with periodic reports based on output printed by a computer. These reports keep management abreast of the progress of the project. The reports show (1) jobs completed, (2) actual completion time of the completed jobs, (3) jobs that are on schedule, and (4) jobs that are behind schedule.

To summarize, using a different project from the computer installation, we will compare this management information system with the conventional bar chart familiar to almost everyone in industry and which has been the traditional approach to planning and scheduling. This chart provides some valuable information, such as the duration of major items and starting and ending times. However, from the standpoint of effectively planning, scheduling and controlling a project, additional and more accurate information is required. For example, this method will have an exceptionally difficult task to answer these questions:

1. Which portions of the design can be done concurrently with fabricating and procuring parts?
2. Which parts of the design must be completed before other parts of the design can begin?
3. Which activities are to be given priority in order not to hold up completing the project on schedule?

Yet, when we note the network, we can answer these questions rather readily. For example:

1. While we are procuring parts and shop fabrication, we can be preparing the installation designs.
2. The sequence of designs, design equipment, detailed equipment design, and installation designs are distinctly shown.
3. The path—design equipment, detailed equipment design, procure parts, install equipment and tryout—must be given priority as this is the critical path.

As the Critical Path permits improved methods for controlling projects by the use of a computer, substantial time can be saved in decision making. Alternate methods can be evaluated with some degree of thoroughness.

CPM Application.

Our plant engineering activity has used the Critical Path method on a number of multi-million dollar programs. Since the Mt. Clemens paint plant allowed for rather active participation by the safety personnel through the use of Critical Path method, we can use it as a typical example:

The Mt. Clemens paint plant doubles our previous paint production, as well as producing resins heretofore purchased for use in the paint formulation. Approval to go ahead was given by the Board of Directors in October, 1964. Construction costs were in the millions, and the entire program required over two years to complete. As this was a new venture for automotive manufacturing personnel the complexities that were expected to be encountered made the use of the Critical Path method a mandate.

The CPM diagram for the paint plant shows only major activities. For this size job some firms would prepare diagrams of 3,000 to 5,000 activities—this diagram contains about 500. Our activity uses CPM to stress planning by monitoring periodically construction progress against the diagram and with specific reference to the status of the milestones.

Milestones represent the key objectives during the course of a program or project. So that the end completion date is defined properly, milestone dates must be met: *Milestone-Start Paint Production, Node 246,* 3/1/66. All of the activities needed to support the production of paint which lead into this activity will determine the planning date. A computer run predicts the ability of confirming this date.

The milestone concept leads into the safety engineer's participation. Our division safety engineer became one of the astute students in CPM and was quick to learn the impact of milestones. He used Node 246 to investigate all of his safety items and activities essential to the production of paint. Such items as gate security, hose carts, extinguishers, protective safety equipment, and other industrial relations items for which he also assumes responsibility are diagrammed —"keyed" to milestones which have been oriented to production. Most important is the means by which he can apply logic, as simple as it may seem, to develop the scope of his responsibility.

The timing of these safety items was evaluated from computer-based programs designed by Ford Motor Company with the output reports being peculiar to Ford Motor Company procedure. The information contained is the type of information that our or-