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Assignment 1 instructions

Based on Lecture 3, you are going to solve exercises related to estimation techniques, such as estimation by Analogy, PERT, and early-stage COCOMO II model.

1. Individually solve the following exercises.
2. The outcome of your work must be uploaded to Moodle web site to the corresponding slot (A1).
3. The required format is a pdf file.
4. Remember that submissions due dates are on Wednesdays 23:59 EST time. Check Moodle website for further info.

Exercise 1.

Venus consulting is the winning bidder for the development of a new mobile app for a ride-share company. Table 1. shows a list of the various features for this project. Given the three estimations for each feature, given by the project experts, use PERT technique to estimate how many days are required to complete the project considering the best, the worst, and the expected scenario.

Round your results to two decimals.

Table 1.

Feature	Estimation time to complete (days)			Expected case
	Best	Most Likely	Worst	
1	1	2	4	2.17
2	2	4	7	4.17
3	1	3	6	3.17
4	3	5	8	5.17
5	4	7	9	6.83
6	6	9	13	9.17
7	1	2	5	2.33
8	2	4	7	4.17
9	1	3	5	3.00
10	7	9	12	9.17
Total	28	48	76	49.33

Total 30 points. Two points will be discounted for each incorrect number in the table.

Calculations

ExpectedCase = [BestCase + (4 × MostLikelyCase) + WorstCase] / 6

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Exercise 2.

Based on the estimation by analogy, what is the estimated effort for developing a new software **epsilon** considering that the effort for developing a similar system, **gamma**, took **48 staff-months**?

Round to two decimals when making your calculations.

Table 2.

Subsystem-Units	Actual Size of gamma	Estimated Size of epsilon	Code size of gamma (LOCs)
Database, tables	25	32	2,500.00
User interface, web pages	34	42	1,700.00
Graphs and reports, reports	33	37	1,650.00
Foundation classes, classes	100	125	5,000.00
Business rules	2	5	200.00

Calculate the multiplication factor (10 points); the estimated code size of epsilon (10 points) for each subsystem; the size ratio (5 points); and the estimated effort for project epsilon (5 points).

Total 30 points.

Subsystem-Units	Code size of gamma (LOCs)	Multiplication factor	Estimated code size of epsilon
Database, tables	2,500.00	1.28	3200.00
User interface, web pages	1,700.00	1.24	2100.00
Graphs and reports, reports	1,650.00	1.12	1850.00
Foundation classes, classes	5,000.00	1.25	6250.00
Business rules	200.00	2.50	500.00
Total	11,050.00		13,900.00

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Calculations

Multiplication factor (subsystem) = (number of elements in New) / (number of elements in Old)

Size (new subsystem) = Size (old subsystem) × Multiplication factor

Size Ratio = Size(New Project)/Size (Old Project)

= 13,900.00 / 11,050.00

= 1.26

Estimated Effort (New Project) = Effort (Old Project) × Size Ratio

= 48 × 1.26 = 60.48

= 61 staff-months

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Exercise 3.

A Java project estimated at 149 kdsi is to be developed by Omega consulting. The team has very little experience on similar projects. The requirements present an average stability. There exists a high number of design constraints for a project of this type. Developers are located in the same location and are well integrated. The software house tends to be very formal in its standards and procedures.

With respect to productivity, the characteristics of the project are the following:

- There is a lot of pressure to finish the project on the date defined by the customer due to market constraints, so the rating for this effort modifier is set to very low.
- Developers are very highly inexperienced in this type of project.
- The platform difficulty is average for the team.
- The client is highly concerned about the reliability of the system.

Use CoCoMo II early design model to calculate:

1. The scale factor and effort **without** considering the effort modifiers. **20 points**
2. The effort required for building the project considering effort modifiers, and the scale factor calculated in 1. **20 points.**

Do not forget to justify your (1) driver levels and (2) effort modifiers choices.

Total exercise 3 = 40 points.

Driver	Rating	Reasoning	Value
PREC	Very low	The team has very little experience on similar projects.	6.20
FLEX	High	There exists a high number of design constraints.	2.03
RESL	Nominal	The requirements present an average stability.	4.24
TEAM	Very high	Developers are located in the same location and are well integrated.	1.10
PMAT	Very high	The software house tends to be very formal in its standards and procedures.	1.56

Calculations

$$\begin{aligned}\text{Scale Factor} &= B + 0.01 \times \sum(\text{exponent driver ratings}) \\ &= 0.91 + 0.01 \times (6.20 + 2.03 + 4.24 + 1.10 + 1.56) \\ &= \mathbf{1.0613}\end{aligned}$$

$$\begin{aligned}\text{Effort} &= c * (\text{size})^k \\ &= 2.94 \times 149^{1.0613} \\ &= 595.3192 \text{ p-m} \\ &= \mathbf{596 \text{ p-m}}\end{aligned}$$

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Code	Rating	Reasoning	Value
RCPX	High	The client is highly concerned about the reliability of the system.	1.33
RUSE	Nominal	No information.	1.00
PDIF	Nominal	The platform difficulty is average for the team.	1.00
PERS	Nominal	No information.	1.00
PREX	Extra low	Developers are very highly inexperienced in this type of project.	1.59
FCIL	Nominal	No information.	1.00
SCED	Very low	There is a lot of pressure to finish the project on the date defined by the customer due to market constraints.	1.43

Calculations

Effort Multiplier = $1.33 \times 1.00 \times 1.00 \times 1.00 \times 1.59 \times 1.00 \times 1.43$
= **3.024021**

Effort Required = Estimated Effort \times Effort Multiplier
= 595.3192×3.024021
= 1800.2578 p-m
= **1801 p-m**

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Total A1, 100 points.

Accreditation Attribute scores (FOR USE OF TAs ONLY)

Attribute	Grade (0-100)
[INV-4] Analysis and interpretation of data.	
[UET-1] Ability to use appropriate engineering tools, techniques and resources.	