TABLE B Three Cost Rate Estimates for NutriStar Production Facility Expansion Project

Activity	Optimistic Cost Rate ($/Month)	Most Likely Cost Rate ($/Month)	Pessimistic Cost Rate ($/Month)
A: Concept Development	1,900	2,000	2,300
Plan Definition			
B: Define project scope	23,750	25,000	28,750
C: Develop broad schedule	15,200	16,000	18,400
D: Detailed cost estimates	28,500	30,000	34,500
E: Develop staffing plan	27,000	30,000	33,000
Design and Construction			
F: Detailed engineering	360,000	400,000	440,000
G: Facility construction	112,500	125,000	156,250
H: Mobilization of employees	270,000	300,000	330,000
I: Procurement of equipment	360,000	400,000	440,000
Start-up and Turnover			
J: Pre-start-up inspection	90,000	100,000	110,000
K: Recruiting and training	540,000	600,000	660,000
L: Solving start-up problems	90,000	100,000	110,000
M: Centerlining	45,000	50,000	55,000

"Well, that's it Wesley! We're glad to have you on board and look forward to working with you. Do you have any questions?"

Questions

1. Draw a network diagram for this project. Identify which path you expect to be the critical path and its expected completion time. Which paths are most likely to threaten this path in terms of becoming critical?
2. Simulate the completion of this project 1,000 times assuming that activity times follow a triangular distribution and that the cost rates are known with certainty and equal to the most likely cost rate. Estimate the mean and standard deviation of the project completion time and the project cost. How does the time compare to your previous answer based solely on the critical path?
3. Develop histograms for both the project completion time and the cost to complete the project. What do these histograms tell you?
4. Using the results of your simulation analysis, calculate the probability that the project can be completed within 30 months. What is the probability that the project will take longer than 40 months? What is the probability that the project will take between 30 and 40 months? What is the probability the project will cost $5.1 million or less to complete? The probability the project will cost between $5 and $6 million to complete?
5. Modify your simulation model to determine the probability that the path you expected to be the critical path actually was the critical path? What are the managerial implications of this?
6. Simulate the completion of this project 1,000 times assuming that the activity times follow a triangular distribution and that the cost rates are also triangularly distributed. Estimate the mean and standard deviation of the project completion time and project cost. How do these results compare to the results you obtained in Question 2?
7. Would you expect there to be a relationship between the duration of an activity and the cost *rate* to complete the activity? If so, how could your simulation model be modified to reflect this relationship?

This brief reading illustrates the kinds of things that can go wrong in a project and delay it, but also the kinds of remedies PMs can come up with to keep the project on schedule. The types of creative remedies available to PMs are then summarized.