CASE STUDY 10.1

Project Scheduling at Blanque Cheque Construction (A)

Joe has worked for Blanque Cheque Construction (BCC) for five years, mainly in administrative positions. Three months ago, he was informed that he was being transferred to the firm's project management group. Joe was excited because he realized that project management was typically the career path to the top in BCC, and everyone had to demonstrate the ability to "get their feet wet" by successfully running projects.

Joe has just left a meeting with his superior, Jill, who has assigned him project management responsibilities for a new construction project the company has successfully bid. The project consists of developing a small commercial property that the owners hope to turn into a strip mall, directly across the street from a suburban college campus. The size of the property and building costs make it prudent to develop the property for four stores of roughly equal size. Beyond that desire, the owners have made it clear to BCC that all project management associated with developing the site is BCC's responsibility.

Joe is sitting in his office at BCC trying to develop a reasonable project plan, including laying out some of the important project activities. At this point, he is content to stick with general levels of activities; that is, he does not want to get too specific yet regarding the various construction steps for developing the site.

Questions

1. Develop a project network consisting of at least 20 steps that should be done to complete the project. As the case suggests, keep the level of detail for these activities general, rather than specific. Be sure to indicate some degree of precedence relationship among the activities.
2. Suppose you now wanted to calculate duration estimates for these activities. How would you make use of the following approaches? Are some more useful than others?
   a. Expert opinion
   b. Past history
   c. Mathematical derivation
3. Joe is trying to decide which scheduling format to employ for his planning: AON or AOA. What are some of the issues that Joe should first consider prior to choosing between these methods?

CASE STUDY 10.2

Project Scheduling at Blanque Cheque Construction (B)

Joe has been managing his project now for more than 12 months and is becoming concerned with how far behind the schedule it is slipping. Through a series of mishaps, late supplier deliveries, bad weather, and other unforeseen circumstances, the project has experienced one delay after another. Although the original plan called for the project to be completed within the next four months, Joe's site supervisor is confident that BCC cannot possibly make that completion date. Late completion of the project has some severe consequences, both for BCC and for Joe. For the company, a series of penalty clauses kicks in for every week the project is late past the contracted completion date. For Joe personally, a late completion to his first project assignment can be very damaging to his career.

Joe has just finished a meeting with his direct supervisor to determine what options he has at this point. The good news is that the BCC bid for the construction project came with some additional profit margin above what is common in the industry, so Joe's boss has given him some "wiggle room" in the form of $30,000 in discretionary budget money if needed. The bad news is that the delivery date for the project is fixed and cannot be altered without incurring substantial penalties, something BCC is not prepared to accept. The message to Joe is clear: You can spend some additional money but you cannot have any extra time.

Joe has just called a meeting with the site supervisor and other key project team members to discuss the possibility of crashing the remaining project activities. He calculates that crashing most of the final activities will bring them in close to the original contracted completion date but at a substantial cost. He needs to weigh these options carefully with his team members to determine if crashing makes sense.

Questions

1. What are some of the issues that weigh in favor of and against crashing the project?
2. Suppose you were the site supervisor for this project. How would you advise Joe to proceed? Before deciding whether or not to crash the project, what questions should you consider and how should you evaluate your options?

MS Project Exercises

Exercise 10.1

Suppose we have a complete activity predecessor table below and we wish to create a network diagram highlighting the activity sequence for this project. Using MS Project, enter activities A through E, their durations, and their predecessors. Note that all duration times are in days.

Project: Remodeling an Appliance

Activity		Duration	Predecessors
A	Conduct competitive analysis	3	—
B	Review field sales reports	2	—
C	Conduct tech capabilities assessment	5	—
D	Develop focus group data	2	A, B, C
E	Conduct telephone surveys	3	D
F	Identify relevant specification improvements	3	E
G	Interface with marketing staff	1	F
H	Develop engineering specifications	5	G
I	Check and debug designs	4	H
J	Develop testing protocol	3	G
K	Identify critical performance levels	2	J
L	Assess and modify product components	6	I, K
M	Conduct capabilities assessment	12	L
N	Identify selection criteria	3	M
O	Develop RFQ	4	M
P	Develop production master schedule	5	N, O
Q	Liaise with sales staff	1	P
R	Prepare product launch	3	Q

Exercise 10.2

Now, continue developing your Gantt chart with the rest of the information contained in the table in Exercise 10.1, and create a complete activity network diagram for this project.

Exercise 10.3

Identify the critical path for the project shown in Exercise 10.1. How can you identify the critical path? (Hint: Click on the "Tracking Gantt" option.)

Exercise 10.4

Suppose that we wish to incorporate lag relationships into our Remodeling an Appliance activity network. Consider the table shown below and the lag relationships noted. Develop an MS Project Gantt chart that demonstrates these lags.

Activity	Duration	Lag Relationship
A Wiring	6	None
B Plumbing	2	None
C HVAC	3	Wiring (Finish to Start), Plumbing (Finish to Finish)
D Interior construction	6	HVAC (Start to Start)

PMP CERTIFICATION SAMPLE QUESTIONS

1. The IT implementation project is bogging down and falling behind schedule. The department heads are complaining that the project cannot help them if it is not implemented in a reasonable time frame. Your project manager is considering putting extra resources to work on activities along the critical path to accelerate the schedule. This is an example of what?
   a. Rebaselining
   b. Crashing
   c. Fast-tracking the project
   d. Identifying critical dependencies

2. Dummy variables are used in what kind of network diagramming method?
   a. AON
   b. Gantt charts
   c. AOA
   d. OBS

3. Suppose you evaluated the best-case, most likely, and worst-case duration estimates for an activity and determined that they were 3 days, 4 days, and 8 days,

respectively. Using PERT estimation techniques, what would be the expected duration for the activity?

a. 4 days
b. 8 days
c. 5 days
d. 4.5 days

4. Suppose you created your activity network and discovered that you had two critical paths in your project. You share this information with another project manager, who strongly argues that a project can have only one critical path; therefore, your calculations are incorrect. What is the correct response to his assertion?

a. A project can have more than one critical path, although having multiple critical paths is also likely to increase the risk of the project falling behind.
b. Your coworker is correct: A project can have only one critical path. You need to return to the network and determine where you erred in developing the network logic and diagram.
c. The critical path is the shortest path through the network, so having more than one is not a significant problem.
d. A project can have more than one critical path, although having multiple critical paths is actually likely to decrease the overall risk of the project.

5. Which of the following circumstances would require the creation of a lag relationship in a network diagram?

a. The critical path
b. The insertion of a dummy variable into a network diagram
c. A delay after painting a room to allow for the paint to dry before beginning to carpet the room's floor
d. An early finish relationship between two activities

Answers: **1. b**—Accelerating the project through adding resources to critical activities is referred to as "crashing" the project; **2. c**—Dummy variables are employed in Activity-on-Arrow (AOA) network diagrams; **3. d**—PERT estimation would lead to the calculation $(3 + (4 \times 4) + 8)/6 = 27/6$ or 4.5 days; **4. a**—Having more than one critical path is possible; however, the more activities that exist on the critical path(s), the greater the risk to the project's schedule because delays in any critical activities will delay the completion of the project; **5. c**—Allowing for paint to dry before beginning the next activity is an example of a lag relationship occurring between activities.

INTEGRATED PROJECT

Developing the Project Schedule

Develop an in-depth schedule for your initial project based on the Work Breakdown Structure you have completed. You will need to complete several activities at this stage: (1) create an activity precedence diagram showing the network logic for each project activity you have identified; (2) prepare an activity duration table showing optimistic, likely, and pessimistic activity times for each task; and (3) create both the network diagram and Gantt charts for your project, indicating the critical path and all critical activities, total project duration, and all activities with float.

As you prepare the activity precedence diagram, consider:

1. Have we identified opportunities to create parallel paths or are we placing too many activities directly in a serial path?
2. Is our logic correct for identifying preceding and subsequent activities?
3. Are there some clear milestones we can identify along the precedence diagram?

As you prepare the activity duration table, you might wish to set it up along the following lines:

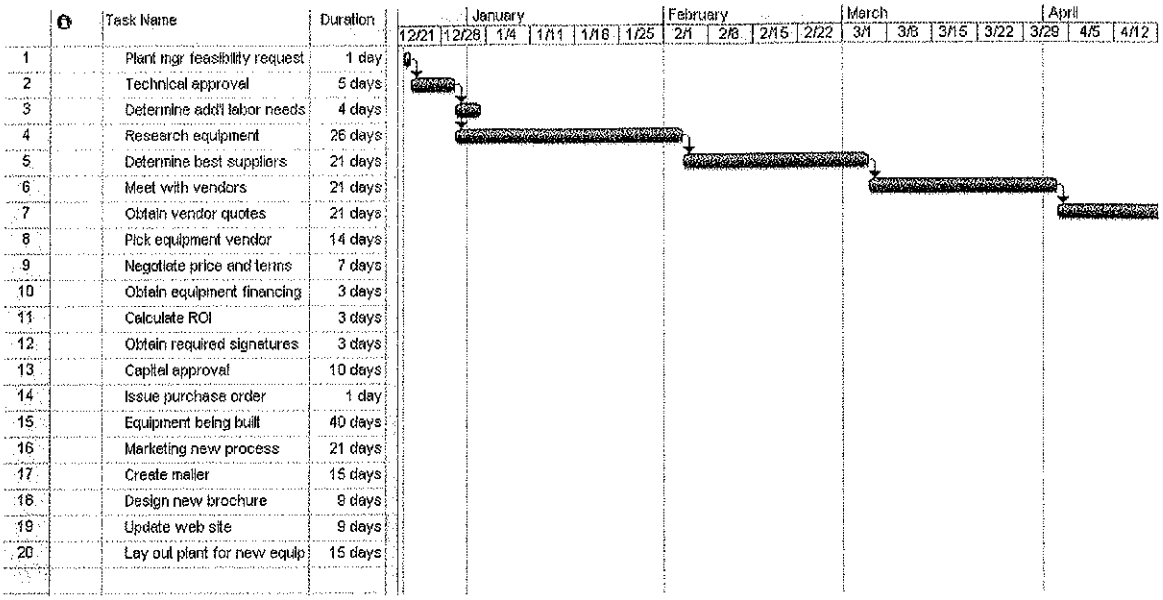
	Duration			
Activity	**Optimistic**	**Likely**	**Pessimistic**	**Est. Duration**
A	6	9	18	10
B	3	8	13	8

Finally, in creating the network diagram and Gantt charts, use MS Project or a comparable scheduling software package (see examples in Figures 10.26, 10.27, and 10.28a, b, and c).

Sample Project Schedule, ABCups, Inc.

Tasks	Duration (in days)
Plant manager feasibility request	1
Get technical approval	5
Determine if additional labor needed	4
Research equipment	26
Determine best suppliers	21
Meet with vendors	21
Obtain quotations from vendors	21
Pick equipment vendor	14
Negotiate price and terms	7
Obtain financing for equipment	3
Calculate ROI	3
Obtain required signatures	3
Capital approved	10
Issue purchase order	1
Equipment being built	40
Marketing new process	21
Create mailer	15
Design new brochure	9
Update Web site	9
Lay out plant for new equipment	15

Note: This is a partial activity network and schedule.



	Task Name	Duration
1	Plant mgr feasibility request	1 day
2	Technical approval	5 days
3	Determine addl labor needs	4 days
4	Research equipment	26 days
5	Determine best suppliers	21 days
6	Meet with vendors	21 days
7	Obtain vendor quotes	21 days
8	Pick equipment vendor	14 days
9	Negotiate price and terms	7 days
10	Obtain equipment financing	3 days
11	Calculate ROI	3 days
12	Obtain required signatures	3 days
13	Capital approval	10 days
14	Issue purchase order	1 day
15	Equipment being built	40 days
16	Marketing new process	21 days
17	Create mailer	15 days
18	Design new brochure	9 days
19	Update web site	9 days
20	Lay out plant for new equip	15 days

FIGURE 10.26 Partial Gantt Chart for ABCups, Inc. Project (Left Side)

Source: MS Project 2013, Microsoft Corporation.

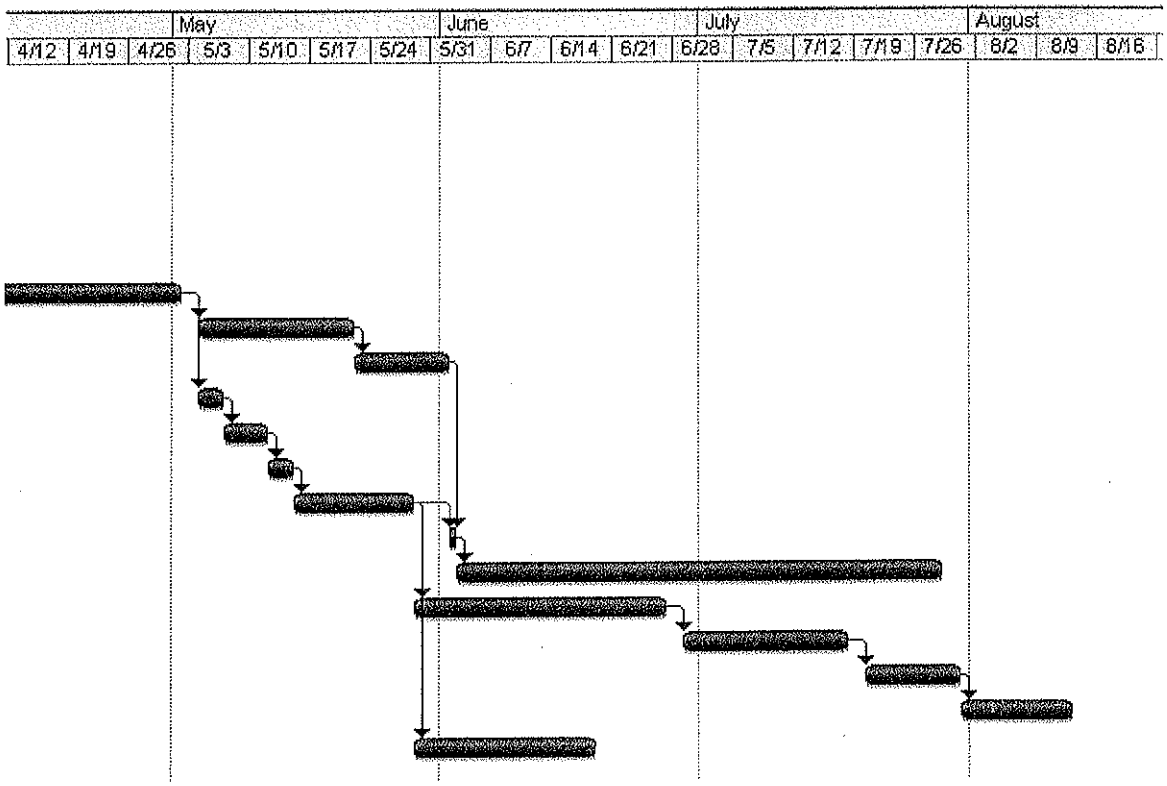


FIGURE 10.27 Partial Gantt Chart for ABCups, Inc. Project (Right Side)

Source: MS Project 2013, Microsoft Corporation.

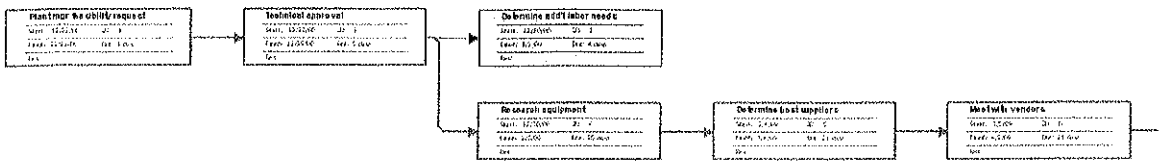


FIGURE 10.28a Network Diagram for ABCups, Inc. Project (Left Side)

Source: MS Project 2013, Microsoft Corporation.

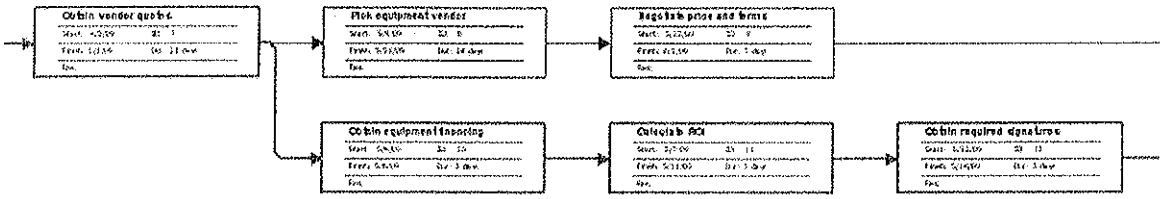


FIGURE 10.28b Network Diagram for ABCups, Inc. Project (Middle)

Source: MS Project 2013, Microsoft Corporation.

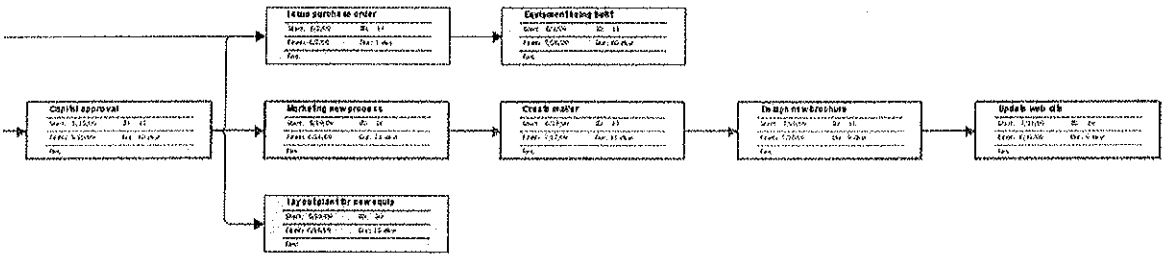


FIGURE 10.28c Network Diagram for ABCups, Inc. Project (Right Side)

Source: MS Project 2013, Microsoft Corporation.

Notes

1. Padgett, T. (2013, May 31). "Expanding the Panama Canal: The Problem Is Money, Not Mosquitoes," *NPR*. www.npr.org/blogs/parallels/2014/05/30/317360379/expanding-the-panama-canal-the-problem-is-money-not-mosquitoes; Faganson, Z., and Adams, D. (2014, July 14). "Panama Canal cost overrun claim headed to Miami arbitration court," *Reuters*. www.reuters.com/article/2014/07/14/us-usa-panamacanal-arbitration-idUSKBN0FJ1PA20140714; Johnston, K. (2014, March 16). "Panama Canal expansion to have major impact on Boston," *Boston Globe*. www.bostonglobe.com/business/2014/03/15/panama-canal-expansion-have-major-impact-boston-worldwide-shipping/lqz3iihcfpHWdTMS9ePDKO/story.html; U.S. Department of Transportation Maritime Administration. (2013). *Panama Canal Expansion Study*. www.marad.dot.gov/documents/Panama_Canal_Phase_I_Report_-_20Nov2013.pdf; Panama Canal Authority (2006). *Proposal for the Expansion of the Panama Canal*. www.acp.gob.pa/eng/plan/documentos/propuesta/acp-expansion-proposal.pdf.
2. Nicholas, J. M. (1990). *Managing Business & Engineering Projects*. Englewood Cliffs, NJ: Prentice-Hall; Hulett, D. (1995). "Project schedule risk assessment," *Project Management Journal*, 26(1): 23–44; Lock, D. (2000). *Project Management*, 7th ed. Aldershot: Gower; Oglesby, P., Parker, H., and Howell, G. (1989). *Productivity Improvement in Construction*. New York: McGraw-Hill.
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