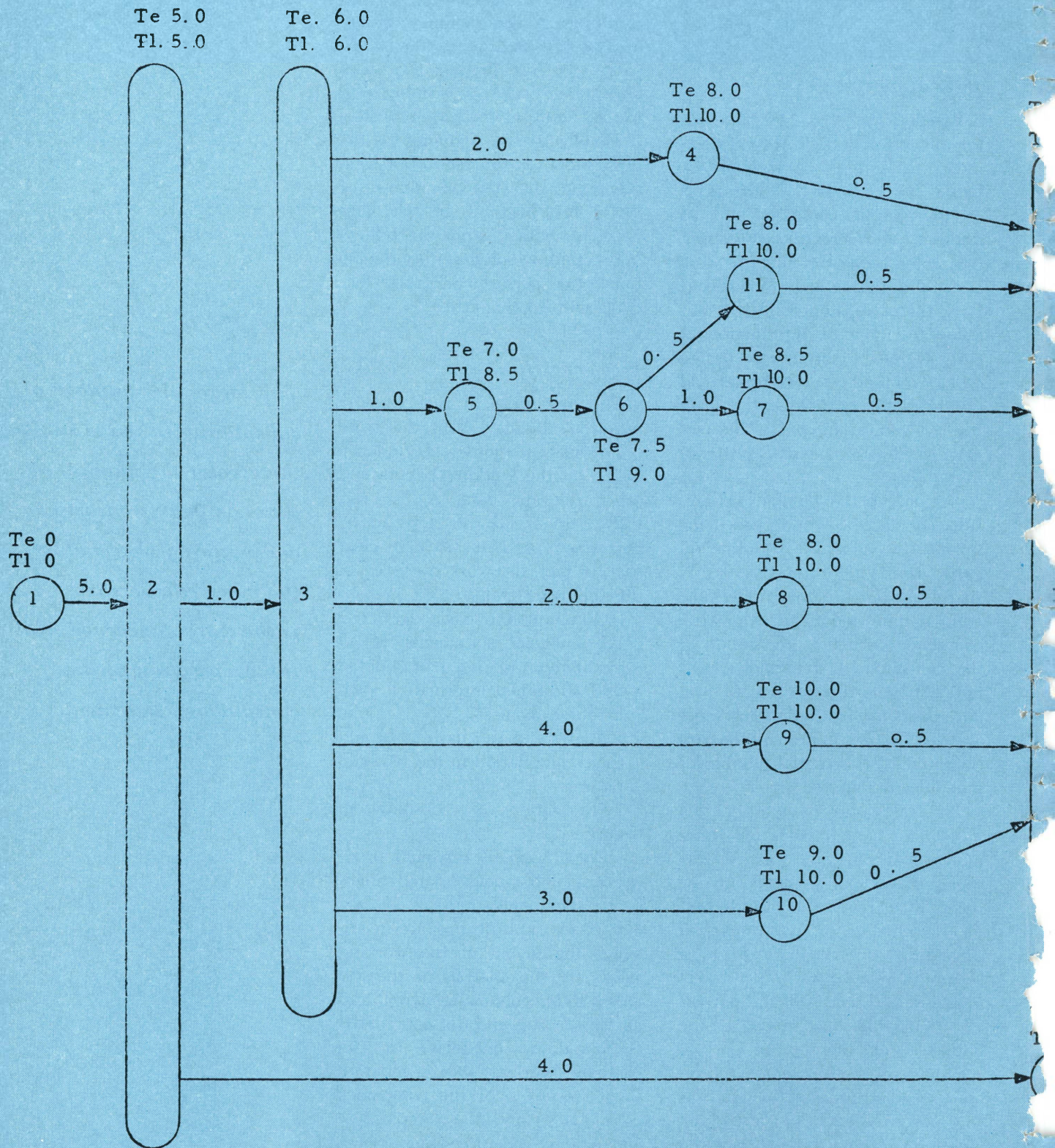
- Preparation of consolidation entries

- Preparation of the final product, i.e., the consolidated financial statements.

It is advisable to prepare in advance the layout of the working sheets for the analysis of the financial statements of the parent and all subsidiaries and the anticipated consolidation schedules. In the company working sheets, separate sheets for each of the companies consolidated and the comparative figures for the preceding years, indicating the sources from which these figures were taken, should be shown. A questionnaire should be sent some time before the year

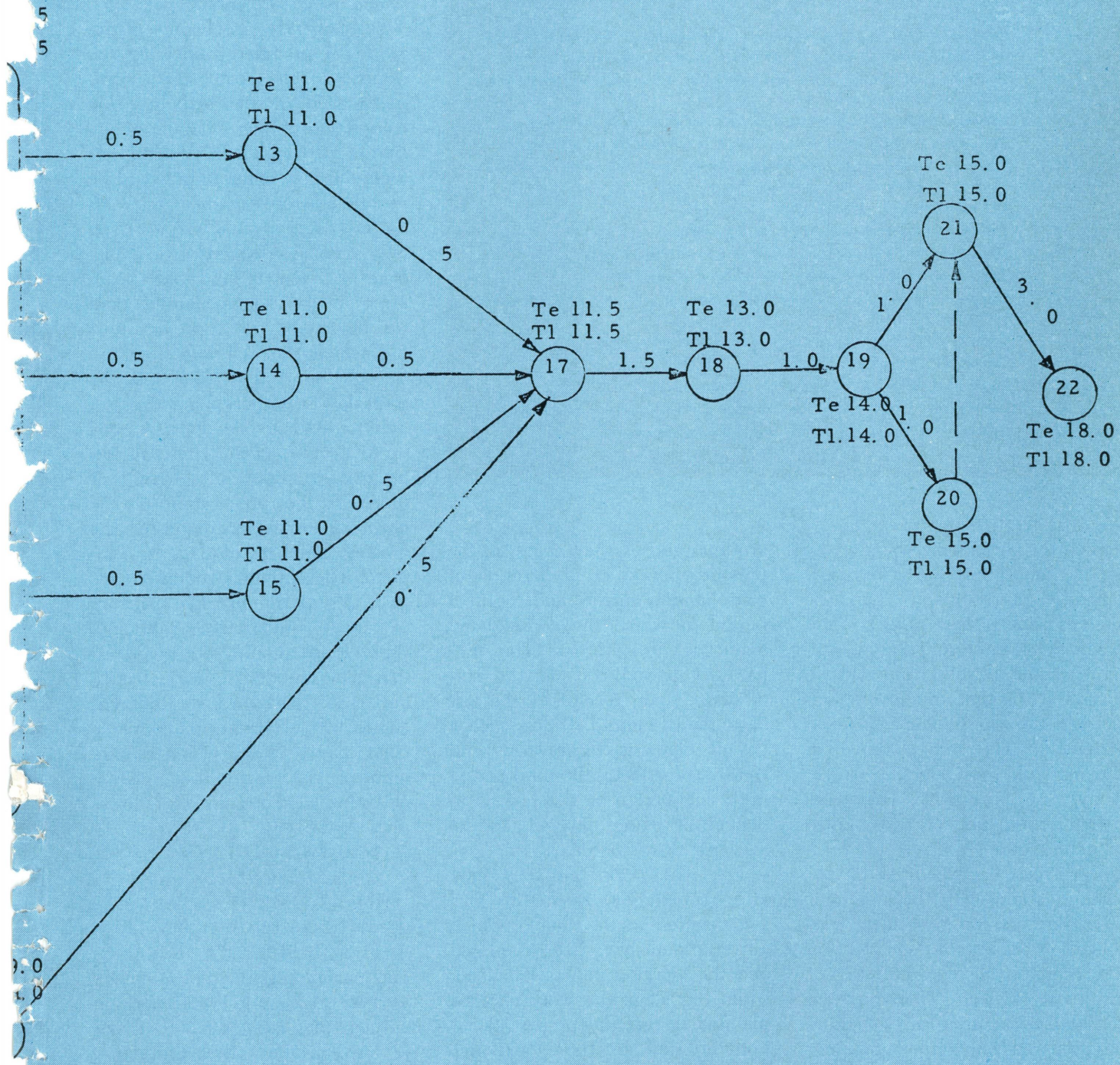
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Network for preparation of cons



The symbols Te and Tl which appear above the events refer to the most optimistic and most pessimistic times. Te stands for the earliest possible time the event could be completed; Tl for the latest possible time at which the event must be completed if the entire schedule is to be maintained.

Validated financial statements



Event No.	Description of Events
1.	Start.
2.	Completion of analyses of financial statements of consolidated companies.
3.	Complete balancing of working schedules.
4.	Completion of reviewing and elimination of all intercompany profit and loss transactions.
5.	Complete establishing the amounts of shares held by minority shareholders.
6.	Completion of calculation of percentages of minority interests.
7.	Complete computation of minority interest in capital, and in earned and capital surplus.
8.	Complete establishing of earned and capital surplus at dates of acquisition, and amounts paid in excess of net equity value at such dates ("goodwill").
9.	Completion of dealing with revaluation of debentures of consolidated companies held by group.
10.	Complete analyzing of intercompany balances at balance sheet date.
11.	Completion of analyses of dividends paid or payable by subsidiaries.
12.	Complete recording of consolidation entries and balancing of various working schedules.
13.	End of drafting of balance sheet.
14.	End of drafting of statement of capital surplus.
15.	End of drafting of statement of income and earned surplus.
16.	End of preparation of notes to the financial statements.
17.	Complete comparison of the various statements with those of preceding year.
18.	Completion of review by senior and by partner in charge.
19.	Completion of typing.
20.	Completion of review by the reviewing committee.
21.	Completion of proofreading and correcting draft financial statements.
22.	Approved by board of directors and financial statements signed.

end to the various members of the group, requesting them to report on all intercompany activities, such as sales, sales of property, and payments of interest. The questionnaire should be filled out and returned at the time of the preparation of the consolidated financial statements. This step is shown in the network (see pages 32-33) as Activity 1-2. (Further references herein to the network are shown in parentheses.)

Work can be expedited by obtaining certain of the basic data at an early stage, but most of the consolidation entries are dependent on the receipt of all relevant data, not just most of them. Therefore, the consolidation entries can generally be prepared only after obtaining and analyzing all basic data and copying them into the working papers.

The time schedule of the total work is, therefore, composed of a preparatory period in which data

are analyzed as they come in, the pressure period of preparation of consolidation entries, and the final period in which the consolidated financials are drafted. The preparatory period ends at the cut-off date, upon receipt of the last basic data required. Unless such a cut-off date is established and rigidly adhered to, the total period until completion of the task is in danger of being delayed. In the network, this is Event 2.

The real work can start only after completing Event 3. This event represents the stage at which all basic data have been compiled and the working papers balanced. From this stage the work may be planned so that, by proper allocation of staff to those activities which are part of the critical path, maximum utilization of time and staff is achieved.

An estimate of the time required for each activity should be made, and no delay should arise in those

activities where the slack time is zero, i.e., where any delay will endanger the time schedule for the completion of the entire project.

This analysis is made by preparing a schedule of events which form the interim stages at which certain parts of the work have been completed. This schedule appears on this page. The activities between events are listed (page 35).

Subsequently, a schedule of activities is prepared, indicating the estimated time required to complete each of the activities. On completion of this schedule of activities, it should be possible to ascertain how much time would be required before commencing work on each activity. (E.g., work on new activities depends on completion of Event 3 and can begin after six days have elapsed from the beginning of the project, during which the first five days are devoted to Activity 1-2 and the sixth day to Activity 2-3.)

If more than one activity leads up to a certain event, efforts should be made to minimize the length of time for the preparation of the chain of activities requiring the greatest numbers of days to complete. The activities requiring less than this maximum time span are of lesser importance, although supervision should be given so that they are tied in correctly. In our case, there are six different chains of activities, paths (see chart, pages 32-33) which require input of resources until completion of Event 12. They are as follows:

- (a) 1-2-3-4-12 (8½ days);
- (b) 1-2-3-5-6-11-12 (8½ days);
- (c) 1-2-3-5-6-7-12 (9 days);
- (d) 1-2-3-8-12 (8½ days);
- (e) 1-2-3-9-12 (10½ days);
- (f) 1-2-3-10-12 (9½ days).

The maximum estimated time is on path "e" (1-2-3-9-12), and work on the activities subsequent to Event 12 can start only after the elapse of 10½ days.

The last two columns in the schedule of activities form the basis of determining the critical path. The first shows the number of days elapsed at the start of work

on each activity plus the time required for its completion. The fact, represents the earliest day at which the activity can be completed, assuming that work will continue immediately after completion of all activities leading to the event preceding it.

The last column is based on a calculation prepared by moving from the opposite direction: If it takes 18 days to complete the entire job and the last event takes 3 days, the event before the last one should begin not later than 15 days after beginning the work. Similarly, if activities 17-18-19-21-22 require 6½ days to complete, all activities ending with Event 17 have a latest completion time of 11½ days (18 days less 6½ days).

Critical path

After preparation of the schedule as described, the slack time available for each activity is also shown. If there is no difference between the time indicated in the last two columns, i.e., if the earliest date at which the activity will be completed equals the latest allowable date, there is no slack period whatsoever, and the activity is located on the critical path. Full attention should be devoted to it so as to avoid any delay in its completion. On the other hand, if there is a difference between the two dates, the difference indicates that the work on the activity may start later than the earliest date possible, the allowable number of days in delaying the start of work on the activity being the difference in number of days between the two columns. This analysis makes it possible to divert staff from activities with slack time to those without slack time, while being certain that this allocation of staff will not cause delay in the completion of the entire job.

Accordingly, work on the activities along the critical path was carried out throughout the consolidation period, while the other activities were carried on concurrently, and when each activity

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Begin- ning Event	End- ing Event	Description of Activity
1	2	Analysis of financial statements of consolidated companies.
2	3	Balancing of working schedules.
2	16	Preparation of notes to financial statements.
3	4	Dealing with intercompany profit and loss transactions.
3	5	Establishing amounts of shares held by minority shareholders.
3	8	Establishing earned and capital surplus at dates of acquisition, and amount paid in excess of net equity value at such dates ("goodwill").
3	9	Revaluation of debentures of consolidated companies held by group, including computation of deferred taxes on profit arising from revaluation, and minority interest therein.
3	10	Dealing with intercompany balances at balance sheet date.
4	12	Recording in the working schedules of entries regarding intercompany transactions.
5	6	Calculation of percentages of minority interest.
6	7	Computation of minority interest in capital and in earned and capital surplus.
6	11	Analyzing of dividends paid or payable by subsidiaries.
7	12	Recording in the working schedules of entries in respect of minority interest.
8	12	Recording in the working schedules of entries in respect of goodwill, etc.
9	12	Recording in the working schedules of entries in respect of revaluation of debentures.
10	12	Recording in the working schedules of entries in respect of intercompany balances.
11	12	Recording in the working schedules of entries in respect of dividends.
12	13	Drafting of balance sheet.
12	14	Drafting of statement of capital surplus.
12	15	Drafting of statement of income and earned surplus.
13	17	Comparison of balance sheet to that of preceding year.
14	17	Comparison of statement of capital surplus to that of preceding year.
15	17	Comparison of statement of income and earned surplus to that of preceding year.
16	17	Comparison of notes to financial statements to those of preceding year.
17	18	Reviewing of financial statements by senior in charge and by partner.
18	19	Typing of financial statements.
19	20	Reviewing by reviewing committee.
19	21	Proofreading and correcting financial statements.
21	22	Approval by board of directors and signing of financial statements.

along the critical path was completed, the other data up to that point were ready and did not hold back the work on the next activity. E.g., along the various stages of the work according to the network shown on pages 32-33, the first task to be completed after the preparation stage was ended was the determination of all amounts relating to elimination of intercompany holdings of debentures issued by group companies. In our case, these amounts were material and involved computations of interest accrued, amounts resulting from clauses providing for increase of return in case of pegging to the

cost-of-living index, or, in case of changes in the rate of exchange of foreign currency, deferred taxes on profits recognized only for consolidation purposes and minority interest in such profits. Event 9 represents completion of this activity. Parallel to this, the other activities leading to Event 12 were performed.

Obviously, the results of all computations should be closely examined. It happens repeatedly that in the preparation of the computations new problems arise, partly professional, possibly theoretical, which are not anticipated in advance. These take up additional

time. Client operations develop continuously, and adaptation of accounting practices to new circumstances may necessitate research and discussions within the firm and between officials of the company and its CPAs. It may be stated that in every healthy corporation there exists a certainty that new problems will crop up; the only thing which cannot be foreseen is what the nature will be of the specific problem to be encountered in a given year. On the other hand, however, time estimates should be realistic so as to permit a proper follow-up on the progress of the work. It is, therefore, recommended that the required time reserve be expressed by planning the work in advance for completion at an earlier date than that absolutely required so that this built-in slack time can be utilized for the said unforeseen matters.

It may be assumed that the technical working procedures of accountants putting together the consolidated financial statements are different, even though they operate within the same accounting principles and methods. This article does not describe all details specifically performed in the present case. A brief description appears in the schedule of activities on page 35. This schedule, read together with the network itself, which is shown on pages 32-33, shows the details and the flow of the various activities. It is seen, for instance, that work on activities 6-11 and 6-7 can begin only after Event 6, which means that before work can start on both the analysis of dividends paid or payable by subsidiaries and the amounts of minority interests in capital stock and earned and capital surplus, first the percentages of minority interests should be computed.

Major elements linked

With the analysis, the completing of data, and the preparation of the consolidation entries carried out, Events 13, 14, 15, and 16

have been reached. Here the major portions in the preparation of the annual consolidated financial statements are linked, viz., the balance sheet, the statement of income and earned surplus, the statement of capital surplus, and the notes thereto.

Statements completed

At this stage the work moves along relatively standard practice and is mentioned here only for the completion of the subject. First, the financial statements have to be reviewed, the balances connecting them checked, amounts compared with the financial statements for the preceding year, and the presentation of data and formulation of notes and explanations compared with those appearing in the unconsolidated financial statements of the parent (Event 17). Then the work carried out has to be reviewed by the senior in charge and by the responsible partner (Event 18). The consolidated statements should then be typewritten (Event 19) and passed upon and edited by the reviewing committee of the firm (Event 20). The sequence of these later activities depends on the practice of the firm. The last activity relates to the approval of the financial statements by the board and the signing of the accountants' opinion, and here the work of the consolidated financial statements with the aid of CPM is completed (Event 22).

The network will not be substantially different if the controller of the parent prepares the financial statements and the consolidation is reviewed by the firm of CPAs, or if the firm of CPAs also undertakes the preparation of the consolidated statements.

Although the preparation of the consolidation is not in itself audit work, it requires special expertise, as the statements should present fairly the financial position and the results of operations of the group on a consolidated basis. This is not a question of technical computations only, but especially one of a

fair presentation, giving due diligence to the elimination of any material transaction within the group. Care should be taken that no inner reserves be created through the preparation of the consolidated statements. It should be verified that the results only include profits realized through transactions with third parties. (The presentation of facts should be made with the view of the activity of the group as a whole and not of each and every separate individual member of the group; e.g. if one subsidiary rents out buildings to another member of the group which is a manufacturer of goods in the rented building, this building should be shown not as part of buildings for rent but as factory buildings, if such separate headings appear in the consolidated balance sheet.)

Auditors help themselves

The PERT/CPM techniques developed in a period when problems of administration and controls multiplied, diversified, and became far more complicated, in a period when costs increased and competition became an even more important factor. PERT and CPM evolved to create a common denominator, a new means of measurement, simplifying procedures through proper planning and detailed description. As with the advent of budgeting, several decades earlier, the method may be misused. Auditors in the past two decades have been conscious of technical developments in methods of administration. They have been aware of the great interest management has had in PERT and CPM. They can do well to study ways by which they can themselves benefit directly from using and applying these modern techniques. They will find that their cost factor will be reduced, their service to clients improved, and possibly that they will even have more free time. The above example, when applied to a client last year, accomplished just that.