

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

March 14th, 2017

Preamble

The Dummy Software Company (DSC) 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 the following amounts for the gross salary **per week**. Moreover historical data show that the company generally experiments a 72% overhead:

- *Senior developer/Analysts*: 3000\$
- *Junior developer*: 1800\$

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	4
T1.2	1	2	4
T1.3 (T1.1)	4	8	13
T1.4 (T1.3)	8	12	17
T1.5 (T3.3)	6	10	12
T2.1	3	4	5
T2.2 (T2.1)	3	4	4,5
T2.3 (T2.2)	2	4	6
T3.1 (T1.2)	2	4	7
T3.2 (T3.1)	7	8	9
T3.3 (T2.2,T3.2)	8	12	13
T3.4 (T1.4,T1.5)	5	7	10
T4.1 (T2.3)	3	4	5
T4.2 (T1.4,T1.5)	3	4	5
T4.3 (T4.1,T4.2)	6	8	11

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 T3.4 and T3.3 exactly as indicated in the derived PERT network.
- Provide the probability of not finishing the project after one year (i.e. 52 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 47,64 weeks.
- In this case it is not necessary to do any computation since the probability of successfully terminating a task as initiated in the PERT network is always 0,5
- In this case we need to calculate the formula $z = (T - t_e)/s$ for the node labeled 13 in Figure 1. Therefore $z = (52 - 47,64)/1,72$ i.e. $z = 2,53$. Now using the table for z we obtain that the probability of finishing the project within the 52th week is higher than 0,97.
- 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 follow the same approach used in CPM. In particular the result we get in this case is: $T1.2 \rightarrow T3.1 \rightarrow T3.2 \rightarrow T3.3 \rightarrow T1.5 \rightarrow T4.2 \rightarrow T4.3$

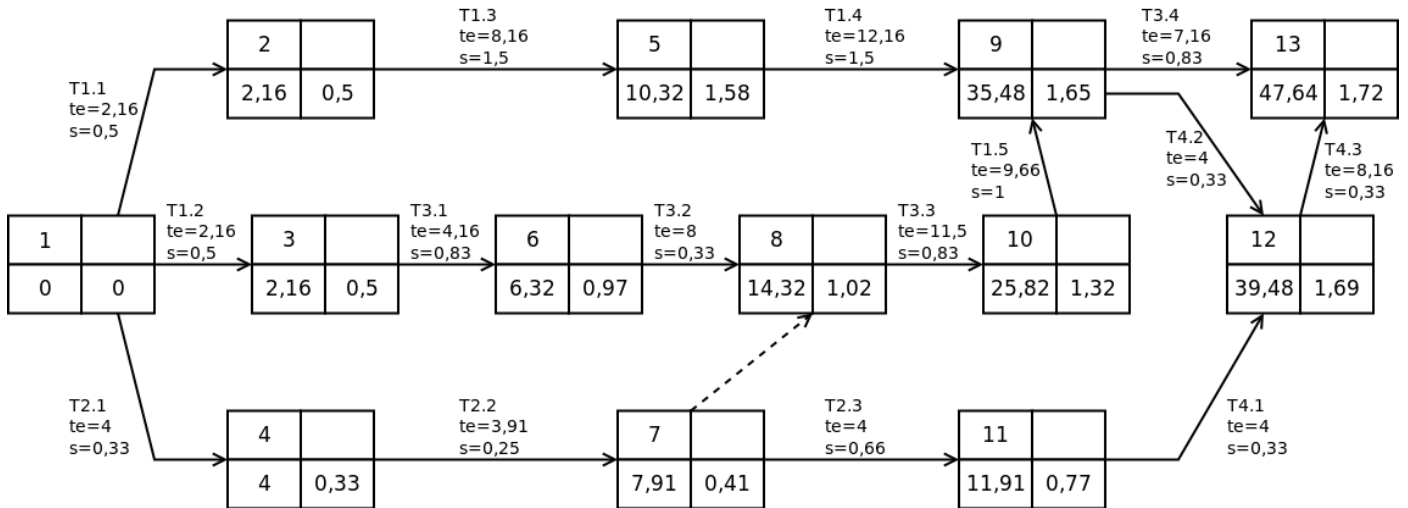


Figure 1: PERT network

Exercise 2.

Consider now a different planning for the same project in which the foreseen activities and dependencies are the following ones:

- $T1.4 \leftarrow T1.1$
- $T3.1 \leftarrow T1.2, T1.3$
- $T2.2 \leftarrow T2.1$
- $T2.3 \leftarrow T1.4, T2.2$
- $T3.2 \leftarrow T3.1$
- $T4.2 \leftarrow T3.2$
- $T4.1 \leftarrow T2.3$

Table 2 reports the resource allocation according to an early start strategy.

- Compute the total cost for the project considering that the management allocate the cost of a resource to a project in case it is released for less than 3 weeks, or it is allocated for less then 3 weeks.
- Provide an alternative allocation of resources to reduce costs, and the maximum request for each type of resource. In doing this consider that you cannot change the effort required by each task, and it is not possible to split the task in more sub-tasks.

8 points

Solution:

- According to the data reported in Table 2 we can observe that 3SDs and 1 JD are assigned to the project for less than three weeks in the period 0-1. According to the rule established by the management the project will incur in an additional cost for an equivalent of 3 weeks SD effort and 1 week JD effort. Successively in the period 10-11 an SD resource is released for just two weeks therefore the project will incur in an additional cost of 2 weeks SD effort. In summary to derive the cost of the project we will need to consider an effort of $100 + 5 = 105$ weeks of

Weeks		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
Tasks																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
T1.1	SD	2	2	2	2	2	2	2	2	2	2	2																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
	JD	1	1	1	1	1	1	1	1	1	1																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
T1.2	SD	2	2	2	2	2	2	2	2	2	2	2	2	2																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
	JD	2	2	2	2	2	2	2	2	2	2	2	2	2	2																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
T1.3	SD	1	1																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
	JD	1	1																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
T1.4	SD											1	1	1	1	1	1																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
	JD																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
T2.1	SD	2	2																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
	JD	1	1																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
T2.2	SD																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
	JD				1	1	1	1	1	1	1	1	1																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
T2.3	SD																	2	2	2	2	2	2																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
	JD																	1	1	1	1	1	1	1																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
T3.1	SD												3	3	3	3																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
	JD												2	2	2	2																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
T3.2	SD																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
	JD																	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Table 2: Early start and resource allocation

Weeks		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37								
Tasks																																															
T1.1	SD	2	2	2	2	2	2	2	2	2	2	2																																			
	JD	1	1	1	1	1	1	1	1	1	1																																				
T1.2	SD	2	2	2	2	2	2	2	2	2	2	2	2	2																																	
	JD	2	2	2	2	2	2	2	2	2	2	2	2	2	2																																
T1.3	SD											1	1																																		
	JD											1	1																																		
T1.4	SD											1	1	1	1	1	1	1																													
	JD																																														
T2.1	SD																	2	2																												
	JD																	1	1																												
T2.2	SD																																														
	JD																					1	1	1	1	1	1	1	1																		
T2.3	SD																										2	2	2	2	2	2															
	JD																										1	1	1	1	1	1	1														
T3.1	SD													3	3	3	3																														
	JD													2	2	2	2																														
T3.2	SD																																														
	JD																2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2													
T4.1	SD																																					2	2	2	2						
	JD																																														
T4.2	SD																																2	2	2	2	2	2	2								
	JD																																1	1	1	1	1	1	1								
Resources												+1	+1																									TOT.									
	SD	4	4	4	4	4	4	4	4	4	4	3	3	4	4	4	4	3	3	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2	2	4	4	4	4	100						
	JS	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	98					
	SD Cost	102*3000*1.72		=													526320 \$					PROJECT COST										829728 \$															
	JD Cost	98*1800*1.72		=													303408 \$																														

Table 3: Revised resource allocation plan

SD effort and $98 + 1 = 99$ weeks of JD effort.

Therefore the project total cost (PTC) is equal to: $PTC = (SD\ effort * 3000 + JD\ effort * 1800) * (1 + overhead)$

After having performed the calculation we discover that $PTC = 848304$ \$

- In order to reduce the peaks in the distribution of the workers effort it is possible to move the tasks within their float and having care of not violating any dependency. In Table 3 the revised plan is reported. From the table we notice that the maximum request of SD workers is now 4 (7 before), while the request for JD workers is now 3 (5 before). At the same time there is still an "extra" allocation of 2 weeks of SD effort, while there is no "extra" allocation of JD effort. The table reports the final costs for the revised plan.

Question 1.

Describe what is the "planning poker", for which activity has been conceived? How it works? which are its interesting characteristics in relation to the objectives of the activities in which it is used? **4 points**

Answer:

Planning poker is a techniques used in planning the sprint to assign points to user stories. Details can be found at page 170 of the book "*Learning Agile - Understanding SCRUM, XP, Lean and Kanban*".

Question 2.

What do we mean with the sentence "better then not doing it" in relation to the adoption of agile methodologies? When a team that reaches such level in the adoption of Agile, can be considered Agile? In case not, why? **4 points**

Answer:

In general the sentence refers to organizations that adopt the Agile techniques and pactices but are not able to integrate Agile values and principles. In such case the team cannot be considered an Agile team. Further information are dispersed in the book "*Learning Agile - Understanding SCRUM, XP, Lean and Kanban*" and in particular page 25 and followings.

Question 3.

Which are the differences between the product backlog and the spring backlog? How are they managed? Who is responsible for their management? **3 points**

Answer:

The product backlog includes all the requirements and user stories the team will have to develop. On the other hand the sprint backlog just includes those requirements and stories that will be the focus of the next sprint. The management of the product backlog is somehow a collective commitment, nevertheless is the product owner that is responsible for inserting stories and requirements into the product backlog and to declare that one of the included item has reached the status "done done" and then moved into the corresponding part of the backlog. The sprint backlog is built at the beginning of each sprint during the sprint planning. The product owner suggests what has to be developed in the next spring but the discussion and decision are taken collectively by the SCRUM team. Successively each memeber of the team will select items from the spring backlog in order to implement the corresponding functionality. Further detail are dispersed in the book "*Learning Agile - Understanding SCRUM, XP, Lean and Kanban*" and in particular page 122 and follwings.