Vivekanand Education Society's Institute of Technology

Department of Computer Engineering

Subject: Software engineering Lab

Class: D12A   Semester-V   Div-A

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GRADE:		Lab Outcomes: LO2,3	Signature:

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SE Expt 5

Aim: Use of metrics to estimate the cost

Theory:

 # LOC:-
1) Line of code is simplest among all metrics available to estimate project size.
2) It counts the number of lines of source code in a project.
3) The units of LOC are:
   a) KLOC:- Thousand lines of code.
   b) NLOC:- Non comment lines of code.
   c) KDSI:- Thousands of delivered source ↓ in statement

Advantages:-
1) universally accepted and is used in many models like cocomo.
2) Estimation is closer to developer's perspective.
3) simple to use.

Disadvantages:-
1) Different programming languages contains different number of lines.
2) No proper industry standard exist for this technique.
3) It is difficult to estimate the size using this technique in early stages of project.

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Function point:-

1] Function point Analysis (FPA) is a method or set of rules of functional size measurement

2] To measures functionality that user request and receives.

3] To measures software development and maintenance independently of technology used for implementation.

4] To minimize the overhead of the measurement process.

5] To be a consistent measure among various projects and organizations.

FP Attributes:-

Measurements Parameters	Examples
1. Number of External iputs(EI)	Input screens and tables
2. Number of external output(EO)	ouput screens and reports
3. Number of external inquiries(EI)	Prompts and interrupts.
4. Number of internal files (IF)	Databases and directories.
5. external interfaces (EIF)	shared database and shared routines.

computing steps

step 1: Each function point is ranked according to complexity i.e. Low (simple), Average, High

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functional units	weighting factors		
	LOW	AVERAGE	High
EI	3	4	6
EO	4	5	7
EQ	3	4	6
ILF	7	10	15
EIF	5	7	10

Step 2: calculate unadjusted function point (UFP) by manipulating each function point its corresponding weight factor.

$$UFP = \sum_{i=1}^{5} \sum_{j=1}^{3} (z_{ij} * w_{ij})$$

where z_{ij} counting functional units and w_{ij} = weighing factors.

For example if we have 3EI and 6EO of Low and complex category respectively then

$$UFP = 5*3 + 6*7 = 57$$

Step 3: calculate CAF using 14 aspects of processing complexity

$$CAF = 0.66 + 0.01 * \Sigma(f_i)$$

$\Sigma(f_i)$ is the sum of all 14 questionnaires and show the CAF (where i ranges from 1 to 14 There are answered on scale of 0 to 5.

* FP metrics:-
  productivity = FP/efforts
  quality = Defects/FP
  cost per function = Rupees/productivity
  Documentation = Pages of documentation/FP

Advantages:-
1] It is a tool which help users discover the benefit of an application package to their organization by counting functions that specifically match their requirement
2] It is a tool to measure the units of software product to support quality and productivity analysis.
3] It is a vehicle to estimate the cost and resources required for software development and maintenance.
4] It is a normilization factor for software comparlision.
5]

Disadvantages:
1] It requires a subjective evaluation and involves many judgements.
2] Run after creating the design spec.
3] Due to long learning error, it is not easy to gain proficiency.

cocomo:-
1] It consists of a heirarchy of three increasingly detailed and accurate forms.
2] Any of 3 forms can be adopted according.

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There are types of cocomo model:

1] Basic cocomo model
2] Intermediate cocomo model
3] Detailed cocomo model

Basic model

1] Basic cocomo model takes the form

$$E = a_b (KLOC)^{b_b}$$
$$D = c_b (E)^{d_b}$$

where E is effort in person-month.

D = Development time

when effort and development time are known, average staff size (SS)

$$(SS) = \frac{E}{D} \text{ persons}$$

Project size is known productivity level is

$$P = \frac{KLOC}{E} KLOC/PM$$

Modes:

1] organic: small size project, experienced developer in familiar environment.

2] semi detached: medium size project, medium size team, average previous exp-on similar project.

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3] Embedded: large project, real time systems, complex interfaces. very little previous experience.

COCOMO II :-

1] It is revised version of original cocomo consmutive cost modell and is developed at university of southern california. It is model that allows one to estimate the cost, effort and schedule when planning a new softwcue activity:-

It consists of 3 models:-

1] End user programming
2] Intermediate sector
3] In structure sector

calculation based on our cased study:

LOC : 8-3 KLOC

EFFORT COST : Rs 30

pages of documentation : 83

Errors : 6

Defects : 2

size oriented software metrics!

Productivity = KLOC/ Effort = 8-3/0-25 = 33-2

efforth = person/month = 3/12 = 0-25

quality = No. of faults/KLOC = 6/8-3 = 0-723

cost = Effort cost/KLOC = 30/8-3 = 3-61

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Documentation = Pages of documentation/15Lor
$$= 83/8 - 3 = 10$$

FP:

Step1:
EO : 15 (high)
EI : 10 (high)
EQ = 6 (avg)
ILF = 8 (high)
EIF = 2 (avg)

Step2:
$$UFP = (6*5) + (10*6) + (6*4) + (8*15) + (2*7)$$
UFP = 293

Step3:
Questions:
1] 3
2] 4
3] 2
4] 1
5] 4
6] 5
7] 3   → $\Sigma fi = 43$
8] 2
9] 3
10] 4
11] 3
12] 2
13] 3
14] 4

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step 4:

CAF = 0.65 + 0.01 * 3ti
    = 0.65 + 0.01 * 43
    = 1.08

step 5
FP = UFP * FP
   = 293 * 1.08
FP = 316.44

Productivity = FP/EFFORT = 316.44/0.25 = 1265.76
quality = Defects/FP = 2/316.44 = 0.006
cost per function = RS/P = 30/1265.76 = 0.02
Documentation = Pages of doc/FP = 83/316.44
                                 = 0.262

cocomo
For our system - organic

$$E = ab(KLOC)^{bb}$$

ab = 2.4
KLOC = 8.3
bb = 1.05
E = 2.4 * (8.3 ^ 1.05) = 22.14
D = 2.5 * (22.14 ^ 0.38) = 8.11
Average staff size = E/D = 22.14/8.11 = 3
P = KLOC/E = 8.3/22.14 = 0.375 KLO/PM
                      = 375 LOC/PM

conclusion: In this experiment, we learned about the software metrics, how to calculate LOC, how to calculate FP and also how to calculate COCOMO. we learned the steps of calculation of UFP, CAF, effort, productivity etc and successfully ~~completed~~ completed this experiment.