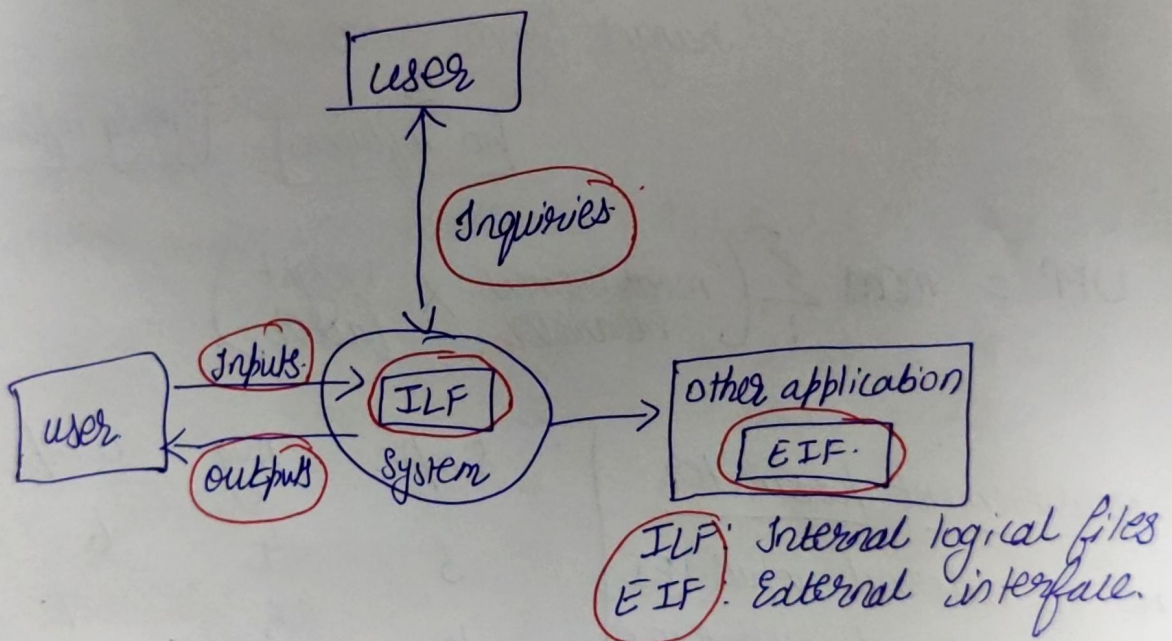
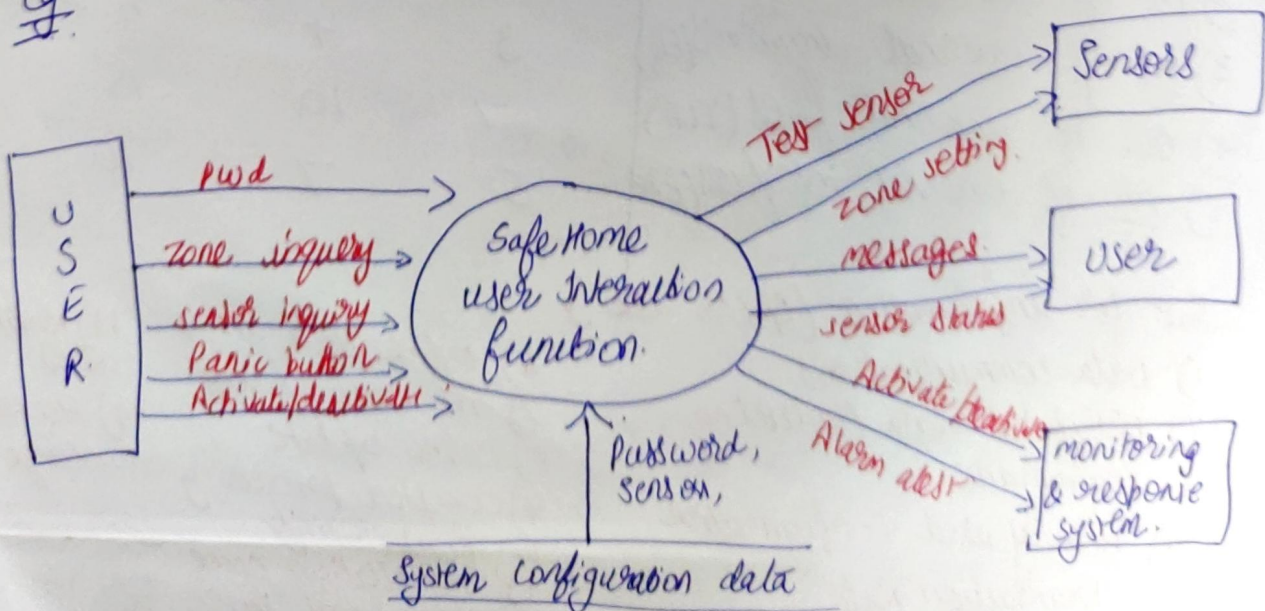


Function point Analysis

To measure and provide the software application functional size to client, customer and the stakeholder on their request. It is used to measure the software project development along with its maintenance, consistently throughout the project irrespective of tools and technologies



Eg.



1) Formula.

$$\begin{aligned}
 FP &= \text{count_total} * [0.65 + 0.01 * (\sum f_i)] \\
 &= \text{count_total} * CAF \\
 &= UFP * CAF
 \end{aligned}$$

\rightarrow VAF.

VAF: value adjustment factor (TOI) \Rightarrow Total degree of influence
 \Rightarrow is a score of all 14 gsc (general system characteristics)
 ranges from 0 to 5.

\Downarrow

no influence

strong influence

$$UFP = \frac{1}{n} \sum_{i=1}^n (\text{measurement parameter} \times \text{weight factor})$$

<u>Measurement parameter</u>	Simple	Avg	comp
1) NO of external inputs (EI)	3	4	6
2) NO of external outputs (EO)	4	5	7
3) NO of external inquiries (EQ)	3	4	6
4) NO of internal files (ILF)	7	10	15
5) NO of external interfaces (EIF)	5	7	10

Just for information (gsc's are)

- | | | |
|--|---|---|
| 1) Data communications
2) Distributed data processing
3) Performance
4) Heavily used configuration
5) Transaction Rate | 6) online data entry
7) end user efficiency
8) online update
9) complex processing
10) Reusability
11) Installation ease
12) operational ease | 13) Multiple sites
14) Facilitate change |
|--|---|---|

compute function point, productivity, documentation, (2)
 cost per function for the following data. for avg
~~comp~~ weighting factor

no of user inputs = 24

$$EO = 46$$

$$EQ = 8$$

$$ILF = 4$$

$$EIF = 2$$

$$\text{effort} = 36.9 \text{ PM}$$

Technical documents = 265 Pages

user document = 122 Pages

$$\text{cost} = \$7744 / \text{month}$$

Various complexity factors are: 4, 1, 0, 3, 3, 5, 4, 4, 3, 3, 4, 3, 4, 5

			Avg weigh	
<u>Sol</u>	EI	24	4	$= 24 \times 4 = 96$
	EO	46	5	$= 46 \times 5 = 230$
	EQ	8	4	$= 8 \times 4 = 32$
	ILF	4	10	$= 4 \times 10 = 40$
	EIF	2	7	$= 2 \times 7 = 14$
				Count total = <u>412</u>

$$\begin{aligned}
 FP &= 412 \times [0.065 + 0.01 \times VAF] \\
 &= 412 \times [0.065 + 0.01 \times 43] \\
 &= 412 \times 1.08 \\
 &= 444.96
 \end{aligned}$$

$4+1+0+3+3+5+$
 $4+4+3+3+2+2+$
 $4+5$

$$\text{Productivity} = \frac{FP}{\text{effort}} = \frac{444.96}{36.9} = 12.05 \text{ FP/PM}$$

$$\text{cost per function} = \frac{\text{cost}}{\text{productivity}} = \frac{7744}{12.05} = \$642.65$$

2) Given for complex weighting factor.

$$EI = 10$$

$$EO = 7$$

$$EQ = 4$$

$$ILF = 5$$

$$EIF = 4$$

and no influence

and historical data

organizational avg productivity = 6.5 FP/m.

labor rate = \$8000/pm

cost per FP = ?

Sol

Avg.

$$EI = 10 \times 6 = 60$$

$$EO = 7 \times 7 = 49$$

$$EQ = 4 \times 6 = 24$$

$$ILF = 5 \times 15 = 75$$

$$EIF = 4 \times 10 = 40$$

$$\text{count total } \underline{248}$$

$$FP = \text{count_total} \times CAF$$

$$= 248 \times [0.65 + 0.01 \times [0]]$$

$$= 248 \times 0.65$$

$$= \underline{161.2}$$

$$\text{total cost} = \frac{FP}{\text{org avg productivity}} \times \text{labor rate}$$

org avg productivity

$$= \frac{161.2}{6.5} \times 8000 = \underline{\$198,400}$$

$$\text{estimated effort} = \frac{FP}{\text{avg prod}} = \frac{161.2}{6.5} = \underline{24.8 \text{ pm.}}$$

Software Project Effort and cost Estimation (3)

eg: LOC Approach

1) Given the LOC of a CAD applicator.

fun	2300
2d geometric analysis	5300
3d "	3350
DBM	4950
graphics display facilities	2100
peripheral control fr.	2300
UI	8400
Design analysis mod.	
	<u>33200.</u>

Historical data

Avg prod for system = 620 LOC/pm

Labor rate = \$8000/pm.

Sol.

$$\text{Estimated effort} = \frac{\text{LOC}}{\text{Avg prod}} = \frac{33200}{620} = 54 \text{ pm.}$$

$$\text{Cost} = \frac{\text{LOC}}{\text{prod}} \times \text{labor rate}$$

$$= \frac{33200}{620} \times 8000$$

$$= \$431,000.$$

2) Estimated LOC count is 56,100. Assuming that your organization produces 450 LOC/pm with a burdened labor rate of \$7000/pm, find cost/LOC, total project cost and estimated effort in person months

Sol

$$\text{cost per LOC} = \text{labor rate per month} / \text{LOC per m.}$$

$$\text{Total cost} = \text{Estimated LOC} * \text{cost per LOC}$$

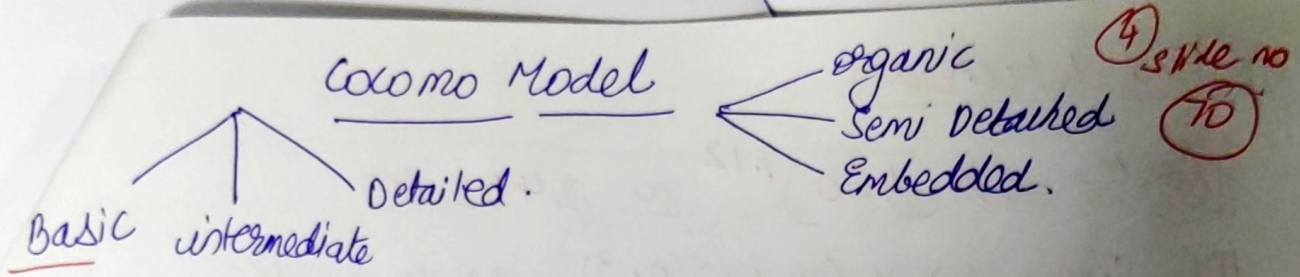
$$\text{Estimated effort in pm} = \frac{\text{Total estimated Proj cost}}{\text{labor rate per month}}$$

$$\text{cost per LOC} = \frac{7000}{450} = 15.5$$

$$\text{Total cost} = \frac{56,100 * 15.5}{15.5} = \$869,550$$

$$\text{Estimated effort} = \frac{869,550}{7000}$$

$$= 124.22 \text{ pm.}$$



Cocomo - 1. (Basic)

$$\text{Effort} = a (\text{KLOC})^b \text{ PM}$$

$$\text{Dev. time} = C (\text{effort})^d \text{ months}$$

$$\text{Staff size} = \frac{\text{effort}}{\text{dev time}} \text{ Person.}$$

$$\text{Productivity} = \frac{\text{KLOC}}{\text{effort}}$$

Given.

	a	b	c	d
org	2.4	1.05	2.5	0.38
Semi	3.0	1.12	2.5	0.35
Embed.	3.6	1.20	2.5	0.32

1) Suppose that a project was estimated to be 400 KLOC. Calculate effort & time for each of 3 modes of development.

a) organic.

$$\begin{aligned}
 \text{Effort} &= a (\text{KLOC})^b \text{ PM} \\
 &= 2.4 (400)^{1.05} \\
 &= 1295 \text{ PM}
 \end{aligned}
 \quad \Bigg| \quad
 \begin{aligned}
 \text{Dev. time} &= C (\text{effort})^d \text{ months} \\
 &= 2.5 (1295)^{0.38} \\
 &\approx 38 \text{ months.}
 \end{aligned}$$

$$\text{Staff size} = \frac{1295}{38} =$$

$$\text{Prod} = \frac{400}{1295} =$$

b) Semi detached

$$\text{Effort} = 3 \times (400)^{1.12} \approx 2462 \text{ PM}$$

$$\text{Dev Time} = 2.5 \times (2462)^{0.35} = 38.4 \text{ months.}$$

c) Embedded

$$\text{Effort} = 3.6 (400)^{1.2} \approx 4772 \text{ PM}$$

$$\text{Dev. Time} = 2.5 (4772)^{0.32} \approx 38 \text{ months.}$$

Colomo II (Intermediate)

(5)

- * Set of 15 addition predictors (cost drivers).
- * also takes development environment into account during cost estimation.

↳ adjust nominal cost to increase the accuracy of estimation

$$\text{Effort} = a_i (\text{KLOC})^{b_i} \times \text{EAF}$$

$$\text{dev time} = c_i (\text{Effort})^{d_i}$$

↳ calculated by multiplying all the values that have been obtained after categorizing each cost driver.

given

mode	a_i	b_i	c_i	d_i
organic	3.2	1.05	2.5	0.38
Semidetached	3.0	1.12	2.5	0.35
Embedded	2.8	1.2	2.5	0.32

- A new proj with estimated 400 KLOC embedded system to be developed. proj manager has a choice of hiring from 2 pools of developers.
- a) very highly capable, with very less experience in pgmg.
 - b) dev with ^{or} low quality but a lot of experience in pgmg lang experience which is better.

Sol Case 1: $EF = 0.82 \times 1.14$
 $= 0.934$

$$E = 2.8(400)^{1.20} \times 0.934$$
$$= 3470 \text{ pm.}$$

$$D = 2.5(3470)^{0.32} = 33.9 \text{ m.}$$

Case 2: $EF = 1.29 \times 0.95$
 $= 1.22$

$$E = 3412 \times 1.22$$

$$\approx 4528 \text{ pm}$$

$$D = 2.5(4528)^{0.32} = 36.9 \text{ m}$$