

## Case Problem R. C. Coleman

R. C. Coleman distributes a variety of food products that are sold through grocery store and supermarket outlets. The company receives orders directly from the individual outlets, with a typical order requesting the delivery of several cases of anywhere from 20 to 50 different products. Under the company's current warehouse operation, warehouse clerks dispatch order-picking personnel to fill each order and have the goods moved to the warehouse shipping area. Because of the high labor costs and relatively low productivity of hand order-picking, management has decided to automate the warehouse operation by installing a computer-controlled order-picking system, along with a conveyor system for moving goods from storage to the warehouse shipping area.

R. C. Coleman's director of material management has been named the project manager in charge of the automated warehouse system. After consulting with members of the engineering staff and warehouse management personnel, the director compiled a list of activities associated with the project. The optimistic, most probable, and pessimistic times (in weeks) have also been provided for each activity.

| Activity | Description                 | Immediate Predecessor |
|----------|-----------------------------|-----------------------|
| A        | Determine equipment needs   | —                     |
| B        | Obtain vendor proposals     | —                     |
| C        | Select vendor               | A, B                  |
| D        | Order system                | C                     |
| E        | Design new warehouse layout | C                     |
| F        | Design warehouse            | E                     |
| G        | Design computer interface   | C                     |
| H        | Interface computer          | D, F, G               |
| I        | Install system              | D, F                  |
| J        | Train system operators      | H                     |
| K        | Test system                 | I, J                  |

| Activity | Time       |               |             |
|----------|------------|---------------|-------------|
|          | Optimistic | Most Probable | Pessimistic |
| A        | 4          | 6             | 8           |
| B        | 6          | 8             | 16          |
| C        | 2          | 4             | 6           |
| D        | 8          | 10            | 24          |
| E        | 7          | 10            | 13          |
| F        | 4          | 6             | 8           |
| G        | 4          | 6             | 20          |
| H        | 4          | 6             | 8           |
| I        | 4          | 6             | 14          |
| J        | 3          | 4             | 5           |
| K        | 2          | 4             | 6           |

## Managerial Report

Develop a report that presents the activity schedule and expected project completion time for the warehouse expansion project. Include a project network in the report. In addition, take into consideration the following issues:

1. R. C. Coleman's top management established a required 40-week completion time for the project. Can this completion time be achieved? Include probability information in your discussion. What recommendations do you have if the 40-week completion time is required?
2. Suppose that management requests that activity times be shortened to provide an 80% chance of meeting the 40-week completion time. If the variance in the project completion time is the same as you found in part (1), how much should the expected project completion time be shortened to achieve the goal of an 80% chance of completion within 40 weeks?
3. Using the expected activity times as the normal times and the following crashing information, determine the activity crashing decisions and revised activity schedule for the warehouse expansion project:

| Activity | Crashed Activity Time<br>(weeks) | Cost (\$) |         |
|----------|----------------------------------|-----------|---------|
|          |                                  | Normal    | Crashed |
| A        | 4                                | 1,000     | 1,900   |
| B        | 7                                | 1,000     | 1,800   |
| C        | 2                                | 1,500     | 2,700   |
| D        | 8                                | 2,000     | 3,200   |
| E        | 7                                | 5,000     | 8,000   |
| F        | 4                                | 3,000     | 4,100   |
| G        | 5                                | 8,000     | 10,250  |
| H        | 4                                | 5,000     | 6,400   |
| I        | 4                                | 10,000    | 12,400  |
| J        | 3                                | 4,000     | 4,400   |
| K        | 3                                | 5,000     | 5,500   |