Software Estimation

Why Estimation?

Estimation will answer the questions like:

- How many human resource will be required?
- What should be the schedule?
- What will be the complexity of the software?
- What should be the cost of the software?

Project Size Estimation Techniques

2 widely used methods to estimate software size:

1. Lines of Code (LOC)
2. Function Point (FP)

Lines of Code (LOC)

- Texts written in a particular language
- Comments and blank lines are not included
- Language oriented
- Developer has own style of coding

Advantages:

- Easy and widely used for size estimation

Disadvantages:

- Language and syntax dependent

```
for(int i=0; i<5; i++)
{
    printf("Hello World");
}
```

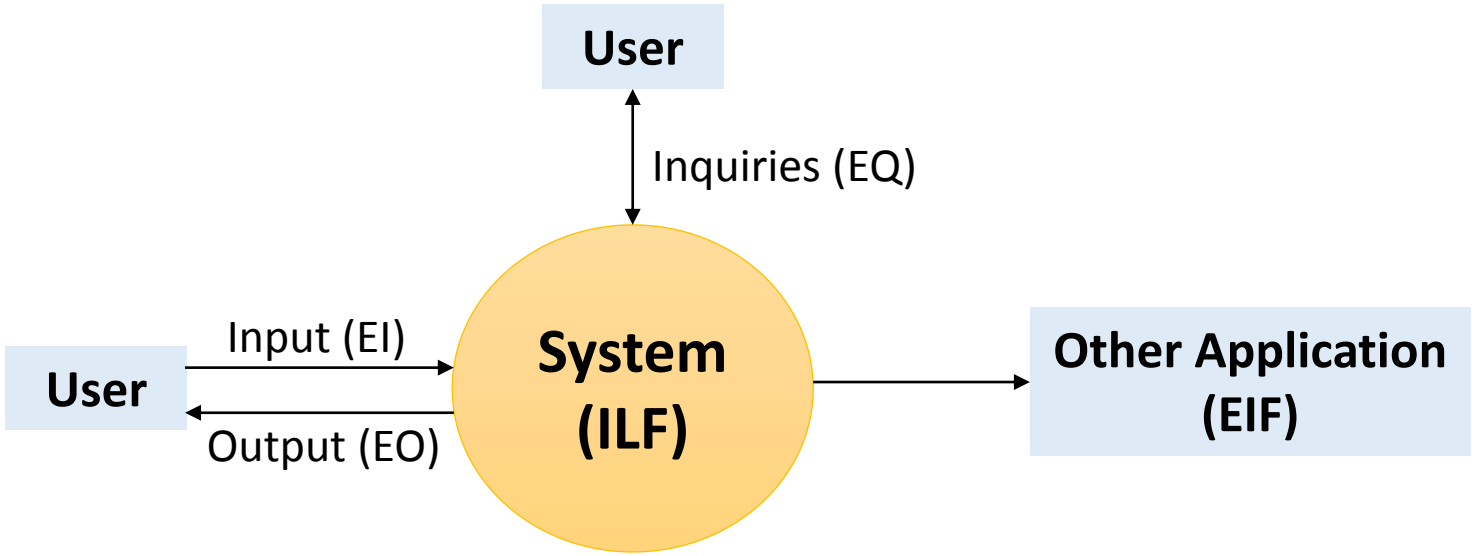
```
for(int i=0; i<5; i++)
    printf("Hello World");
```

Function Point (FP)

- Measures functionality from user's point of view
  - Based on the request and response of user
- Language Independent
- Estimation can be made from problem description

Function Point (FP)

- Internal Logical Files (ILF)
- External Interface Files (EIF)
- External Inputs (EI)
- External Outputs (EO)
- External Queries (EQ)



Function Point (FP) Practice Problem

https://www.javatpoint.com/software-engineering-functional-point-fp-analysis

COCOMO Model

Constructive Cost Model

Projects are categorized into 3 types:

1. Organic
2. Semidetached
3. Embedded

Estimation can be done in 3 stages

1. Basic Model
2. Intermediate Model
3. Detailed Model

Basic COCOMO Model

Effort (E) = $a*(KLOC)^b$ MM

Scheduled Time (D) = $c*(E)^d$ Months(M)

Where,

- **E =** Total effort required for the project in Man-Months (MM).
- **D =** Total time required for project development in Months (M).
- **KLOC =** the size of the code for the project in Kilo lines of code.
- **a, b, c, d =** The constant parameters for a software project.

PROJECT TYPE	a	b	c	d
Organic	2.4	1.05	2.5	0.38
Semidetached	3	1.12	2.5	0.35
Embedded	3.6	1.2	2.5	0.32

Basic COCOMO Model (Practice Problem)

Example: For a given project was estimated with a size of 300 KLOC. Calculate the Effort, Scheduled time for development. Also, calculate the Average resource size and Productivity of the software for Organic project type.

Ans: Given estimated size of project is: 300 KLOC

For Organic

Effort (E) = $a*(KLOC)^b = 2.4*(300)^{1.05} = 957.61$ MM

Scheduled Time (D) = $c*(E)^d = 2.5*(957.61)^{0.38} = 33.95$ Months(M)

Avg. Resource Size = E/D = 957.61/33.95 = 28.21 Mans

Productivity of Software = KLOC/E = 300/957.61 = 0.3132 KLOC/MM = 313 LOC/MM

For Semidetached

Effort (E) = $a*(KLOC)^b = 3.0*(300)^{1.12} = 1784.42$ MM

Scheduled Time (D) = $c*(E)^d = 2.5*(1784.42)^{0.35} = 34.35$ Months(M)

For Embedded

Effort (E) = $a*(KLOC)^b = 3.6*(300)^{1.2} = 3379.46$ MM

Scheduled Time (D) = $c*(E)^d = 2.5*(3379.46)^{0.32} = 33.66$ Months(M)