

SPM (Software Project Management)

- * Software Project Management is an Art and Science of planning and leading of SW projects
- * Main goal is to enable a group of developers to work effectively towards successful completion of project
- * Project Manager is an administrative leader of the team.
- * Various factors make this job very complex (e.g. changeability, complexity, Uniqueness, possibility of multiple solutions etc)

Job Responsibility of Project Manager.

- * Planning
- * Organizing
- * Staffing
- * Directing
- * Monitoring
- * Controlling
- * Innovating
- * Representing

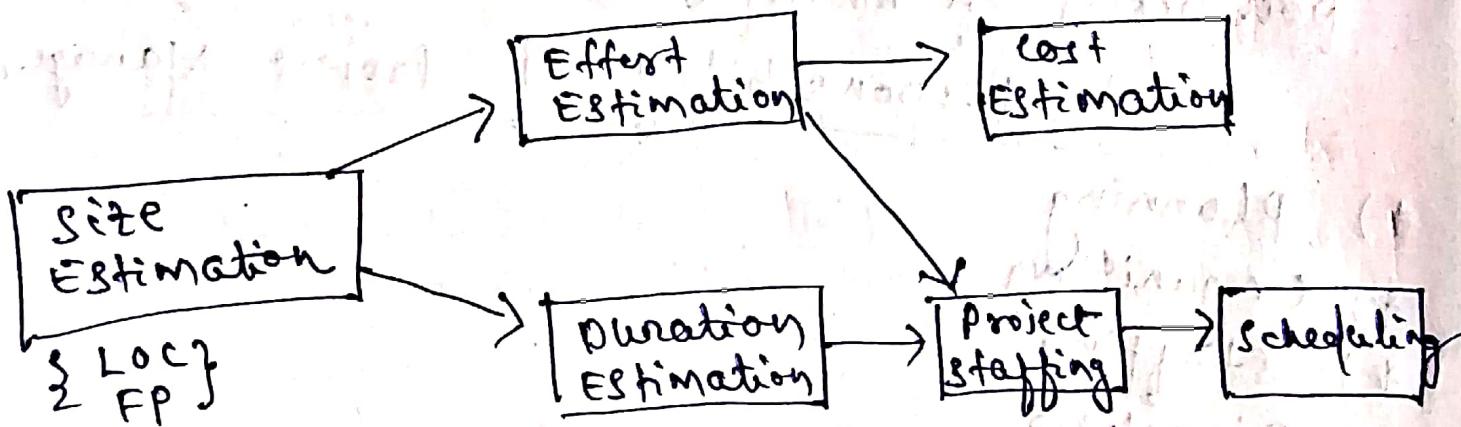
Skills required for Project Manager.

- * Managerial Skills
- * Technical Skills
- * Problem Solving Skills
- * Coping Skills
- * Conceptual Skills
- * Friendship Skills
- * Communication Skills

Project planning:

- * Estimation (cost, duration, effort)
- * Staffing (staff organization, staff plans)
- * Scheduling manpower & other resources
- * Risk Management
- * Miscellaneous plans (quality assurance plan, configuration & installation plans)

Precedence Ordering:



Sliding window planning (SWP):

- * planning a project over a no. of stages protects managers from making big commitments too early. This technique of staggered planning is known as SWP.
- * In this technique, starting with a initial plan, the project is planned more accurately in successive development stages.
- * At the start of the project, Project Manager have incomplete knowledge about the details of the project.

- * Their information base gradually improves as the project progresses through different phases.
- * After the completion of each phase, the Project Manager can plan each subsequent phase more accurately & with increasing level of confidence.

Organization of SPMP Document

- * After planning is complete : document the plans in a Software Project Management plan (SPMP) document.
- * Introduction:- (Objectives, Major functions, performance issues, Management & Technical constraints).
- * Project Estimates:-(Historical Data, Estimation techniques, Effort, cost and project duration Estimation)
- * Project Resource plan:- (People, Hardware and software, special resources).
- * Schedules:(Work Breakdown Structure, Task Network, Gantt chart Representation, PERT chart)
- * Risk Management plan (Risk Analysis, Risk Identification, Risk Estimation)
- * Project Tracking & Control plan
- * Miscellaneous plans (Quality Assurance)

Software project size Estimation

two standard Metrics are we.

- lines of code (LOC)
- function point (FP)

LOC

- * Measure the size of a project by counting no. of source instructions in the programs ignoring the commentry code, header line & blank spaces.
- * Determining the LOC at the beginning is very difficult than in the end.
- * Problem is divided into modules & each module into sub modules & go on and LOC is approximately predicted.

e.g.

```
void main ()  
{  
    int i,j;  
    printf("Enter integers");  
    scanf("%d %d", &i, &j);  
    int sum=0;  
    sum = i+j;  
    printf("%d", sum);  
    // display sum
```

$$\text{Loc} = 9$$



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Adv.

- * Loc are easily measured upon the project completion.
- * Easy to count & calculate from the developed code.
- * Widely used & Universally Accepted.
- * It measures SW from developer's point of view.

Disadv.

- * Difficult to measure Loc before completion of project.
- * Coding style varies from developer to developer.
 - e.g. `for (i=0; i<10; i++)` `for (i=0; i<10; i++)`
 `{` `printf("Hello");`
 `printf("Hello");`
 `}` $Loc = 2$
 - $Loc = 3$
- * Depends on program. e.g. developing a Bubble sort program in 'c' requires approximately 30 to 40 lines but if we develop in python it requires only 10 lines.
- * Ambiguity in comment line. In loc comment line is ignored but if the comment line is associated with a logical line then whether that line is countable or not.

e.g. if ($a > b$) // value of $a >$ value of b

{
 --
 -- - -

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Function point (FP)

- * It is a standard method used to estimate the size, complexity & functionality of software projects.
- * Unadjusted function point (UFP) :- calculate the UFP by multiplying the no. of each type of component by its corresponding weight & summing them up.
- * No. of components :- Count each of below

i) EI :- No. of External input

Data passes across the boundary from out side to inside.

e.g. in library database system, enter the card no.

ii) EO :- No. of external output

Data passes across the boundary from inside to outside.

e.g. display a list of books

iii) EQ :- No. of External query

Both c/p & o/p components, that result in data retrieval from one or more internal logical files.

e.g. ~~Book~~ Book availability check, status check

IV) internal logical file (ILF)

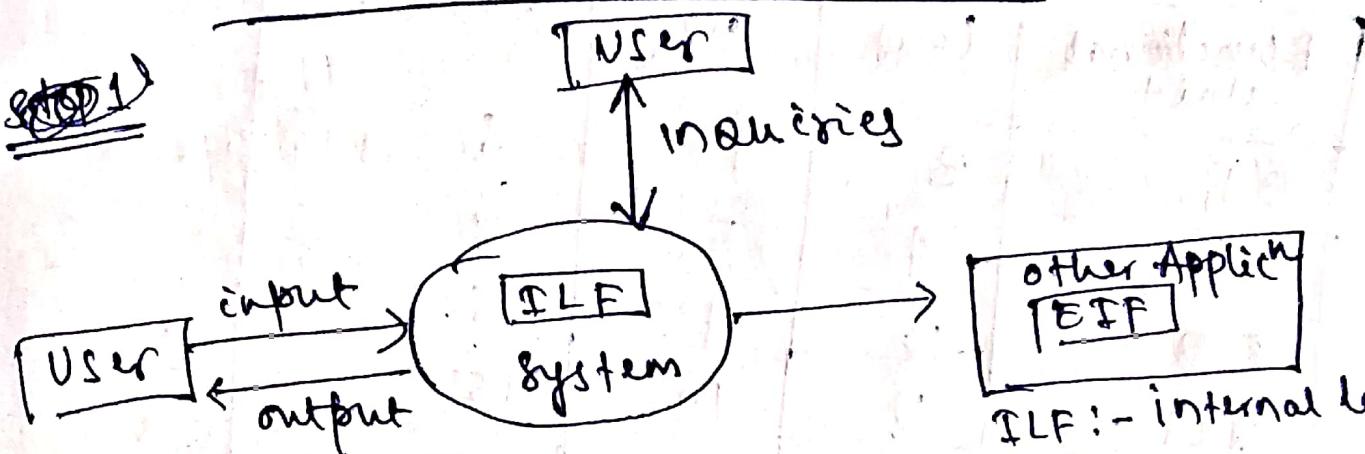
No. of internal files stored in Database

e.g.. student record, book details, book issued record . . . (within the system boundary)

V) External Interface file (EIF)

e.g. Payment gateway interface, third party shipping service interface (DTDC Courier) (outside the system boundary)

~~calculator based function point~~



ILF :- internal logical file

EIF :- External logical files

Calculate function point

Step 1

$$F = 14 * \text{Scale}$$

Scale values are from 0 - 5.

0 - No ~~Confidential~~ Influence

1 - Incidental

2 - Moderate

3 - Average

4 - Significant

5 - Essential

Step - 2

calculate CAF (Complexity Adjustment factor)

$$CAF = 0.65 + (0.01 * F_i)$$

Step 3

calculate UFP (Un Adjustment function point) -

functional Unit	low	avg	high
EI	3	4	6
EO	4	5	7
EQ	3	4	6
ILF	7	10	15
EIF	5	7	10

Step - 4

$$FP = UAF * CAF$$

e.g. 1 Given the following values -

compute FP where all complexity adjustment factor (CAF) & weighted factor are average.

User Input = 50

" Output = 40

" " Inquiries = 35

" " files = 6

External Interface = 7

Step 1

Step 1

$$F = 14 * \text{scale}$$

scale is given Arg. in the question.

$$F = 14 * 3 = 42$$

Step 2

$$\text{CAF} = 0.65 + (0.01 * 42) = 1.07$$

Step 3

UFP

weighting factor is arg. given in question

~~UFP~~
$$ET = 50, EO = 40, EQ = 35, IFL = 6$$
$$EIF = 4$$

$$\begin{aligned} UFP &= (50 \times 4) + (40 \times 5) + (35 \times 4) + (6 \times 10) \\ &\quad + (4 \times 7) = 628 \end{aligned}$$

Step 4

$$TFP = UAF * CAF$$

$$= 628 * 1.07 = 671.96$$

eg. 2

Calculate the FP, Productivity, documentation, cost per function for the following data

No. of User Input = 24

" " " output = 46

" " " inquiries = 8

" " " files = 4

" " " External Interface = 2

Effect = 36.9 PM

Technical document = 265 pages

User " = 122 pages

Cost = \$ 27.44 / month

Complexity factors are

4, 1, 0, 3, 3, 5, 4, 4, 3, 3, 2, 2, 4, 5.

Ans

$$F = 14 * \text{Scale} ; \quad \text{given}$$

$$F = 4 + 1 + 0 + 3 + 3 + 5 + 4 + 4 + 3 + 3 + 2 + 2 + 4 + 5 \\ = 43$$

$$\underline{\text{CAF}} = (0.65 + (0.01 * F)) \\ = (0.65 + 0.01 * 43)$$

$$\underline{\text{UFP}} = (24 * 4) + (46 * 5) + (8 * 4) + (1 * 10) \\ + (2 * 7)$$

$$\underline{\text{FP}} = \underline{\text{UAF}} * \text{CAF} = 408$$

$$\boxed{\text{Productivity} = \frac{\text{FP}}{\text{Effort}}} = \frac{408}{36.9} = 11.1$$

$$\boxed{\text{Total page document} = \text{Technical document} \\ + \text{User document}} \\ = 265 + 122 = 387 \text{ pages}$$

$$\boxed{\text{Cost per function} = \frac{\text{Cost}}{\text{productivity}}} \\ = \frac{7744}{11.1} = \$ 700$$

Q3 calculate FP, Productivity, document & cost per function for S/w application with multiple processing factor

5, 1, 0, 4, 3, 5, 4, 3, 4, 5, 2, 3, 4, 2 by following data.

$$\text{No. of EI (Avg)} = 22$$

$$\text{No. of EO (Low)} = 45$$

$$\text{No. of EQ (High)} = 06$$

$$\text{No. of TLF (Avg)} = 05$$

$$\text{No. of ELF (Low)} = 02$$

Effort = 3 P.M., Technical document = 250 pages, User Related document = 120 pages

& Budget/Cost = \$ 7520 per Month.

Soln
Step-1 $F = (5+1+0+4+3+5+4+3+4+4+2) = 45$

Step-2 ~~CAF~~ $C_{AF} = (65 + (0.01 * 45)) = ?$

Step-3 ~~UAF~~ $U_{AF} = (22 * 4) + (45 * 4) + (06 * 6) + (05 * 10)$
+ (02 * 5) = ?

Step-3 $FP = UAF * CAF = 450$

$$\text{Productivity} = \frac{FP}{\text{Effort}} = 450 / 32$$

$$\frac{\text{Total Page}}{\text{a documet}} = 250 + 120$$

Advantages of FP

- *) It enhances the productivity & work flow process of SW application
- *) It estimates the SW application functional size.
- *) It estimates the development time.

Dis Adv.

- *) Time consuming process
- *) It is a costly model of estimation
- *) The accuracy of FPA is very difficult as multiple factors are involved in it.

A software project was estimated at 352 function point (FP). A four person team will be assigned to this project consisting of an Architect, two programmers and a tester. The salary of the Architect is 80,000 per month, the programmers 60,000 per month and the tester 50,000 per month. The avg. productivity for the team is 8 FP per person month. Find the project cost of the project?

Ans:- There are 4 Persons,

one Architect + 2 Programmers + one Tester.

$$\text{So Salary} = 80,000 + (60,000 \times 2) + 50,000 \\ = 2,50,000 \text{ per month.}$$

Now total function point = 352.

The Avg. ~~function point~~^{productivity} = 8 FP per person

in a month.

So total Avg. function point in a month for 4 Person = $8 \times 4 = 32$ FP. in a month.

So in one month. 32 FP. Total FP = 352.

So $352 / 32 = 11$ month required to complete the project.

cost of one month = 2,50,000.

" " 11 month = $2,50,000 \times 11 = 27,50,000$

So the cost of the project will be

27,50,000. Ans



Op A SFW Project was estimated at 864 FP.
A six person team will be assigned to project consisting of a requirement gathering person, one designer, two programmers & two testers. Salary of designer is 70,000 per month, Req. gathering is 50,000 PM, programmer is 60,000 PM & tester is 60,000 PM. Avg. productivity for the team is 12 FP per person month. Find project cost.

Ans 6 Persons
Total salary = $(70,000 + 50,000 + 2(60,000) + 2(60,000))$

~~180,000~~ Avg. Productivity = 12 FP per person per month.

for 6 person it is $= 12 \times 6 = 72$ FP. per month

project was estimated 864 FP. per month.

so total 8 months $\frac{864}{12} = 72$ months.

so total cost of the project is 72

$(70,000 + 50,000 + 120,000 + 1,20,000) \times 12$

$= 43,20,000$ Ans

so total cost is 43,20,000

