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Constructive Cost Model v1.0

Team 8

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REVISION HISTORY

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Cost analysis	7 April, 2015	1.0	Archit Gajjar	Shivani Thakker

Definition:

COCOMO is a Heuristic estimation technique for estimating cost and effort of any project. The model implies that size is the primary factor for cost and other factors have lesser effect.

Different version of COCOMO:

Boehm proposed three levels of the model: **basic, intermediate, detailed**.

1 **The basic COCOMO'81** model is a single-valued, static model that computes software development effort (and cost) as a function of program size expressed in estimated thousand delivered source instructions (KDSI).

1. **The intermediate COCOMO'81** model computes software development effort as a function of program size and a set of fifteen "cost drivers" that include subjective assessments of product, hardware, personnel, and project attributes.

2. **The advanced or detailed COCOMO'81 model** incorporates all characteristics of the intermediate version with an assessment of the cost driver's impact on each step (analysis, design, etc.) of the software engineering process.

Advantage of using COCOMO:

1. Repeatable process

2. Easy to use

3. Thoroughly documented

4. Versatile

Disadvantage of using COCOMO:

1. Ignore safety issues

2. The effort estimate includes development, management and support tasks but does not include the cost of the secretarial and other staff that might be needed in an organization

Document to be referred by:

1. Buyer of software(most probably client): By seeing this document a client can see the amount of effort put by development team in terms of time , effort etc. so that approximate cost of software can be calculated.

2. Team Members (mostly team leader): By seeing this document a team member/leader can decide whether the team is proceeding in right direction or NOT by checking duration of each task.

Different types of COCOMO based on different modes of development:

Development Mode	Size	Innovation	Deadline/Constraints	Development environment
Organic	Small	Little	Not tight	Stable
Semi-detached	Medium	Medium	Medium	Medium
Embedded	Large	Greater	Tight	Complex hardware/

				customer
				interfaces

Procedure followed in the basic COCOMO'81:

The COCOMO model starts with an initial estimate determined by using the static single variable model equations (depends on size) and then adjusting the estimates based on other variables.

- Obtain an initial estimate of the development effort from the estimate of thousands of delivered lines of source code (KDLOC)

$$E_i = a * (KDLOC)^b$$

- Determine a set of 15 multiplying factors from different attributes of the project called the cost driver attributes

- Adjust the effort estimate by multiplying the initial estimate with all the multiplying factors together called the effort adjustment factor (EAF).

$$E_a = (EAF) * E_i$$

Applying COCOMO to our project:

Since our project consist member of team size of 9 people (~ medium) and with little prior experience in field of web development.

PHP which is a server scripting language is unfamiliar to most of our group

members. The scope of deployment is large if our product is used by our college.

So, after seeing above claims our project comes under Semi-detached

Category. Now, estimation of an initial effort is given by following formula:

EAF= All cost drivers are multiplied

together. E=EAF*

Where KDLOC = estimated line of code in thousands

= initial effort estimate

EAF= Effort adjustment

factor E=Final effort estimate

Assuming KDLOC=5.6 (5600 lines of codes) as per decided by our group members for our project.

For Semi-detached pre-defined values: a=3.0; b=1.12 so, = 3.0 *
(5.6)1.12 = 20.658

Cost Driver attributes:

Product attributes

- Required software reliability

- Size of application database

- Complexity of the product

Project attributes

- Modern programming practices

- Use of SW tools

- Development schedule

Personnel Attributes

- Analyst capability

- Application experience

- Programmer capability

- Virtual machine experience

- Programming language experience

Computer Attributes

- Execution time

- Storage requirement

- Virtual memory volatility

- Turnaround time

Hardware attributes

- Run-time performance constraints

- Memory constraints

- Volatility of the virtual machine environment

Cost Driver Rating:

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)*. Typical values for EAF range from 0.9 to 1.4.

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

Hardware 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	

*All selected values are decided by our group members.

So, EAF= All cost drivers are multiplied together.

EAF = 0.88 * 1.08 * 1.15 * 1.0 * 1.06 * 0.87 * 1.0 * 1.0 * 1.0 * 1.0 * 1.07 * 1.21 * 0.91 * 0.83 * 1.10 = 1.084

So, final effort E= 20.658 * 1.084 = 22.4

So, considering the above situation, it can assumed that with given set of technological skills and constraints with our group members final effort comes out be 18.0778 person –months

Future analyzing the result, it can be said that

Time duration required for completing the project = final effort (in person-months) / total members (persons)

Time duration required = 22.4/9= **2.5 months** are required with given 9 members.

Source of Reference:

- http://en.wikipedia.org/wiki/COCOMO (Cost driver taken from here)

- https://files.ifi.uzh.ch/rerg/arvo/courses/seminar_ws02/reports/Seminar_4.pdf (basic calculation)