# CSE 423: Software Engineering

## COCOMO Model

Tajkia Nuri Ananna

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Lecturer, Metropolitan University

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# Constructive Cost Estimation (COCOMO) Model

### COCOMO

- Most generally used software estimation models in the world
- Predicts the efforts and schedule of a software product based on the size of the software.

### COCOMO

Projects are categorized into three types:

- Organic
- Semidetached
- Embedded

#### Organic

A development project can be treated of the organic type, if

- Project is small and simple.
- Project team is small with prior experience.
- The problem is well understood and has been solved in the past.
- Requirements of projects are not rigid, such a mode example is payroll processing system, Simple business systems, Simple inventory management systems, and Data processing systems

# Constructive Cost Estimation (COCOMO) Model

## Semidetached

A development project can be treated of the Semidetached type, if

- Project has complexity.
- Project team requires more experience, better guidance and creativity.
- The project has an intermediate size and has mixed rigid requirements such a mode example is a transaction processing system which has fixed requirements.
- It also includes the elements of organic mode and embedded mode.
- Few such projects are- Database Management System(DBMS), new unknown operating system, difficult inventory management system.

### Embedded

A development project can be treated of the Embedded type, if

- A software project has fixed requirements of resources .
- Product is developed within very tight constraints.
- A software project requiring the highest level of complexity, creativity, and experience requirement fall under this category.
- Such mode software requires a larger team size than the other two models.
- Example: ATM, Air Traffic control.

## Basic COCOMO Model

### Basic COCOMO Model

$$\text{Effort} = a * (KLOC)^b$$

$$\text{Tdev} = c * (efforts)^d \text{ Months}$$
$$\text{Person required} = Effort/Tdev$$
$$\text{Productivity} = (KLOC)/Effort$$

Where

- KLOC = Estimated size of the software product indicate in Kilo Lines of Cod
- a,b,c,d = constants for each group of software products
- Tdev = Estimated time to develop the software, expressed in months
- Effort = Total effort required to develop the software product, expressed in person months (PMs)

The constant values a,b,c, and d for the Basic Model for the different categories of the system:

### Basic COCOMO Model

| Software Projects | a | b | c | d |
|:---:|:---:|:---:|:---:|:---:|
| Organic | 2.4 | 1.05 | 2.5 | 0.38 |
| Semi-Detached | 3.0 | 1.12 | 2.5 | 0.35 |
| Embedded | 3.6 | 1.20 | 2.5 | 0.32 |

### Basic COCOMO Model - Example

Suppose a project was estimated to be 400 KLOC. Calculate the effort and development time for each of the three model i.e., organic, semi-detached embedded.

### Basic COCOMO Model - Example Solution

Effort=a*(KLOC) $^{b}PM$

Tdev=c*(efforts) $^{d}Months$

Estimated Size of project= 400 KLOC

- Organic Mode
  $E = 2.4 * (400)^{1.05} = 1295.31 PM$
  $TDev = 2.5 * (1295.31)^{0.38} = 38.07 Months$

- Semidetached Mode
  $E = 3.0 * (400)^{1.12} = 2462.79 PM$
  $TDev = 2.5 * (2462.79)^{0.35} = 38.45 Months$

- Embedded Mode
  $E = 3.6 * (400)^{1.20} = 4772.81 PM$
  $D = 2.5 * (4772.8)^{0.32} = 38 Months$