Team 16

NGO Information Management Suite 1.0

COCOMO

(Constructive Cost Model)
Effort Estimation for NIMS

Overview:

The COCOMO Model analysis is undergone as a part of heuristic approach to undergo effort analysis for any software project. The cost here, is in terms of person months needed to complete the project successfully.

Target Audience:

- The buyer of the software/client
- The project mentor
- The Team leader - To keep a check on the work not exceeding a certain limit beyond the calculated cost.

Revision History:

Version	Primary Author(s)	Description of Version	Reviewed By	Date Completed
1.0	Jatan	COCOMO will have only 1 version.	Megha	25 Feb 2012

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COCOMO Project Categories:

Basic COCOMO computes software development effort (and cost) as a function of program size. Program size is expressed in estimated thousands of source lines of code (SLOC) COCOMO applies to three classes of software projects:

- **Organic projects -** In an area in which the organization has considerable expertise and requirements are less stringent e.g. simple data processing system
- **Semi-detached projects -** Projects that fall between the above two categories, "medium" teams with mixed experience working with a mix of rigid and less than rigid requirements.
- **Embedded projects -** Projects are ambitious and novel and the organization has little or no prior experience in those areas and there are stringent requirements to be met e.g. embedded avionics system.

Calculating Basic COCOMO for our project:

Our project comes under the category *"Semi-detached"* because some of our group members have a little prior experience in android and web development areas, but the overall project scope is little large, and it is also different from general web development. Now, estimation of an initial effort is given by following formula:

$$\mathbf{E_i = a * (KDLOC)^b}$$

where, KDLOC = estimated line of code in thousands

We are assuming KDLOC = 7 (LOC = 7000) for our project.
Values of 'a' and 'b' for a semi-detached projects are: a = 3.0 and b = 1.12
So,

$$\mathbf{E_i = 3 * (7)^{1.12} = 26.5235}$$

COCOMO Cost Driver attributes:

Intermediate COCOMO computes software development effort as function of program size and a set of "cost drivers" that include subjective assessment of product, hardware, personnel and project attributes. This extension considers a set of four "cost drivers",each with a number of subsidiary attributes:-

- **Product attributes**
    - Required software reliability
    - Size of application database
    - Complexity of the product
- **Hardware attributes**
    - Run-time performance constraints
    - Memory constraints

- - Volatility of the virtual machine environment
  - Required turnabout time
- **Personnel attributes**
  - Analyst capability
  - Software engineering capability
  - Applications experience
  - Virtual machine experience
  - Programming language experience
- **Project attributes**
  - Use of software tools
  - Application of software engineering methods
  - Required development schedule

Each of the 15 attributes receives a rating on a six-point scale that ranges from "very low" to "extra high" (in importance or value). An effort multiplier from the table below applies to the rating. The product of all effort multipliers results in an *effort adjustment factor (EAF)*.

Cost Drivers	Ratings					
	Very Low	Low	Nominal	High	Very High	Extra High
Product attributes						
Required software reliability	**0.75**	0.88	1.00	1.15	1.40	
Size of application database		0.94	1.00	**1.08**	1.16	
Complexity of the product	0.70	0.85	1.00	**1.15**	1.30	1.65
Computer attributes						
Run-time performance constraints			**1.00**	1.11	1.30	1.66
Memory constraints			**1.00**	1.06	1.21	1.56
Volatility of the virtual machine environment		**0.87**	1.00	1.15	1.30	
Required turnabout time		0.87	**1.00**	1.07	1.15	
Personnel attributes						
Analyst capability	1.46	1.19	**1.00**	0.86	0.71	
Applications experience	1.29	**1.13**	1.00	0.91	0.82	
Software engineer capability	1.42	**1.17**	1.00	0.86	0.70	
Virtual machine experience	1.21	**1.10**	1.00	0.90		
Programming language experience	1.14	1.07	**1.00**	0.95		
Project attributes						
Application of software engineering methods	1.24	1.10	1.00	**0.91**	0.82	
Use of software tools	1.24	1.10	1.00	0.91	**0.83**	
Required development schedule	1.23	1.08	1.00	**1.04**	1.10	

In above, table highlighted numbers are ratings of the cost drivers for our project, decided by all our team members.

Now,

All 15 cost drivers are multiplied to get the effort adjustment factor EAF:

EAF = 0.75 * 1.08 * 1.15 * 1 * 1 * 0.87 * 1 * 1 * 1.13 * 1.17 * 1 * 1.10 * 0.91 * 0.83 * 1.04 = 0.9262

So,

The final effort is obtained by multiplying the initial estimate by the EAF:

$$E = (EAF) * E_i$$

E = 0.9262 * 26.5235 = 24.566 person months

Conclusion:

Hence we conclude, that with the given skill set and use of technology in our group, we need 24.566 person months effort to finish the project successfully.
Given, that we have 9 people we can get the "*approximate*" ideal months needed to finish to be :
        24.566/9 = 2.72 months (In ideal case, which is never so)
Therefore, we will need more than minimum 2.72 "working" months to finish our project.

References:

- Lecture Slides of Prof. Asim Banerjee

- **http://en.wikipedia.org/wiki/COCOMO**