

**Group-1**

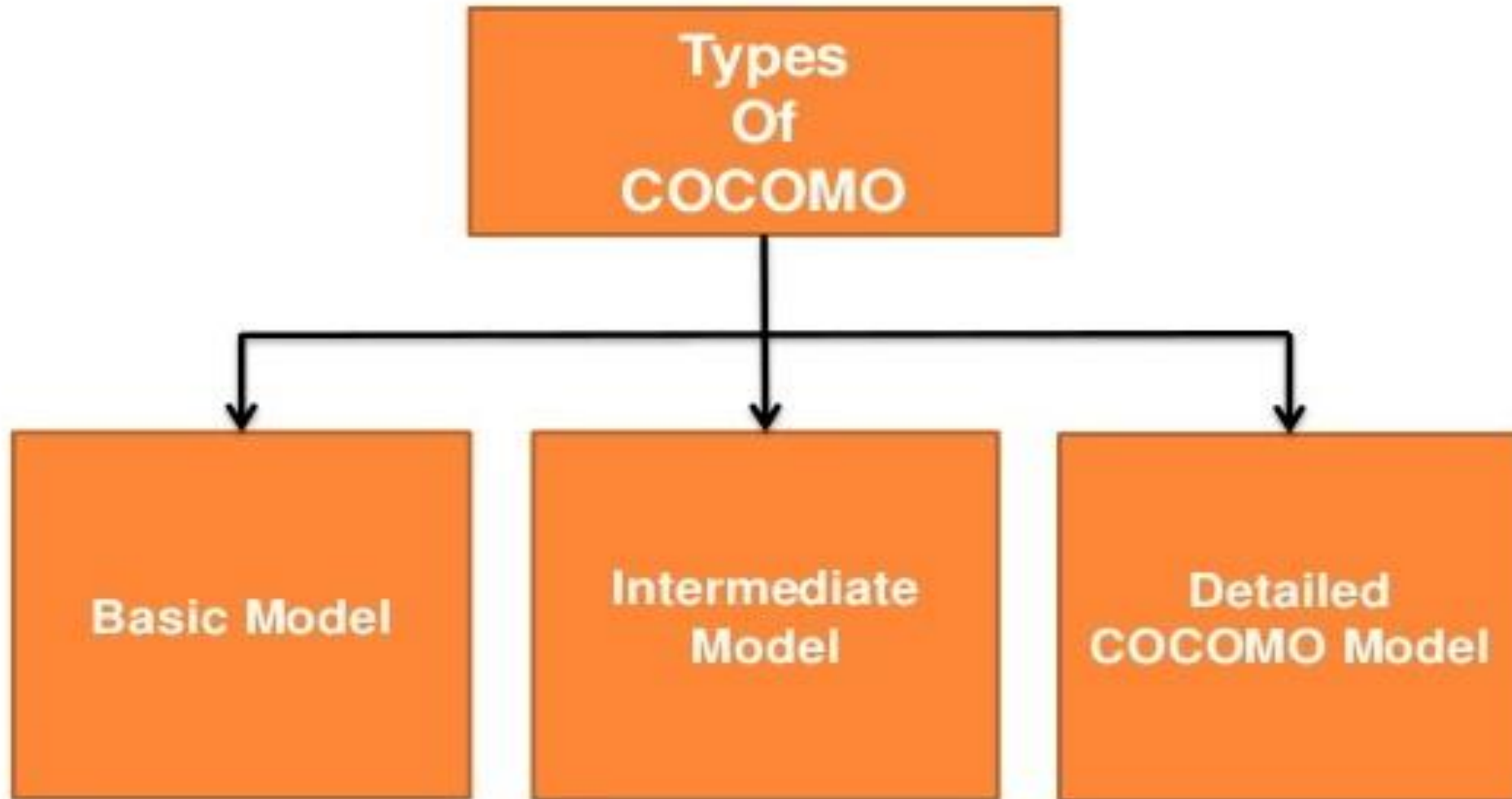
**PROJECT NAME : ONLINE NEWS PORTAL**

**Presentation – 3 : COCOMO Method**

# Overview of COCOMO Method

- ❖ COCOMO stands for **C**onstructive **C**ost **M**odel
- ❖ Developed by **Barry Boehm** in 1981
- ❖ One of the most widely used S/W estimation model
- ❖ It is a open model as all of the details are published
- ❖ It is used to model :-
  - ✓ **Effort** required to develop S/W
  - ✓ Project **Duration**
  - ✓ **Cost**

# Types of COCOMO Method



# Steps of COCOMO Method

**Step-1** : Calculate the **Count Total (CT)** by 5 information domains

- ❖ *Number of user inputs*
- ❖ *Number of user outputs*
- ❖ *Number of user inquiries*
- ❖ *Number of files*
- ❖ *Number of external interfaces*

**Step-2** : Assign complexity level out of 5 & calculate the **Function Points (FP)** by the given formula

$$FP = CT * [0.65 + 0.01 * \sum Fi]$$

**Step-3 :** After selecting Programming Language calculate the **Line Of Code (LOC)**

Thus the required **KLOC** is determined for the software project

**Step-4 :** This is the *final step* of the basic COCOMO model. Here we will find **Efforts** and **Duration** of the project.

# Types of step-4 selection Method

**Organic Model:** Relatively small, simple software projects in which a small teams with good application experience work to a set of less than rigid requirement. The equation for the Effort (E) and Development time (D) for this model are:

$$E = 2.4 * (KLOC)^{1.05}$$

$$D = 2.5 * (E)^{0.38}$$

**Semi-Detached Model:** An intermediate (in size and complexity) software project in which teams with mixed experience levels must meet a mix of rigid and less than rigid requirements. The equation for the Effort (E) and Development time (D) for this model are:

$$E = 3.0 * (KLOC)^{1.12}$$

$$D = 2.5 * (E)^{0.35}$$

**Embedded Model:** A software project that must be developed within a set of tight hardware, software and operational constraints. The equation for the Effort (E) and Development time (D) for this model are:

$$E = 3.6 * (KLOC)^{1.20}$$

$$D = 2.5 * (E)^{0.32}$$

# Construct the COCOMO model from our Project perspective

Use case – 1 News Category Module

## Step-1 : Calculate Count Total (CT)

### Information Domain Values

Measurement Parameter	Count		Simple ○	Average ○	Complex ○		Total
Number of user inputs	2	X	3	4	6	=	8.00
Number of user outputs	2	X	4	5	7	=	10.00
Number of user inquiries	3	X	3	4	6	=	12.00
Number of files	2	X	7	10	15	=	20.00
Number of external interfaces	2	X	5	7	10	=	14.00
Count=Total							64.00

Count Total



## Step-2 : Assign complexity & Calculate Function Points (FP)

### Complexity Weighting Factors

// heading of the second table Rate each factor on a scale of 0 to 5:

(0 = No influence, 1 = Incidental, 2 = Moderate, 3 = Average, 4 = Significant, 5 = Essential):

Question	0	1	2	3	4	5
1. Does the system require reliable backup and recovery?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
2. Are data communications required?	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Are there distributed processing functions?	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Is performance critical?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Will the system run in an existing, heavily utilized operational environment?	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Does the system require on-line data entry?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
7. Does the on-line data entry require the input transaction to be built over multiple screens or operations?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Are the master file updated on-line?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Are the inputs, outputs, files, or inquiries complex?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. Is the internal processing complex?	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. Is the code designed to be reusable?	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. Are conversion and installation included in the design?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. Is the system designed for multiple installations in different organizations?	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. Is the application designed to facilitate change and ease of use by the user?	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Total						
30.00						

Show Total of weighting Factor

The Function Points is:

Show Function Points

60.80



## Step-3 : Calculate the Line Of Code (LOC)

Programming Language	LOC/FP (average)	Select
Assembly Language	320	<input type="radio"/>
C	128	<input type="radio"/>
COBOL	105	<input type="radio"/>
Fortran	105	<input type="radio"/>
Pascal	90	<input type="radio"/>
Ada	70	<input type="radio"/>
Object-Oriented Languages	30	<input checked="" type="radio"/>
Fourth Generation Languages (4GLs)	20	<input type="radio"/>
Code Generators	15	<input type="radio"/>
Spreadsheets	6	<input type="radio"/>
Graphical Languages (icons)	4	<input type="radio"/>

LOC/F P:  1824.00

## Step-4 : Calculate Efforts and Duration

Software Project	$a_b$	$b_b$	$c_b$	$d_b$	Select
Organic	2.4	1.05	2.5	0.38	<input checked="" type="radio"/>
Semi-detached	3.0	1.12	2.5	0.35	<input type="radio"/>
Embedded	3.6	1.20	2.5	0.32	<input type="radio"/>

Calculate Effort and Duration

$$\text{Effort (E)} = a_b(\text{KLOC})^{b_b} = 4.51 \quad \text{Duration (D)} = c_b(E)^{d_b} = 4.43$$

Reset Data

**Average Staff Size = (E/D) = 4.51/4.43 = 1 Person**

**Let salary of each developer = 35,000 BDT**

**Total Cost with Overhead = (35,000\*1) \* ( 2 \* 4.43)**  
**= 310100 BDT**

## Use case – 2 Add News Module

### Step-1 : Calculate Count Total (CT)

#### Information Domain Values

Measurement Parameter	Count		Simple <input type="radio"/>	Average <input checked="" type="radio"/>	Complex <input type="radio"/>		Total
Number of user inputs	3	X	3	4	6	=	12.00
Number of user outputs	3	X	4	5	7	=	15.00
Number of user inquiries	3	X	3	4	6	=	12.00
Number of files	4	X	7	10	15	=	40.00
Number of external interfaces	1	X	5	7	10	=	7.00
Count=Total							86.00

Count Total

## Step-2 : Assign complexity & Calculate Function Points (FP)

### Complexity Weighting Factors

// heading of the second table Rate each factor on a scale of 0 to 5:

(0 = No influence, 1 = Incidental, 2 = Moderate, 3 = Average, 4 = Significant, 5 = Essential):

Question	0	1	2	3	4	5
1. Does the system require reliable backup and recovery?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
2. Are data communications required?	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Are there distributed processing functions?	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Is performance critical?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Will the system run in an existing, heavily utilized operational environment?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
6. Does the system require on-line data entry?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
7. Does the on-line data entry require the input transaction to be built over multiple screens or operations?	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Are the master file updated on-line?	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Are the inputs, outputs, files, or inquiries complex?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. Is the internal processing complex?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
11. Is the code designed to be reusable?	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. Are conversion and installation included in the design?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
13. Is the system designed for multiple installations in different organizations?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. Is the application designed to facilitate change and ease of use by the user?	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Total						

38.00

Show Total of weighting Factor

The Function Points is:

Show Function Points

88.58

## Step-3 : Calculate the Line Of Code (LOC)

Programming Language	LOC/FP (average)	Select
Assembly Language	320	<input type="radio"/>
C	128	<input type="radio"/>
COBOL	105	<input type="radio"/>
Fortran	105	<input type="radio"/>
Pascal	90	<input type="radio"/>
Ada	70	<input type="radio"/>
Object-Oriented Languages	30	<input checked="" type="radio"/>
Fourth Generation Languages (4GLs)	20	<input type="radio"/>
Code Generators	15	<input type="radio"/>
Spreadsheets	6	<input type="radio"/>
Graphical Languages (icons)	4	<input type="radio"/>

LOC/F P:  2657.40

## Step-4 : Calculate Efforts and Duration

Software Project	$a_b$	$b_b$	$c_b$	$d_b$	Select
Organic	2.4	1.05	2.5	0.38	<input checked="" type="radio"/>
Semi-detached	3.0	1.12	2.5	0.35	<input type="radio"/>
Embedded	3.6	1.20	2.5	0.32	<input type="radio"/>

Calculate Effort and Duration

$$\text{Effort (E)} = a_b(\text{KLOC})^{b_b} = 6.70 \quad \text{Duration (D)} = c_b(E)^{d_b} = 5.15$$

Reset Data

**Average Staff Size = (E/D) = 6.70/5.15 = 1 Person**

**Let salary of each developer = 35,000 BDT**

**Total Cost with Overhead = (35,000\*1) \* (2 \* 5.15)**  
**= 360500 BDT**

## Use case – 3 Add to Archive Module

### Step-1 : Calculate Count Total (CT)

#### Information Domain Values

Measurement Parameter	Count		Simple	Average	Complex		Total
Number of user inputs	4	X	3	4	6	=	16.00
Number of user outputs	4	X	4	5	7	=	20.00
Number of user inquiries	2	X	3	4	6	=	8.00
Number of files	4	X	7	10	15	=	40.00
Number of external interfaces	2	X	5	7	10	=	14.00
Count=Total							98.00

Count Total



## Step-2 : Assign complexity & Calculate Function Points (FP)

### Complexity Weighting Factors

// heading of the second table Rate each factor on a scale of 0 to 5:

(0 = No influence, 1 = Incidental, 2 = Moderate, 3 = Average, 4 = Significant, 5 = Essential):

Question	0	1	2	3	4	5
1. Does the system require reliable backup and recovery?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
2. Are data communications required?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Are there distributed processing functions?	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Is performance critical?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Will the system run in an existing, heavily utilized operational environment?	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Does the system require on-line data entry?	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Does the on-line data entry require the input transaction to be built over multiple screens or operations?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
8. Are the master file updated on-line?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
9. Are the inputs, outputs, files, or inquiries complex?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. Is the internal processing complex?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. Is the code designed to be reusable?	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. Are conversion and installation included in the design?	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. Is the system designed for multiple installations in different organizations?	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. Is the application designed to facilitate change and ease of use by the user?	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Total						
35.00						

Show Total of weighting Factor

The Function Points is:

Show Function Points

98.00

## Step-3 : Calculate the Line Of Code (LOC)

Programming Language	LOC/FP (average)	Select
Assembly Language	320	<input type="radio"/>
C	128	<input type="radio"/>
COBOL	105	<input type="radio"/>
Fortran	105	<input type="radio"/>
Pascal	90	<input type="radio"/>
Ada	70	<input type="radio"/>
Object-Oriented Languages	30	<input checked="" type="radio"/>
Fourth Generation Languages (4GLs)	20	<input type="radio"/>
Code Generators	15	<input type="radio"/>
Spreadsheets	6	<input type="radio"/>
Graphical Languages (icons)	4	<input type="radio"/>

**LOC/FP:**

Show LOC/FP

2940.00

## Step-4 : Calculate Efforts and Duration

Software Project	$a_b$	$b_b$	$c_b$	$d_b$	Select
Organic	2.4	1.05	2.5	0.38	<input checked="" type="radio"/>
Semi-detached	3.0	1.12	2.5	0.35	<input type="radio"/>
Embedded	3.6	1.20	2.5	0.32	<input type="radio"/>

Calculate Effort and Duration

$$\text{Effort (E)} = a_b(\text{KLOC})^{b_b} = 7.45 \quad \text{Duration (D)} = c_b(E)^{d_b} = 5.36$$

Reset Data

**Average Staff Size = (E/D) = 7.45/5.36 = 1 Person**

**Let salary of each developer = 35,000 BDT**

**Total Cost with Overhead = (35,000\*1) \* ( 2 \* 5.36)**  
**= 375200 BDT**

## Total Duration and Cost

**Total Duration :**

$$\begin{aligned} &= ( 4.43 + 5.15 + 5.36 ) \text{ Months} \\ &= 15 \text{ Months} \end{aligned}$$

**Total Cost :**

$$\begin{aligned} &= ( 310100 + 360500 + 375200 ) \text{ BDT} \\ &= 1045800 \text{ BDT} \end{aligned}$$

## Comparison

### Strength of COCOMO

- ❖ More predictable about project
- ❖ Clearly understand with highly accuracy
- ❖ Account for various factors that affect cost of the project
- ❖ COCOMO is factual and easy to interpret
- ❖ The drivers are very helpful to understand the impact on the different factors that affect the project costs & duration

### Weakness of COCOMO

- ❖ Ignore documentation & requirement
- ❖ Ignore co- operation, skill, knowledge & parameters
- ❖ Hardware requirements are denied
- ❖ Dependent on the amount of time spent in each phase
- ❖ Personal turnover levels aren't used



