Software Project Management
(A.Y. 2016/2017)
Commented Solutions

July 18^{th}, 2017

Preamble

The Silly Software Company (SSC) has been asked to develop a complex software system and you, as an employee of the company, have been nominated Project Manager. The management is now asking you to provide some forecasting in order to decide on how to proceed with the project.

In deriving your prediction you should consider that the **week** gross salary of the emplyees is as following specified:

- *Senior developer:/Analysts* 3500$
- *Junior developer:* 2000$

Moreover historical data show that the company generally experiments a 65% overhead

Exercise 1.

In order to derive a more reliable estimation you sketch a set of workpackages (WPs) and tasks needed in order to complete the project. WPs and tasks are detailed in Table 1. The table also includes information concerning the dependencies among the tasks.

Activity (Precedents)	Activity Durations (weeks)		
	Optimistic (a)	Most likely (m)	Pessimistic (b)
T1.1	1	2	5
T1.2	1	2	4
T1.3 (T1.1,T2.1)	4	8	13
T2.1	8	12	17
T2.2 (T1.1, T1.2)	3	4	4,5
T2.3 (T1.1, T1.2)	2	4	6
T3.1 (T2.1,T2.2)	7	8	9
T3.2 (T2.1,T2.3)	4	12	10
T3.3 (T2.2,T2.3,T3.1)	8	12	13
T4.1 (T3.2,T3.3)	3	4	5
T4.2 (T3.1,T3.3)	3	4	5
T4.3 (T4.1,T4.2)	6	8	12

Table 1: PERT activities time estimates (in weeks)

Apply the PERT approach to:

- Compute the duration of the project
- Provide the probability of successfully terminating task T4.2 within 35 weeks, according to the dependencies and the corresponding path ending with activity 4.2
- Provide the probability of finishing the project after one year (52 weeks)
- Provide the probability of finishing the project after one year (56 weeks)
- Provide the ordered list of activities belonging to the critical path where the value for the time is the one specified by t_e.

14 points

Solution:

- To compute the expected duration of the project we need to build the PERT network as reported in Figure 1. Then from the data reported there we can deduce that the expected duration for the project is 52 weeks.
- In this case we need to calculate the formula $z = (T - t_e)/s$ for the path ending with task T4.2. In this case we should not consider the value on node 16 being related to the path ending with task T4.1. So we need to compute the value for t_e and s with respect to that path. Using the usual formula we obtain the following values $t_e = 24,67 + 4 = 28,67$ and $s = \sqrt{(1,87^2 + 0,33^2)} = 1,9$. Therefore $z = (35 - 28,67)/1,9 = 3,33$. Now using the table for z we obtain that the probability of finishing Task T4.2 project within the 20^{th} week is almost 1.
- In this case the value corresponds with the one for the path ending with activity 4.4. Therefore as it is well known the probability of successfully terminating a task as indicated in the PERT network is always $0,5$
- In this case we can use the value on node 14 on Figure 1 to compute the value of z. In particular we obtain $z = (56 - 52)/2,79 = 1,43$. Using the table for the value of z we can deduce that the probability of finishing the project after 56 weeks year is around $0,92$.
- The critical path is generally computed applying the CPM technique. Nevertheless if the value to use is the one for t_e we can deduce the critical path also from a PERT network given that the number in it follows the same logics used in CPM. In particular the following one is the critical path:

  1. $T1.3 \rightarrow T2.3 \rightarrow T3.4 \rightarrow T4.4$

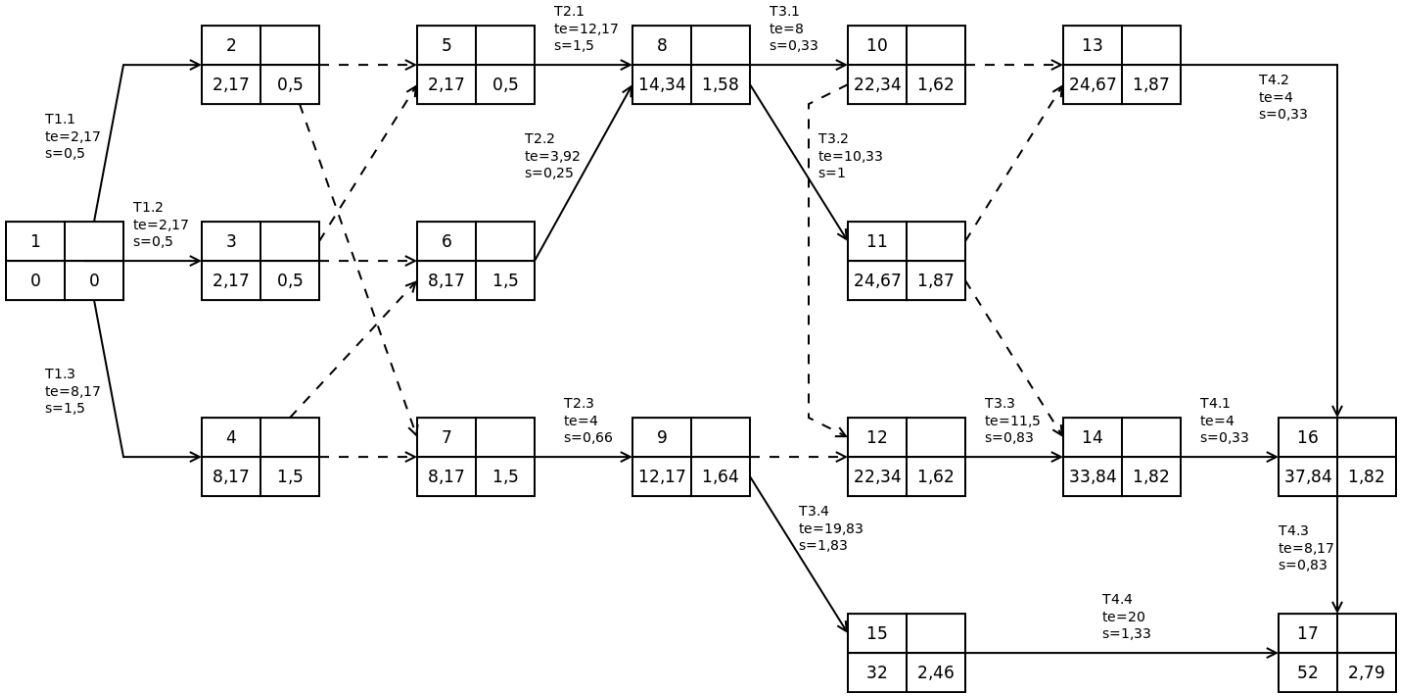

Figure 1: PERT network

Exercise 2.

Consider now a project in which the foreseen activities and dependencies are the ones specified in Table 2, where the duration is expressed in weeks, and the effort is expressed in terms of needed Senior Developers (SD) and Junior Developers (JD) respectively:

Task	**Duration**	**Effort**	**Depends on**
T1.1	10	20 SD/10 JD	
T1.2	8	24 SD/16 JD	
T1.3	6	6 SD/0 JD	T1.1
T1.4	6	6 SD/6 JD	
T2.1	2	4 SD/2 JD	
T2.2	6	12 SD/6 JD	T1.3,T2.3
T2.3	8	0 SD/8 JD	T2.1
T3.1	4	12 SD/8 JD	T1.2, T1.4
T3.2	16	16 SD/16 JD	T3.1
T4.1	6	12 SD/12 JD	T3.2
T4.2	4	8 SD/8 JD	T2.2

Table 2: Activities, effort and dependencies

- Report the CPM network and derive the total duration of the project, as well as the various floats for each activity
- Compute the total cost for the project
- Provide a possible allocation of resources respecting the following constraints:
  - activities cannot be split in subactivities
  - effort should be uniformly distributed over the weeks for the whole duration of the corresponding activity
  - the company does not have more than 5 Senior Developers and 4 Junior Developers.

7 points

Solution:

- The CPM network and related information can be easily derived from Figure 2 given the depnedencies reported in Table 2.
- Figure 2 reports also the effort needed for each activity and the total effort for SD, and JD. As indicated the total cost of the project is 1027950$.
- In order to respect the constraints listed in the third item of the problem list, it will be necessary to move the tasks within their float. The objective will be to derive a distribution of effort that still respects taks dependencies and the additional contraints. Figure 3 reports a possible allocation respecting all the listed constraints, but it is obviously possible to arrange the effort according to different strategies, still respecting the constraints.

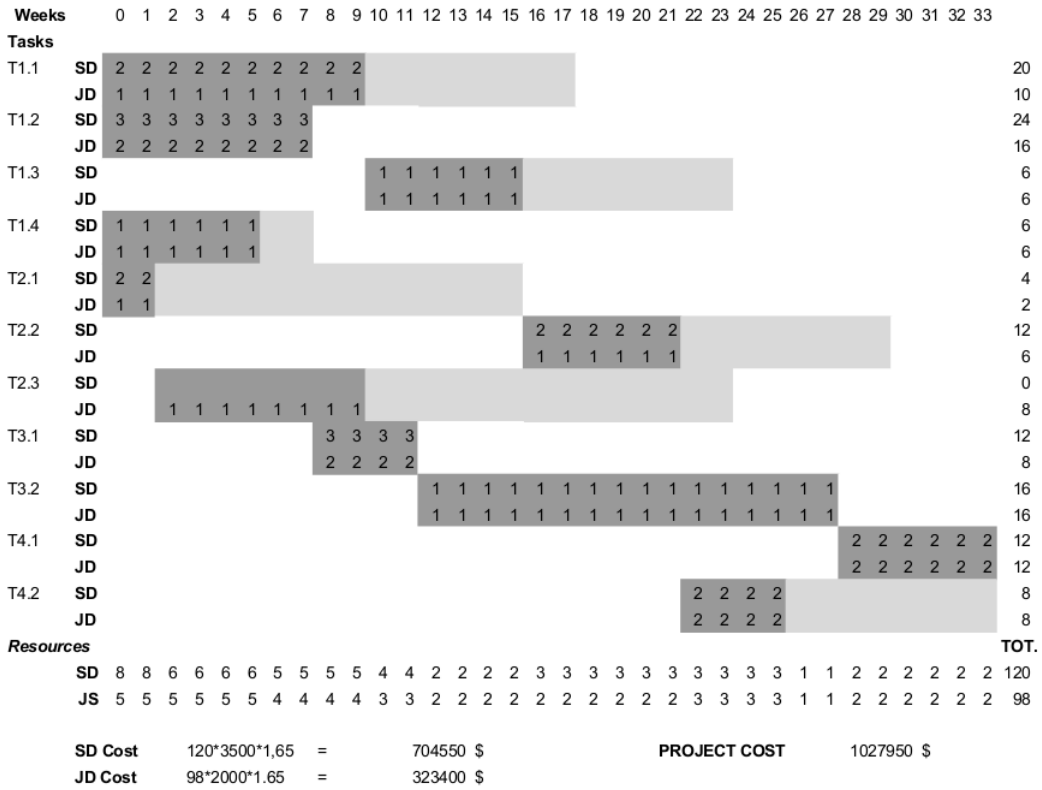

Figure 2: CPM and costs indication

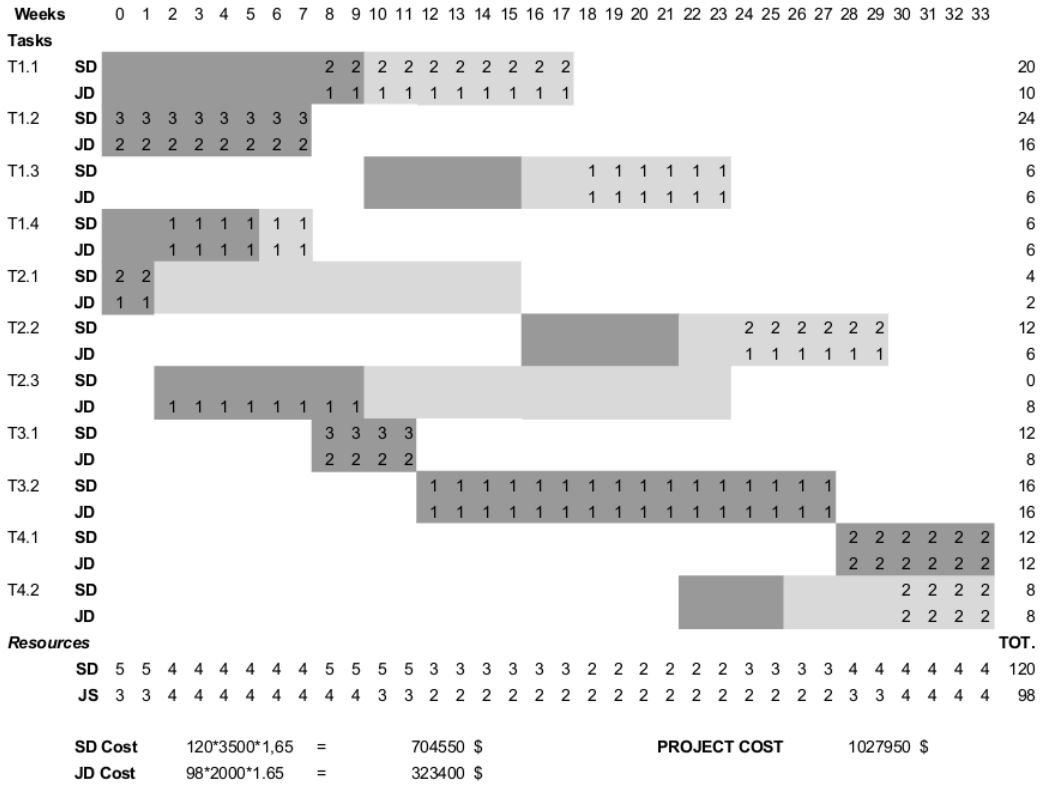

Figure 3: CPM with revised allocation

Question 1.

What are the differences between iterative and incremental development and how are they adopted in SCRUM?

4 points

Answer:

Answers to this questions can be found at pages 44, 121 and 122 of the book.

Question 2.

List and shortly discuss some general principles to plan and run effective Scrum Sprint. **4 points**

Answer:

The answer to this question can be found at page 128

Question 3.

What is visibility in a software development process, and how is it adopted by SCRUM? **4 points**

Answer:

The answer to this question can be found at page 111