Software Project Management
(A.Y. 2021/2022)
Mock Exam
January 10th-12th, 2022

Preamble

The Silly Software Company (SSC) has been asked to develop a complex software system. You, as an employee of the company, have been appointed as 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 **day** gross salary of the emplyees is as following specified:

- *Senior developer:/Analysts* 800€
- *Junior developer:* 500€

Moreover historical data show that the company generally experiments a 60% overhead

Exercise 1. (PERT Analysis)

At first in order to derive a more reliable estimation you sketch a set of workpackages (WPs) and tasks that you consider necessary in order to complete the project. WPs and tasks are detailed in Table 1. The table also includes information concerning the dependencies among the various tasks, as well as the duration defined according to a three point approach.

Activity (Precedents)	Activity Duration (weeks)				
	Optimistic (a)	Most likely (m)	Pessimistic (b)	Expected te	Standard deviation (s)
A	11	13	21	14	
B (A)	6,5	7,5	11,5	8	0,83
C (D)	10,5	11,5	15,5		0,83
D	11	15	25	16	2,33
E (A)	7	9,5	15	10	1,33
F (B,E)	10	13	22	14	2
G (L,M)	6	7,5	12	8	1
H (B)	8,5	9,5	13,5	10	
I (H,F)	10,5	13,5	19,5		1,5
L (F,H)	5	6	7	6	0,33
M (B,C,E)	5	6,5	11	7	1
N (M)	3,5	4	4,5		0,16
O (L,N)	6	7	8	7	

Table 1: Activity duration estimates (in days)

TO derive a first estimation you should now apply the PERT approach to:

- Compute the duration of the project

- Provide the probabilities to have ended the project by days 52 and 60

- Compute the probability to successfully terminating activity H by day 38

- Compute the day by which the probability of having finished activity O is 0,95

- Compute the day by which the probability of having finished the project is 0,9

- Immagine to have adopted an "early start" strategy to derive the scheduling of the project. At day 35 you realize that the values aasociated to activity "N" should be changed to $t_e = 5$ and $\sigma = 2$. Discuss how the modificaton impacts the project duration and scheduling. Now assume that 'N" should be changed to $t_e = 10$ and $\sigma = 2$. In particular provide the day by which the probability to have ended the project is 0,95.

12 points

Exercise 2. (Resource Allocation and Optimization)

In order to derive the plan you now consider the critical chain method. For deriving the plan you consider the numbers reported in Table 2 and you consider as duration the one expressed by t_e, and the corresponding comfort zone is the one derived considering a probability of 95% with an approximation derived using ceiling to the whole week. In deriving the plan you should use the value $0, 5$ to define the project buffer and $0, 25$ for the feeding buffers (approximate using ceiling to the whole week).

Once you have defined the plan according to the critical chain method you now derive the expected costs on the base of the effort needed by each task in relation to Senior Developers (SD) and Junior Developers (JD) respectively (the effort should be uniformly distributed over the weeks for the whole duration of the corresponding task):

Task	Effort
A	56 SD/28 JD
B	16 SD/16 JD
c	24 SD/24 JD
D	16 SD/32 JD
E	20 SD/0 JD
F	28 SD/28 JD
G	8 SD/0 JD
H	20 SD/20 JD
I	14 SD/28 JD
L	6 SD/6 JD
M	28 SD/21 JD
N	8 SD/8 JD
O	0 SD/7 JD

Table 2: Expected effort for the project activities

- Provide the resource allocation according to the critical chain method, and compute the total cost assuming that no constraint has to be respected (infinite resources).
- compute the total cost of the project assuming that the company staff is constituted by 6 JD and 6 SD and hiring a JD costs 10K€ while to hire a SD 15K€ are needed.
- Compute the total cost, possibly suggesting modification to the plan to reduce the cost. Moreover it is necessary to consider the following additional contraint (Tables 3 and 3 are provided for your convenience):
  - activities cannot be split in subactivities
  - in order to simplify management of the personnel the following rules have to be considered:
    * personnel are charged to the project budget for a minimum of 3 days (i.e. in case a resource is assigned to a project for less then three days in any case the budget to be considered is the one corresponding to three days).
    * the release of personnel for less then 3 days is in any case charged for the whole duration of the gap

12 points

Sample Questions

Question 1. (Agile)

Give a description for values, principles and practices in the context of agile methodologies. Explain then the meaning of the sentence "Better-then-not-doing-it" in relation to the adoption of agile practices. **3 points**

Question 2. (SCRUM)

Explain what the "last responsible moment" is and how it relates to planning in agile methodologies and in particular in SCRUM.   **3 points**

Question 3. (XP)

How does XP intends to support changes in requirements?   **3 points**

Question 4. (BRUF)

Describe the strategy based on the "probability impact matrix" (4x4 approach) in order to identify the most relevant risks worthy to be considered during risk planning activities.

Question 5. (Project Cost Predition)

Describe the characteristics of COCOMOII and its underlying hypothesis   **3 points**

Question 5.II (Project Cost Predition)

Describe the general formula for the algorithmic cost modelling approach and successively apply the COCOMO II approach to derive the PM of a traditional development project, with the following characteristics, and in a phase in which requirements have been clearly established:

- Reliability and Complexity - considered "Extra high" (factor 2,72)
- Reuse required - considered "Nominal" (factor 1)
- Development and deployment platform complexity and difficulty - considered "Extra high" (factor 2,61)
- Personnel capability - considered "Extra high" (factor 0,5)
- Personnel experience - considered "Nominal" (factor 0,62)
- Scheduling - no particular challenges are perceived "Nominal" (faccor 1)
- Supporting Facilities - considered "Very High" (factor 0,73)
- expected KLOC = 100
- value for B = 1,2

3 points

Day	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	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	TOT.
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Table 3: Exercise 2 - Resource Allocation

Day	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	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	
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