

COCOMO II Booklet (FlickTime)

COCOMO II using Function Points

Finetuning the parameters

The Function Points can be:

- Simple: chosen type since (on average) each function execute relatively small operations
- Average
- Complex

Each type of FP has a different set of weights [$w_{ExtInps}$, $w_{ExternalOuts}$, $w_{ExtInqs}$, $w_{IntLogFiles}$]:

- $[3, 4, 3, 7]_{simple}$
- $[4, 5, 4, 10]_{average}$
- $[6, 7, 6, 15]_{complex}$

Functions are classified:

- External Inputs: user registration, login, logout, writing reviews, adding/removing movies and artists
- External Outputs: viewing movie and artist details, search results
- External Inquiries: search a movie by year or title
- Internal Logical Files: DB operations for movie and artist details, reviews, internal storage for images, user registration, artist-movie relations

Each function has a different number of lines of code (LOC), we consider an average expected value of LOCs equals to 40 since the main language for this project is Java (high-level) and the functions performs simple operations on average.

The development process may be:

- Organic: chosen mode because it is a small team and few months of development
- Semi-detached
- Embedded

For each type of development process, we define different parameters [a, b, c, d]:

- $[2.4, 1.05, 2.5, 0.38]_{organic}$
- $[3.0, 1.12, 2.5, 0.35]_{semi-detached}$
- $[3.6, 1.2, 2.5, 0.32]_{embedded}$

A scale factor would be applied to compute the parameters, this value is called nominal (standard) when the scale factor is equal to 1. Otherwise, it is a (positive) value that could be less or greater than 1.

Values chosen for this development project:

$$FPType = simple$$

$$ExternalInputs = 8$$

$$ExternalOutputs = 4$$

$$ExternalInquires = 2$$

$$InternalLogicFiles = 8$$

$$AvgLOCperFP = 40$$

$$DevMode = organic$$

$$ScaleFactor = 1.0$$

Formulas to get the predicted results

$$FunctionPoints = \sum_{i=ExternalInputs}^{InternalLogicFiles} w_{FPType_i} \cdot i$$

$$EstimatedSLOC = FunctionPoints \cdot AvgLOCperFP$$

$$ScaleFactor_{FP} = \frac{FunctionPoints}{EstimatedSLOC} \cdot ScaleFactor$$

$$Effort = a_{DevMode} \cdot (FunctionPoints)^{b_{DevMode}} \cdot ScaleFactor_{FP}$$

$$DevTime = c_{DevMode} \cdot (Effort)^{d_{DevMode}}$$

$$StaffRequired = \frac{Effort}{DevTime}$$

Software to make the computations

In order to compute the predicted results of the cost model, we developed a simple python program that takes in input the metrics (FP type, number of each function, average LOC per FP, development mode, scale factor) of the project and outputs the predicted results accordingly to COCOMO II framework.

Final predicted results

$$FunctionPoints = 102$$

$$EstimatedSLOC = 4080$$

$$ScaleFactor_{FP} = 0.025$$

$$Effort = 7.71 \text{ person} - \text{months}$$

$$DevTime = 5.43 \text{ months}$$

$$StaffRequired = 1.42 \text{ persons}$$

COCOMO II using KLOCs

Actual LOCs

$$KLOCs = 1000 \cdot SLOC \cong 3.5$$

Formulas to get the results

$$Effort = a_{DevMode} \cdot (KLOC)^{b_{DevMode}} \cdot ScaleFactor$$

$$DevTime = c_{DevMode} \cdot (Effort)^{d_{DevMode}}$$

$$StaffRequired = \frac{Effort}{DevTime}$$

Software to make the computations

Similarly as the case before, we developed a simple python program that now takes in input KLOCs, development mode, scale factor of the project and outputs the metrics accordingly to COCOMO II framework.

Final results

$$Effort = 7.61 \text{ person} - \text{months}$$

$$DevTime = 5.4 \text{ months}$$

$$StaffRequired = 1.41 \text{ persons}$$

Comparison between FPs & KLOCs models

	COCOMO II with FPs	COCOMO II with KLOCs	Accuracy
Effort	7.71 person-months	7.61 person-months	98.7 %
Development Time	5.43 months	5.4 months	99.45 %
Staff Required	1.42 persons	1.41 persons	99.3 %

The average of accuracy is $\cong 99.15 \%$. We can conclude that our cost model is accurate. In fact, the development was carried out by 2 persons and lasted 14 weeks (3.5 months).