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*PERT is almost invariably thought of as a control technique for monitoring accomplishment of a specific program. However, it can work equally well in controlling recurring work responsibilities —*

## **PERT FOR MONTHLY FINANCIAL CLOSING**

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A UNIQUE application of PERT in job costing in the electronics industry is described in this article. The contribution of this technique in expediting the preparation of the monthly financial statements is demonstrated through the use of a PERT network, Exhibit 1, pages 32 to 35.

To place this application of the technique in proper perspective, the program evaluation review technique (PERT) was developed primarily for planning, monitoring, and controlling performance toward the accomplishment of stated objectives.

A recent version of PERT, PERT/Cost, was developed by the armed services for use on weapon systems development projects. Essentially, PERT/Cost adds an extra dimension to the schedule produced by the PERT procedure, namely, the consideration of resource costs.

PERT is an effective tool for one-

time, complex projects such as are encountered frequently in the aerospace or defense industry. However, it may be equally applicable to the work of the systems analyst in his efforts to streamline or expedite existing procedures, such as those described in this article. The steps that are necessary for the monthly closing of the books are shown under PERT but, in addition, the "bottlenecks" in meeting the reporting deadlines imposed by management are highlighted. This encourages corrective action by management in scheduling additional resources to the accomplishment of those "critical" activities which threaten the target date.

While PERT is used in Exhibit 1 to detail *all* the activities required to close the books (from the date of cutoff for materials, labor, and overhead item inputs into the system until the job cost statements

are completed), the Critical Path Method (CPM) pinpoints those activities which take the longest time as a group to accomplish. These frequently require decision-making by management to meet the project's target date at minimum cost.<sup>1</sup>

PERT demands that each activity necessary for the completion of a project be listed with the time required to complete that particular task. Each of these appears on Exhibit 1, along with the number of man-hours required for completion. Arrows point to the flow of the work, which originates with a circle marked "start" or cutoff date for all charges to the system.

A number of different "arrow

<sup>1</sup> Levy, Ferdinand K., Gerald L. Thompson, and Jerome D. Wiest, "The ABC's of the Critical Path Method," *Harvard Business Review*, September-October, 1963, pp. 99-100.

## PERT and CPM together can expedite the 10 per cent of critical tasks at closing . . .

paths" are shown from start to finish and the total time required to traverse each path is the sum of the man-hours shown for all tasks along the route. By definition, the critical path is the longest one in terms of man-hours from start to finish and, therefore, dictates the minimum time necessary to complete the entire project. Only by finding corrective ways to shorten jobs along this critical path can the overall time of closing the books be reduced or kept within the deadlines set by top management for the review of the statements.<sup>2</sup>

Since only about 10 per cent of the tasks on most projects are "critical," the entire closing may be expedited by concentration on this "critical path" resulting perhaps in a reduction of costly overtime during closing time. For accounting personnel the result could also be improved quality or fewer errors which seem to multiply when accountants are working under pressure.

Therefore, PERT in an overall sense and CPM, with respect to the critical or "bad actors," are tools for action in reducing the elapsed time required for the monthly closing so that target dates for review are met at the minimum cost possible.

### **Techniques illustrated**

The approach described in this article combines the use of the above techniques but confines the resources used to man-hours as opposed to dollars under the PERT/Cost method. In Exhibit 1 the PERT network is shown for the monthly closing of the job cost ledgers for all end items manufactured by an electronics equipment manufacturing subsidiary, but the principles illustrated and discussed in this article can apply to the opera-

tions of any manufacturing subsidiary. Complicating the monthly closing for this type company is the need to make its schedule conform with that of the parent company.

Extreme pressure is often exerted on such subsidiaries to have operating results in the hands of the parent company's accounting department in adequate time for inclusion in the parent's consolidated statements and submission to the corporate president on the date determined and published monthly by him.

As a part of Exhibit 1, footnotes are included showing the parameters of this PERT network. The first is the requirement that the subsidiary and parent company start their monthly closings on the same date, including the cutoff date on material requisitions, shown in this illustration as 4:00 p.m. on the fourth working day *before* the end of that month.

Another note indicates that the labor cutoff date is based on the parent company schedule using a 5/4/4 week cycle to accommodate the 13 weeks of each quarter. Other notes are discussed as we step through the PERT network, from start (S) to the final hour on which the financial statements are scheduled to be released to the chief financial officer of the subsidiary, for review and approval prior to submission to the vice-president-financial and later to the parent company.

### **Understanding the network**

Important to an understanding of the PERT network are the symbols described under the legend located in the lower right-hand corner of Exhibit 1. The first symbol shown, the circle, indicates estimated elapsed time before the necessary printouts become available to the accounting department of the subsidiary. A central computer facility

at the parent company handles all of the subsidiary's data processing.

The second symbol, the square, shows when each input of the subsidiary is required by the parent corporation's accounting department. Such time constraints imposed on the subsidiary apply to its operating results required by the parent's accounting system in closing at the same time that the subsidiary is doing so. A third symbol, the diamond, reports the labor cutoff on the aforementioned 5/4/4 week cycle.

The legend describes the use of capital letters as follows: "A" to denote hours required for each task described in the network; "B" for the number of personnel presently assigned; "C" for elapsed time in man-hours using only the personnel described under "B," that is, those presently on board; "D" the maximum number of personnel who could be used effectively, assuming that the critical path indicated a need for a crash program. This is



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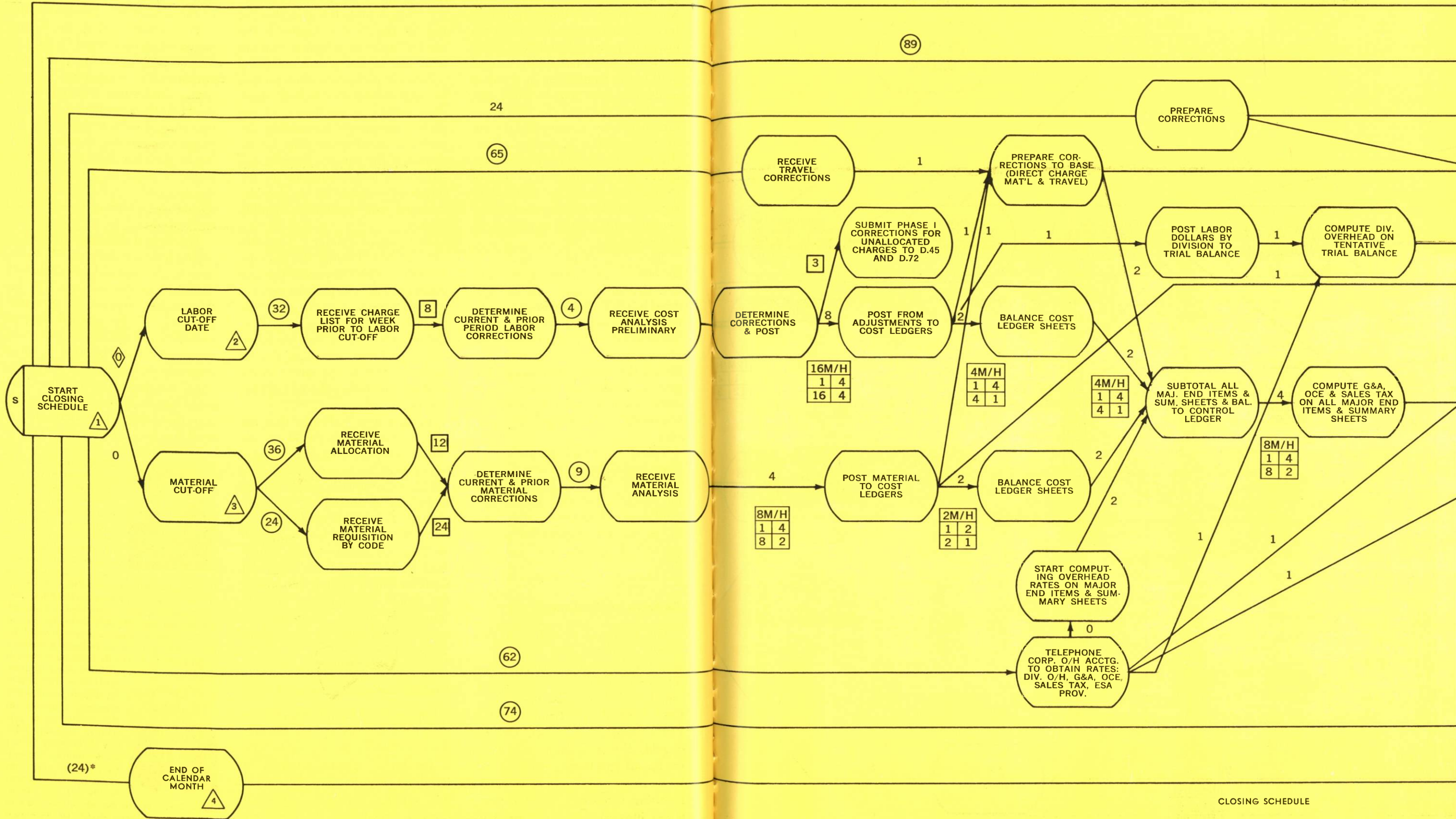
the School of Business Administration, University of Missouri. Dr. Ameiss received his bachelor's, master's, and doctorate in business administration from St. Louis University. He has published many articles and was named "Author of the Year" by the National Association of Accountants in 1970. He is assistant editor of the *Journal of Mental Health Administration*.



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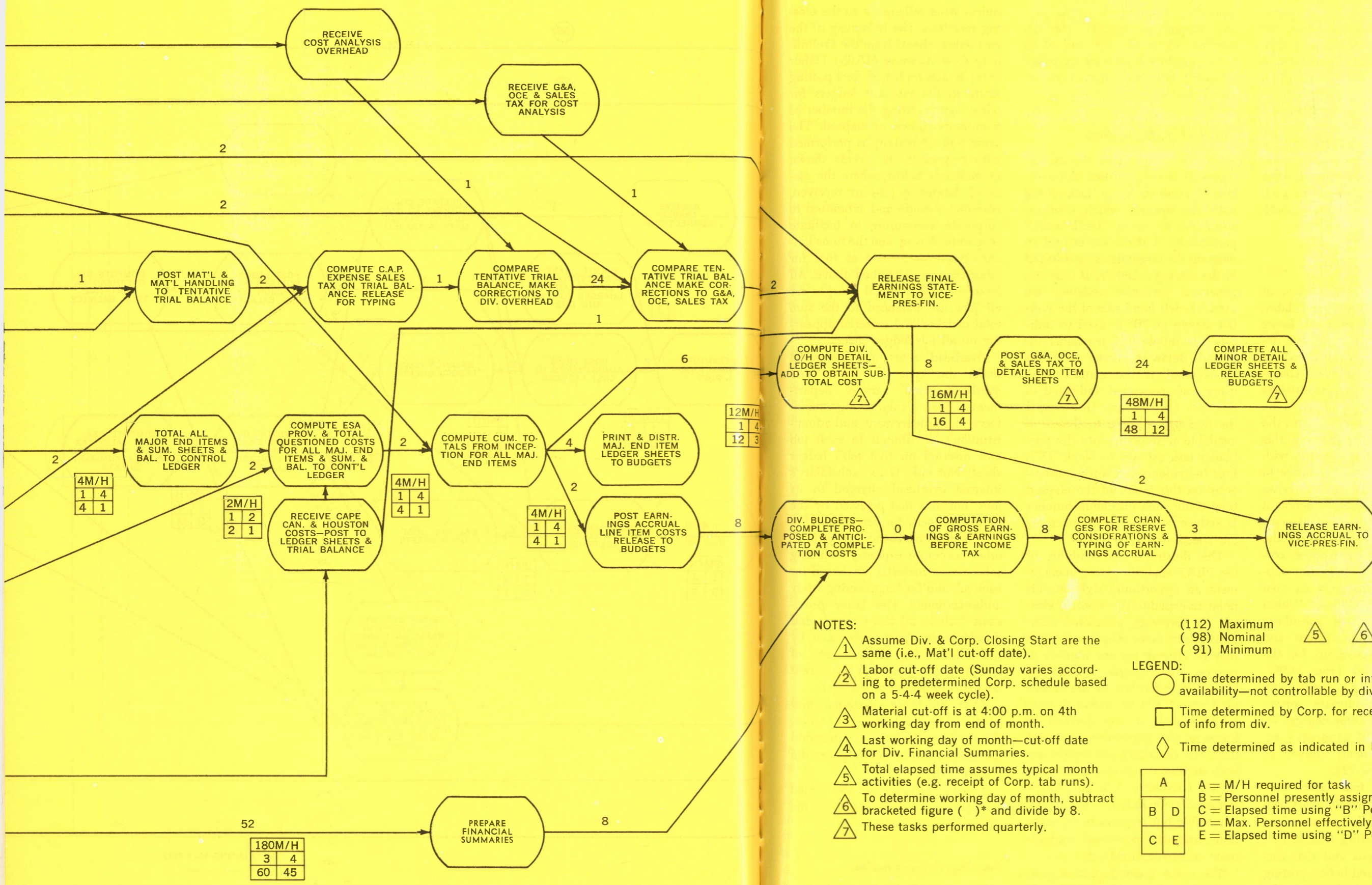
which hooks up to the eleven hospitals in the Division of Mental Health. Dr. Thompson received his doctorate in business management from the University of Missouri. He is president of the Association of Mental Health Administrators.

<sup>2</sup> *Ibid.*



CLOSING SCHEDULE





**NOTES:**

- ① Assume Div. & Corp. Closing Start are the same (i.e., Mat'l cut-off date).
- ② Labor cut-off date (Sunday varies according to predetermined Corp. schedule based on a 5-4-4 week cycle).
- ③ Material cut-off is at 4:00 p.m. on 4th working day from end of month.
- ④ Last working day of month—cut-off date for Div. Financial Summaries.
- ⑤ Total elapsed time assumes typical month activities (e.g. receipt of Corp. tab runs).
- ⑥ To determine working day of month, subtract bracketed figure ( )\* and divide by 8.
- ⑦ These tasks performed quarterly.

(112) Maximum  
( 98) Nominal  
( 91) Minimum

**LEGEND:**

- Time determined by tab run or info availability—not controllable by div.
  - Time determined by Corp. for receipt of info from div.
  - ◇ Time determined as indicated in Note ②
- |   |                           |   |
|---|---------------------------|---|
| A | A = M/H required for task |   |
| B | D                         | B = Personnel presently assigned        |
| C | E                         | C = Elapsed time using "B" Personnel    |
|   |                           | D = Max. Personnel effectively utilized |
|   |                           | E = Elapsed time using "D" Personnel    |



an important contribution of PERT—the “built in” flexibility—to meet important deadlines in getting the operating statements to the president on time. The last letter, the capital “E,” indicates lapsed time in man-hours when the *maximum* number of personnel described under “D” above are used.

The use of the above symbols are illustrated in the subsidiary’s closing. To initiate or start the closing, the labor cutoff date and material cutoff dates are determined, after which no further charges for such costs will be included in the month being closed.

### ***Through the network***

Following the determination of the material and labor cutoff dates, a considerable number of hours elapse (32) before the printout, described as “11.96,” is scheduled for receipt by the subsidiary’s accounting department. This printout lists all invalid charge numbers to be corrected for the week prior to the labor cutoff date. Following this happening, a square appears with an “8” inserted in it. Reference to the legend in this exhibit shows that the square is used to denote a time restraint by the parent company—in this case, the need for the parent company to receive corrected information from the subsidiary in order to meet its own closing-schedule deadlines. Within this time period, the subsidiary must determine the current and prior monthly corrections for the bad charges listed (run 11.96), shown as a previous event, and, having made appropriate corrections, submit the labor charges by jobs to the parent company’s accounting department, shown as D.72 (Department 72).

Approximately four hours later the Cost Analysis Preliminary run (15.05) is scheduled, denoted as “Phase 1,” suggesting that it is a preliminary analysis and that corrections are required before posting can be made of such charges to the *subsidiary’s* cost ledgers. An individual cost ledger account is main-

tained for each job which the subsidiary undertakes, the majority of which represent the electronic engineering requirements of the parent company’s contracts. The job number identifies the end item being produced as well as other pertinent data for internal managerial control.

### ***“Critical path” options***

The final legend in the exhibit shows in the top portion the man-hours required for a task along with the options which management has in easing “bottlenecks,” particularly if these are critical to meeting the target dates established in the closing schedule. If only the personnel presently assigned are used, the left-hand side of the symbol shown as “B” is used to indicate the number of personnel involved. Below it, shown as “C” in the symbol, is the elapsed time using such personnel, indicated in this task as 16 hours. However, if the decision is made to throw all available accountants into this particular task (shown in block “D”), four individuals can work conveniently on this task and the elapsed time using such maximum number is reduced to four man-hours for our specific task.

This illustrates the flexibility of the PERT analysis, giving management an opportunity right at this point to expedite the monthly closing by throwing additional manpower into tasks whose execution may be lagging for any number of reasons. For example, if runs are late, with reference to the scheduled time for their arrival, it may be impossible to use the full 16 hours on this particular event and meet the deadlines for reports for both divisional and corporate executives. Therefore, to be able to get the job done in only four man-hours is possible but requires in this case four times the personnel commitment otherwise involved.

The same general pattern prevails throughout this PERT network. The need to obtain printouts on time and have these reviewed

by accountants for the different types of corrections which have to be fed back into the system requires strict adherence to the closing schedule. The balancing of the cost ledger sheets from the Preliminary Cost Analysis (15.05) (labor only) is accomplished and posting made to the job cost ledgers for labor charges using the number of man-hours shown as elapsed. The same type of activity is performed with respect to the events shown immediately below, where the *material* charges by jobs are received, corrections made and submitted to corporate accounting to facilitate corporate closing, and the same balancing act performed as that for labor charges, described above. All labor and all material charges for all jobs are balanced to the sum total of labor and material appearing on all job ledger sheets.

Overhead rates are computed under this type of closing, and overhead from various departmental pools (engineering, manufacturing, procurement, and administration) distributed to each job and inserted on that job’s ledger sheet. Not only is the subsidiary’s internal overhead charged to its jobs, but also that assessed by the parent company for general and administrative overhead, as well as other corporate expense, including sales tax on material purchased for each job and for “engineering study authorizations.” The latter provisions include all the research and development effort undertaken by the engineering departments of both the subsidiary and the parent company allocated to each job.

After all labor, material, and overhead costs are assigned to jobs, the next event requires a subtotal for the purpose of balancing to the control ledger.

A trial balance is developed showing total costs incurred for the month being closed.

### ***Earnings determination***

Earnings calculations on all jobs, using the cost completion method, become the next task. The earnings

accrued for each job are based on the percentage of completion measured by costs incurred. Using dollar costs actually incurred for all material, labor, and overhead on a given job from its inception, and comparing this total dollar figure with its original *planned* or estimated cost when the bid for this job was made, a per cent of completion results which is applied against the total profit estimated for the job when bid to the customer, less any reserves thought necessary.

This accrual of earnings is made to all the *major* end items and then released to the budgeting department which completes the total earnings statement. Their review includes using such accrual of earnings in the process of reviewing each job with respect to its progress and anticipated completion dates. Thus, if the original completion date planned for the job appears in jeopardy, or the original target costs budgeted for this job are being exceeded, the percentage of profit accrued for that particular job is carefully scrutinized and a reserve set up. This flexibility in accruing or not accruing profits by jobs affords a real opportunity to "flag" potential cost overruns on jobs before the problem becomes too serious and corrective action can still be taken.

Having determined the amount of gross earnings before income tax, the total earnings figure is developed and released to the subsidiary's accounting manager as shown in the final events on the PERT report.

### ***PERT standards***

The *maximum* number of hours involved by using present personnel in this PERT network are shown as 112, the minimum 91, and the normal 98, affording accounting management a frame of reference in evaluating its overall performance in this hectic monthly chore of closing the books and meeting the deadline dates for review of the statements by its own top management, as well as that of the parent

company. Standards are developed by the accounting manager, but dictated by top management's review date.

Without going into all the details in this network, it is apparent from the operation of this model that none can be eliminated in the drafting of the PERT analysis if the deadlines are to be met, particularly the review scheduled by the president of the parent company. The flexibility of this technique is such that adjustments can be made anywhere along the line as indicated by the fourth symbol under the legend of Exhibit 1. As a result, neither PERT nor CPM become an "end unto themselves" but rather flexible tools for accounting management telling them when additional manpower should be thrown into the breach as problems in closing are encountered—critical computer runs or other inputs are not received on schedule, or things don't balance.

PERT and its ally, the Critical Path Method (CPM), thus become useful tools, which quickly focus attention on activities or "work packages" which are most critical to the completion of the project on time. CPM offers an easy way to determine the effects of alternatives, such as the use of added resources in men or equipment to shorten various work packages in the project. Such techniques also enable accounting managers to evaluate the impact and costs of a "crash program" if this is absolutely required due to some emergency.

Planning, evaluation, and review techniques described in this article, if kept up-to-date, can help significantly in introducing order where chaos frequently reigns. Trying to close the books and take off statements in adequate time to permit the accounting manager a reasonable opportunity for his own review and analysis is the "consumation devoutly to be wished"—so that he can answer intelligently the inevitable questions from his superiors that such statements always engender.

*. . . accounting management has a frame of reference in evaluating overall performance in the hectic monthly chore of closing the books and meeting the deadline date for review of the statements by its own top management, as well as that of the parent company.*