COURSE NAME

SOFTWARE ENGINEERING

CSC 3114

(UNDERGRADUATE)

CHAPTER 14

SOFTWARE PROJECT ESTIMATION

SOFTWARE PROJECT PLANNING

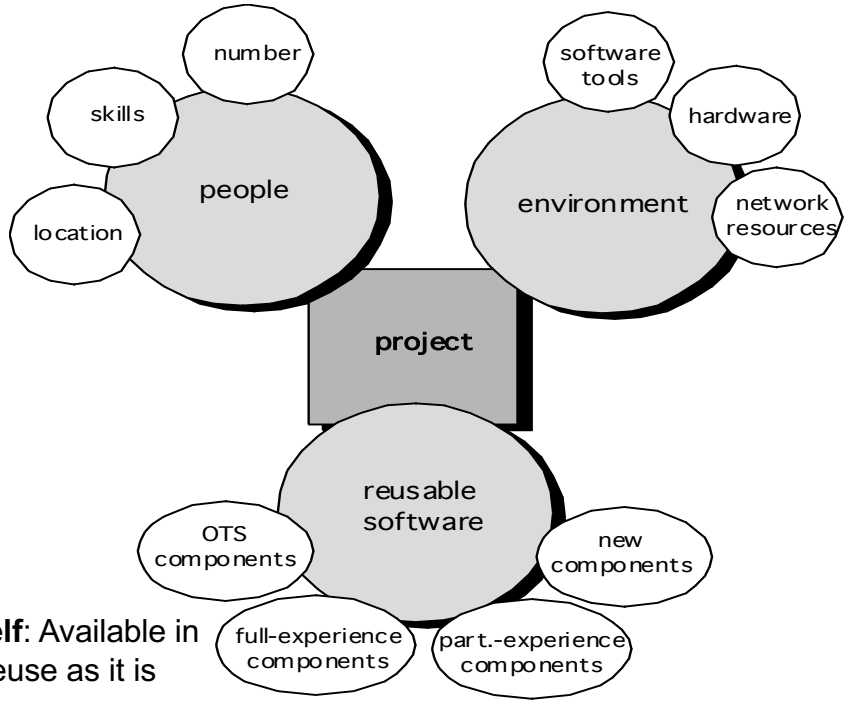
- The overall goal of project planning is to establish a pragmatic strategy for controlling, tracking, and monitoring a complex technical project.

WHY?

- So the end result gets done on time, on budget, and with quality

PROJECT PLANNING TASK SET-I

- Establish project scope
- Determine feasibility
- Analyze risks
- Define required resources
  - Determine require human resources
  - Define reusable software resources
  - Identify environmental resources



Off-the-shelf: Available in the stock, reuse as it is

PROJECT PLANNING TASK SET-II

- Estimate cost and effort
  - Decompose the problem
  - Develop two or more estimates using size, function points, process tasks (complexity),
  - Reconcile the estimates

- Develop a project schedule
  - Establish a meaningful task set
  - Define a task network
  - Use scheduling tools to develop a timeline chart
  - Define schedule tracking mechanisms

PROJECT ESTIMATION PRINCIPLES

- Project scope must be understood
- Elaboration (decomposition) is necessary
- Historical metrics (pervious data) are very helpful
- At least two different techniques should be used
- Uncertainty is inherent in the process

CONVENTIONAL METHOD

- Conventional estimation techniques
  - task breakdown and effort estimates
  - size (e.g., LOC/FP) estimates
  - compute LOC/FP using estimates of information domain values
  - use historical data (previous experience) to build estimates for the project
- Automated tools

EFFORT ESTIMATION

- A dynamic multivariable model for effort estimation

$$E = [LOC \times B^{0.333}/P]^3 \times (1/t^4)$$

Where,

E = effort in person-months or person-years (the amount of time, personnel devote to a specific project)

t = project duration in months or years

B = "special skills factor"

P = "productivity parameter"

COCOMO (CONSTRUCTIVE COST MODEL)

Based on SLOC characteristic, and operates according to the following equations:

- $\text{Effort} = \text{PM} = \text{Coefficient}_{\text{<Effort Factor>}} * (\text{SLOC}/1000)\text{^P}$ [100,000 SLOC/1000 = 100k SLOC]
- `Development time = DM = 2.50*(PM)^T`
- `Required number of people = ST = PM/DM`

PM : person-months needed for project (labor working hours)
SLOC : source lines of code
P : project complexity (1.04-1.24)
DM : duration time in months for project (week days)
T : SLOC-dependent coefficient (0.32-0.38)
ST : average staffing necessary

Software Project Type	Coefficient <Effort Factor>	P	T
Organic	2.4	1.05	0.38
Semi-detached	3.0	1.12	0.35
Embedded	3.6	1.20	0.32

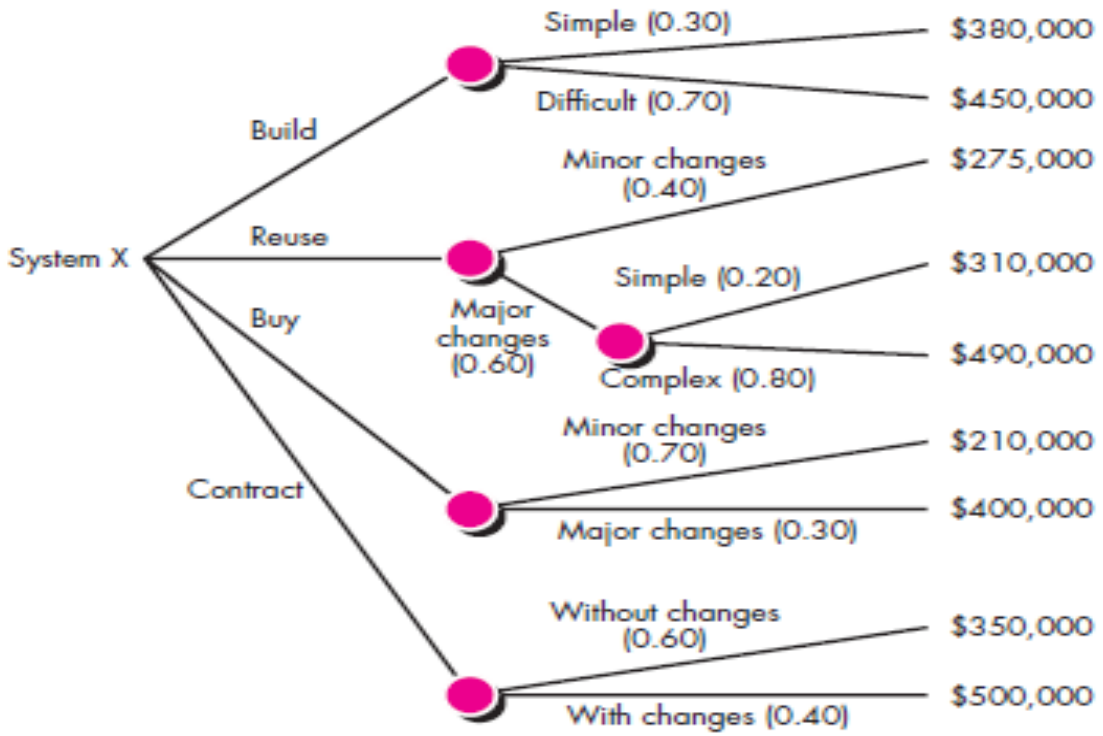
COCOMO (CONSTRUCTIVE COST MODEL)

Organic: relatively small, simple software projects in which a small teams with good application experience work to a software development project (e.g. showing VUES information to webpage)

Semidetached: an intermediate (in size and complexity) software project in which teams with mixed experience levels works in a mix of hardware and software application (e.g. biometric log-in time saved in VUES database)

Embedded: A software project that must be developed within a strongly coupled to hardware environment (e.g. biometric device, elevator)

MAKE-BUY DECISION



COMPUTING EXPECTED COST FROM DECISION TREE

$$\text{expected cost} = \sum_i (\text{path probability})_i \times (\text{estimated path cost})_i$$

For example, the expected cost to build is: **expected cost = 0.30 ($380K) + 0.70 ($450K) = $429 K**

similarly,

expected cost$_{reuse}$ = $382K

expected cost$_{buy}$ = $267K

expected cost$_{contr}$ = $410K

REFERENCES

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- Kelly, J. C., Sherif, J. S., & Hops, J. (1992). An analysis of defect densities found during software inspections. *Journal of Systems and Software*, *17*(2), 111-117.
- Bhandari, I., Halliday, M. J., Chaar, J., Chillarege, R., Jones, K., Atkinson, J. S., & Yonezawa, M. (1994). In-process improvement through defect data interpretation. *IBM Systems Journal*, *33*(1), 182-214.