

PMGT 501 WBS 5.4 Chapter 7 Exercises

Benjamin Srock

Embry-Riddle Aeronautical University Worldwide Campus

Fundamentals of Project Management

PMGT 501

Robert W. Erickson, Ph.D.

RUNNING HEAD: CHAPT. 7 EXERCISES

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Chapter 7: Exercises 1 and 2

1. Given the project information below, what is the probability of completing the National Holiday Toy project in 93 time units?

Act. ID	Description	Predecessor	Optm. (a)	Most likely (m)	Pess. (b)	Act Time (t_e)	Variance $[(b-a)/6]^2$	Critical
1	Design package	None	6	12	24			
2	Design product	1	16	19	28			
3	Build package	1	4	7	10			
4	Secure patent	2	21	30	39			
5	Build product	2	17	29	47			
6	Paint	3,4,5	4	7	10			
7	Test market	6	13	16	19			

Step 1: Solve for the weighted average activity time (t_e) for each project activity.

$$\text{Equation 1: } t_e = \frac{a+4m+b}{6} \text{ where,}$$

t_e = weighted average activity time

a = optimistic activity time

b = pessimistic activity time

m = most likely activity time

Act. ID	Description	Predecessor	Optm. (a)	Most likely (m)	Pess. (b)	Act Time (t_e)	Variance $[(b-a)/6]^2$	Critical
1	Design package	None	6	12	24	13		
2	Design product	1	16	19	28	20		
3	Build package	1	4	7	10	7		
4	Secure patent	2	21	30	39	30		
5	Build product	2	17	29	47	30		
6	Paint	3,4,5	4	7	10	7		
7	Test market	6	13	16	19	16		

Step 2: Solve for the activity time variance.

$$\text{Equation 2: } \text{Variance} = \left[\frac{(b-a)}{6} \right]^2 \text{ where,}$$

a = optimistic activity time

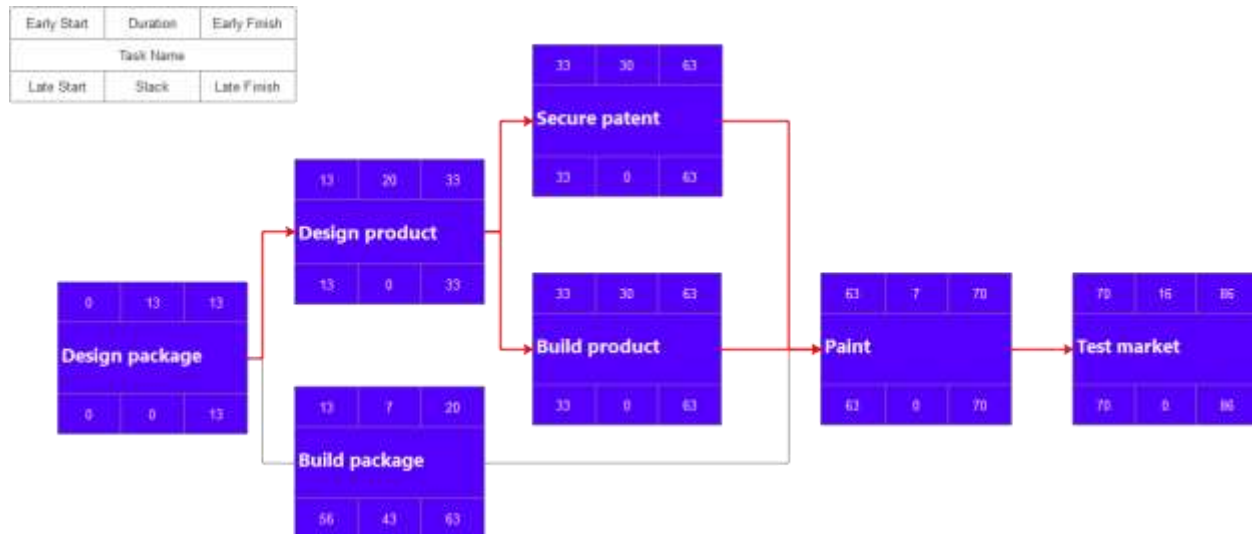
b = pessimistic activity time

Act. ID	Description	Predecessor	Optm. (a)	Most likely (m)	Pess. (b)	Act Time (t_e)	Variance $[(b-a)/6]^2$	Critical
1	Design package	None	6	12	24	13	9	
2	Design product	1	16	19	28	20	4	
3	Build package	1	4	7	10	7	1	
4	Secure patent	2	21	30	39	30	9	
5	Build product	2	17	29	47	30	25	
6	Paint	3,4,5	4	7	10	7	1	
7	Test market	6	13	16	19	16	1	

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Step 3: Determine which activities are on the critical path.

Act. ID	Description	Predecessor	Optm. (a)	Most likely (m)	Pess. (b)	Act Time (t_e)	Variance $[(b-a)/6]^2$	Critical
1	Design package	None	6	12	24	13	9	YES
2	Design product	1	16	19	28	20	4	YES
3	Build package	1	4	7	10	7	1	NO
4	Secure patent	2	21	30	39	30	9	YES
5	Build product	2	17	29	47	30	25	YES
6	Paint	3,4,5	4	7	10	7	1	YES
7	Test market	6	13	16	19	16	1	YES



Step 4: Solve for the probability of completing the National Holiday Toy project in 93 time units.

$$\text{Equation 3: } Z = \frac{T_S - T_E}{\sqrt{\sum \sigma_{t_e}^2}} \text{ where,}$$

Z = probability of meeting scheduled duration

T_E = critical path = **86 time units**

T_S = scheduled project duration = **93 time units**

$\sigma_{t_e}^2$ = variability in the activity time estimates

$$Z = \frac{T_S - T_E}{\sqrt{\sum \sigma_{t_e}^2}} = \frac{93 - 86}{\sqrt{49}} = \frac{7}{7} = +1.0$$

Answer: $P = .841 = 84.1\%$

2. The Global Tea and Organic Juice companies have merged. The following information has been collected for the “Consolidation Project.”

1. Compute the expected time for each activity. Expected time for each activity calculated by using formula ($t_e = \frac{a+4m+b}{6}$).
2. Compute the variance for each activity. Variance, for each activity was calculated using formula ($Variance = \left[\frac{(b-a)}{6}\right]^2$).

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Act. ID	Description	Predecessor	Optm. (a)	Most likely (m)	Pess. (b)	Act Time (t_e)	Variance $[(b-a)/6]^2$	Critical
1	Codify Accounts	None	16	19	28	20	4	
2	File articles of unification	None	30	30	30	30	0	
3	Unify price and credit policy	None	60	72	90	73	25	
4	Unify personnel policies	None	18	27	30	26	4	
5	Unify data processing	1	17	29	47	30	25	
6	Train accounting staff	1	4	7	10	7	1	
7	Pilot run data processing	5	12	15	18	15	1	
8	Calculate P & L and balance sheet	6,7	6	12	24	13	9	
9	Transfer real property	2	18	27	30	26	4	
10	Train salesforce	3	20	35	50	35	25	
11	Negotiate with unions	4	40	55	100	60	100	
12	Determine capital needs	8	11	20	29	20	9	
13	Explain personnel policies	11	14	23	26	22	4	
14	Secure line of credit	9,12	13	16	19	16	1	
15	End	10,13,14	0	0	0	0	0	

3. Compute the expected project duration.

Answer: The expected project duration is **114** time units.

Act. ID	Description	Predecessor	Optm. (a)	Most likely (m)	Pess. (b)	Act Time (t_e)	Variance $[(b-a)/6]^2$	Critical
1	Codify Accounts	None	16	19	28	20	4	YES
2	File articles of unification	None	30	30	30	30	0	NO
3	Unify price and credit policy	None	60	72	90	73	25	NO
4	Unify personnel policies	None	18	27	30	26	4	NO
5	Unify data processing	1	17	29	47	30	25	YES
6	Train accounting staff	1	4	7	10	7	1	NO
7	Pilot run data processing	5	12	15	18	15	1	YES
8	Calculate P & L and balance sheet	6,7	6	12	24	13	9	YES
9	Transfer real property	2	18	27	30	26	4	NO
10	Train salesforce	3	20	35	50	35	25	NO
11	Negotiate with unions	4	40	55	100	60	100	NO
12	Determine capital needs	8	11	20	29	20	9	YES
13	Explain personnel policies	11	14	23	26	22	4	NO
14	Secure line of credit	9,12	13	16	19	16	1	YES
15	End	10,13,14	0	0	0	0	0	YES

4. What is the probability of completing the project by day 112? $P = .3897 = 38.97\%$. Within 116 days? $P = .6103 = 61.03\%$.

• Day 112:

$$Z = \frac{T_S - T_E}{\sqrt{\sum \sigma_{t_e}^2}} \text{ where,}$$

- Z = probability of meeting scheduled duration
 - T_E = critical path = **114 time units**
- T_S = scheduled project duration = **112 time units**
- $\sigma_{t_e}^2$ = variability in the activity time estimates
- $Z = \frac{T_S - T_E}{\sqrt{\sum \sigma_{t_e}^2}} = \frac{112 - 114}{\sqrt{49}} = \frac{-2}{7} = -0.2857$
 - Answer: $P = .3897 = 38.97\%$

• Day 116:

$$Z = \frac{T_S - T_E}{\sqrt{\sum \sigma_{t_e}^2}} \text{ where,}$$

- Z = probability of meeting scheduled duration
 - T_E = critical path = **114 time units**
- T_S = scheduled project duration = **116 time units**
 - $\sigma_{t_e}^2$ = variability in the activity time estimates
 - $Z = \frac{T_S - T_E}{\sqrt{\sum \sigma_{t_e}^2}} = \frac{116 - 114}{\sqrt{49}} = \frac{2}{7} = 0.2857$
 - **Answer: $P = .6103 = 61.03\%$**

5. What is the probability of completing “Negotiate with Unions” by day 90?

- $Z = \frac{T_S - T_E}{\sqrt{\sum \sigma_{t_e}^2}}$ where,
 - Z = probability of meeting scheduled duration
- T_E = critical path = **86 time units** (Comprised of Activity 4 and Activity 11). These are not part of the original critical path, but are the only two items within the path required for the completion of the “Negotiate with Unions” requirement, and are therefore, for consideration of this problem, considered to be the critical path.
- T_S = scheduled project duration = **90 time units**
 - $\sigma_{t_e}^2$ = variability in the activity time estimates
 - $Z = \frac{T_S - T_E}{\sqrt{\sum \sigma_{t_e}^2}} = \frac{90 - 86}{\sqrt{104}} = \frac{4}{10.198} = 0.3922$
 - **Answer: $P = .6517 = 65.17\%$**

Act. ID	Description	Predecessor	Optm. (a)	Most likely (m)	Pess. (b)	Act Time (t_e)	Variance $[(b-a)/6]^2$	Critical
1	Codify Accounts	None	16	19	28	20	4	YES
2	File articles of unification	None	30	30	30	30	0	NO
3	Unify price and credit policy	None	60	72	90	73	25	NO
4	Unify personnel policies	None	18	27	30	26	4	NO
5	Unify data processing	1	17	29	47	30	25	YES
6	Train accounting staff	1	4	7	10	7	1	NO
7	Pilot run data processing	5	12	15	18	15	1	YES
8	Calculate P & L and balance sheet	6,7	6	12	24	13	9	YES
9	Transfer real property	2	18	27	30	26	4	NO
10	Train salesforce	3	20	35	50	35	25	NO
11	Negotiate with unions	4	40	55	100	60	100	NO
12	Determine capital needs	8	11	20	29	20	9	YES
13	Explain personnel policies	11	14	23	26	22	4	NO
14	Secure line of credit	9,12	13	16	19	16	1	YES
15	End	10,13,14	0	0	0	0	0	YES