Southwestern University

After 6 months of study, much political arm wrestling, and some serious financial analysis, Dr. Martín Starr, president of Southwestern University, had reached a decision. To the delight of its students, and to the disappointment of its athletic boosters, SWU would not be rel*ocating* to a new football site, but would expand the capacity at its on-campus stadium.

Adding 21,000 seats, including dozens of luxury skyboxes, would not please everyone. The influential football coach, Bo Pitterno, had long argued the need for a first-class stadium, one with built-in dormitory rooms for his players and a palatial office appropriate for the coach of a future NCAA champion team. But the decision was made, and *everyone,* including the coach, would learn to live with it.

The job now was to get construction going immediately after the 2001 season ended. This would allow exactly 270 days until the 2002 season opening game. The contractor, Hill Construction (Bob Hill being an alumnus, of course), signed *his* contract. Bob Hill looked at the tasks his engineers had outlined and looked President Starr in the eye, "I guarantee the team will be able to take the field on schedule next year," he said with a sense of confidence. "I sure hope so," replied Starr. "The contract penalty of $ 10,000 per day for running late is nothing compared to what Coach Pitterno will do to you if our opening game with Penn State is delayed or canceled." Hill, sweating slightly, did not need to respond. In football-crazy Texas, Hill Construction would be *mud* if the 270-day target were missed.

Back in his office, Hill again reviewed the data (see Table 16.5 and note that optimistic time estimates can be used as crash times). He then gathered his foremen. "Boys, if we're not 75% sure we'll finish this stadium in less than 270 days, I want this project crashed! Give me the cost figures for a target date of 250 days— also for 240 days. I want to be *early,* not just on time!"

Questions

1. Develop a network drawing for Hill Construction and determine the critical path. How long is the project expected to take?
2. What is the probability of finishing in 270 days?
3. If it is necessary to crash to 250 or 240 days, how would Hill do so, and at what costs? As noted in the case, assume that optimistic time estimates can be used as crash times.

TABLE 16.5 • Southwestern University Project

			Time Estimates (days)			
ACTIVITY	DESCRÍPTION	PREDECESSOR(S)	OPTIMISTIC	MOST LIKELY	PESSIMISTIC	CRASH COST/DAY
A	*Bonding, insurance, tax structuring*	——	*20*	*30*	*40*	*$1,500*
B	Foundation, concrete footings	A	20	65	80	$3,500
C	Upgrading skyboxes stadium seating	A	50	60	100	$4,000
D	Upgrading walkways. Elevators	C	30	50	100	$1, 900
E	Interior wiring, lathes,	B	25	30	35	$9,500
F	Inspection approvals	E	0.1	0.1	0.1	0
G	Plumbing	*D, F*	25	30	35	$2,500
H	Painting	*G*	10	20	30	$2,000
I	Hardware/AC/metal workings	*H*	20	25	60	$2,000
J	Tile/carpeting/windows	H	8	10	12	$6,000
K	Inspection	J	0.1	0.1	0.1	0
L	Final detail work/cleanup	I,K	20	25	60	$4,500

$$t = \frac{(t_{optimista} + 4 * t_{probable} + t_{pesimista})}{6}$$

$$v=[\frac{(t_{pesimista}-t_{optimista})}{6}]^2$$

$$\sigma_p=\sqrt{v_{proyecto}}$$

$$\text{Probabilidad}=\frac{(\text{fecha-fecha}_{prevista})}{\sigma_p}$$

	t	v
A	30	11.11
B	60	100
C	65	69.44
D	55	136.11
E	30	2.77
F	0.1	0
G	30	2.77
H	20	11.11
I	30	44.44
J	10	0.444
K	0.1	0
L	30	44.44

CUESTIÓN 2

$$v_{proyecto}=v_{camino\ crítico}=319.42$$

$$\sigma_p=\sqrt{v_{proyecto}}=17.87 \text{ dias}$$

$$\text{Probabilidad}=\frac{(\text{fecha-fecha}_{prevista})}{\sigma_p}=\frac{(270\text{-}260)}{17.87}=0.56$$

Mirando en las tablas nos da una probabilidad del 71.22%, lo cual no satisface la condición que nos impone.

CUESTIÓN 3

Si reducimos 10 días la duración.

$$\text{Probabilidad}=\frac{(\text{fecha-fecha}_{\text{prevista}})}{\sigma_p}=\frac{(270\text{-}250)}{17.87}=1.12$$

Que mirando en las tablas se traduce en una probabilidad del 86.86%, lo cual satisface la condición impuesta.