**Topic: Project Management**

**Questions for the Case: Project Management Analysis in the Internet Forecasting Industry**

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*Q 1: Construct the project network (activity-on-node diagram). List all the paths of the project network.*

*Q 2: If we ignore the uncertainty in the duration of the tasks, what is the completion time for this project? (Use the most likely time estimates for your calculations).*

*What is the cost of the project?*

*Identify the critical path(s) of the project. Identify the critical and non-critical tasks.*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Task | Time | Earliest Start Time | Earliest Finish Time | Latest Start Time | Latest Finish Time | Slack |
| A | 3 |  |  |  |  |  |
| B | 7 |  |  |  |  |  |
| C | 6 |  |  |  |  |  |
| D | 7 |  |  |  |  |  |
| E | 9 |  |  |  |  |  |
| F | 5 |  |  |  |  |  |
| G | 6 |  |  |  |  |  |
| H | 4 |  |  |  |  |  |
| I | 2 |  |  |  |  |  |
| J | 4 |  |  |  |  |  |
| K | 3 |  |  |  |  |  |

**Exhibit 3:** The expected time of the tasks and their variance is computed using the formulas below and are shown in the table as follows:

* Expected Time = (Most Optimistic Time + 4\* Most Likely Time + Most Pessimistic Time)/6
* Variance = (Most Pessimistic Time - Most Optimistic Time)2/36

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Task | Most Optimistic  Time | Most Likely  Time | Most Pessimistic  Time | Expected Time | Variance |
| A | 2 | 3 | 4 | 3.00 | 0.11 |
| B | 4 | 7 | 10 | 7.00 | 1.00 |
| C | 5 | 6 | 9 | 6.33 | 0.44 |
| D | 6 | 7 | 16 | 8.33 | 2.78 |
| E | 7 | 9 | 10 | 8.83 | 0.25 |
| F | 4 | 5 | 6 | 5.00 | 0.11 |
| G | 3 | 6 | 10 | 6.17 | 1.36 |
| H | 2 | 4 | 7 | 4.17 | 0.69 |
| I | 2 | 2 | 2 | 2.00 | 0.00 |
| J | 3 | 4 | 14 | 5.50 | 3.36 |
| K | 2 | 3 | 4 | 3.00 | 0.11 |
|  |  |  |  | TOTAL = 59.33 |  |

*Q 3: If the uncertainty in the duration of the tasks is considered, estimate the completion time for this project? What is the cost of the project?*

*Identify the critical path(s) of the project. Identify the critical and non-critical tasks.*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Task | Expected Time | Earliest Start Time | Earliest Finish Time | Latest Start Time | Latest Finish Time | Slack |
| A | 3.00 |  |  |  |  |  |
| B | 7.00 |  |  |  |  |  |
| C | 6.33 |  |  |  |  |  |
| D | 8.33 |  |  |  |  |  |
| E | 8.83 |  |  |  |  |  |
| F | 5.00 |  |  |  |  |  |
| G | 6.17 |  |  |  |  |  |
| H | 4.17 |  |  |  |  |  |
| I | 2.00 |  |  |  |  |  |
| J | 5.50 |  |  |  |  |  |
| K | 3.00 |  |  |  |  |  |

*Solution:*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Task | Expected Time | Earliest Start Time | Earliest Finish Time | Latest Start Time | Latest Finish Time | Slack |
| A | 3.00 | 0 | 3 | 0 | 3 | **0** |
| B | 7.00 | 3 | 10 | 19.50 | 26.50 | **16.50** |
| C | 6.33 | 3 | 9.33 | 3 | 9.33 | **0** |
| D | 8.33 | 9.33 | 17.67 | 9.33 | 17.67 | **0** |
| E | 8.83 | 17.67 | 26.50 | 17.67 | 26.50 | **0** |
| F | 5.00 | 26.50 | 31.50 | 26.50 | 31.50 | **0** |
| G | 6.17 | 17.67 | 23.83 | 25.33 | 31.50 | **7.67** |
| H | 4.17 | 26.50 | 30.67 | 27.33 | 31.50 | **0.83** |
| I | 2.00 | 10 | 12 | 29.50 | 31.50 | **19.50** |
| J | 5.50 | 31.50 | 37 | 31.50 | 37 | **0** |
| K | 3.00 | 37.00 | 40.00 | 37.00 | 40 | **0** |

*Q 4: What is the level of confidence that the project can be completed in 35 weeks? Or what is the probability that the project can be completed in 35 weeks?*

* *Use the excel function NORMDIST (X, mean, standard deviation, cumulative frequency) to compute the probability.*

*Q 5: What is the level of confidence that the project can be completed by the mean duration of the 40 weeks? Or what is the probability that the project can be completed in 40 weeks?*

**Exhibit 4:** The normal costs, normal times, crash cost, crash times are shown in the table below. The marginal cost is computed as (Crash Cost- Normal Cost)/ (Normal Time – Crash Time)”.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Task | Normal Costs | Normal Time | Crash Costs | Crash Time | Marginal Cost  ($/week) | Normal-Crash Time |
| A | 10,000 | 3 | 10,000 | 3 |  |  |
| B | 20,000 | 7 | 25,000 | 6 | 5,000 | 1 |
| C | 15,000 | 6.33 | 30,000 | 5 | 11,278 | 1.33 |
| D | 45,000 | 8.33 | 65,000 | 6 | 8,584 | 2.33 |
| E | 10,000 | 8.83 | 20,000 | 8 | 12,048 | 0.83 |
| F | 15,000 | 5 | 18,000 | 4 | 3,000 | 1 |
| G | 20,000 | 6.17 | 30,000 | 4 | 4,608 | 2.17 |
| H | 10,000 | 4.17 | 15,000 | 3 | 4,274 | 1.17 |
| I | 5,000 | 2 | 5,000 | 2 |  |  |
| J | 40,000 | 5.5 | 50,000 | 5 | 20,000 | 0.5 |
| K | 15,000 | 3 | 25,000 | 2 | 10,000 | 1 |
|  | **205,000** |  | **293,000** |  |  |  |

*Q 6: The project manager would like to reduce the duration of the project to 35 weeks. Clearly indicate the activities to crash, the resulting expected project time and associated costs at each step.*

*Q 7: Based on the information provided, crash the project as much as possible. Clearly indicate the activities to crash, the resulting expected project time and associated costs at each step.*

*Q 8: Plot the crashing cost curve (project duration vs. total project cost). What insights do this curve provide?*

*Q 9 [PRACTICE QUESTIONS]: Phillips wanted to investigate the impact on the crashing solution if the expected time for task B (market assessment) was increased from seven to nine weeks. Clearly indicate the activities to crash, the resulting expected project time and associated costs at each step.*

*Q 10 [PRACTICE QUESTIONS]: Phillips wanted to see the impact on the crashing solution if the expected time for task D (development) was decreased to seven weeks. Clearly indicate the activities to crash, the resulting expected project time and associated costs at each step.*

*Q 11 [PRACTICE QUESTIONS]: Analyze the impact on the crashing solution if the expected time for task B (market assessment) was increased from seven to nine weeks whereas the expected time for task D (development) was decreased to seven weeks simultaneously. Clearly indicate the activities to crash, the resulting expected project time and associated costs at each step.*