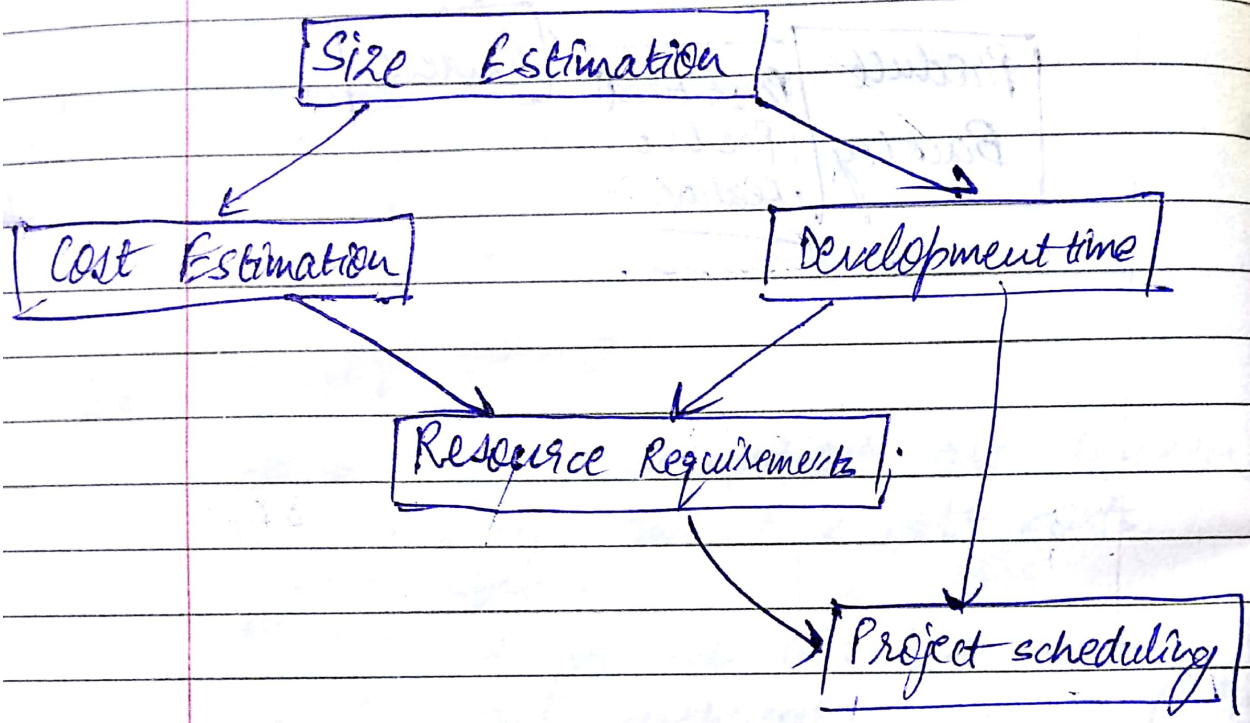
Module - 2
Project Planning

Various steps of planning activity :-



Q- Write a short note on Project Planning.

LOC

Introduction :-

A Line of code is any line of program text that is not a comment or blank line, regardless of the no. of statements or fragments of statements of line.

This includes all line containing program headers, declaration and executable and non executable statement.

Advantages :-

1. Simple method based on counting the no. of lines.

Disadvantages :- 1. It is language depended.
2. They also reflect what the system is rather than what it does.

Ex:
```
# include <stdio.h>
void main ()
{
    // addition of two numbers
    int a, b, c;
    a = 10; b = 10;
    c = a + b;
    Printf ("%d", c);
}
```
8 LOC

Function Point

Intro :-

Alan Albrecht developed a technique called FPA (Function Point Analysis) It measures functionality from user point of view.

The principle of FPA is that a system is decomposed into functional units.

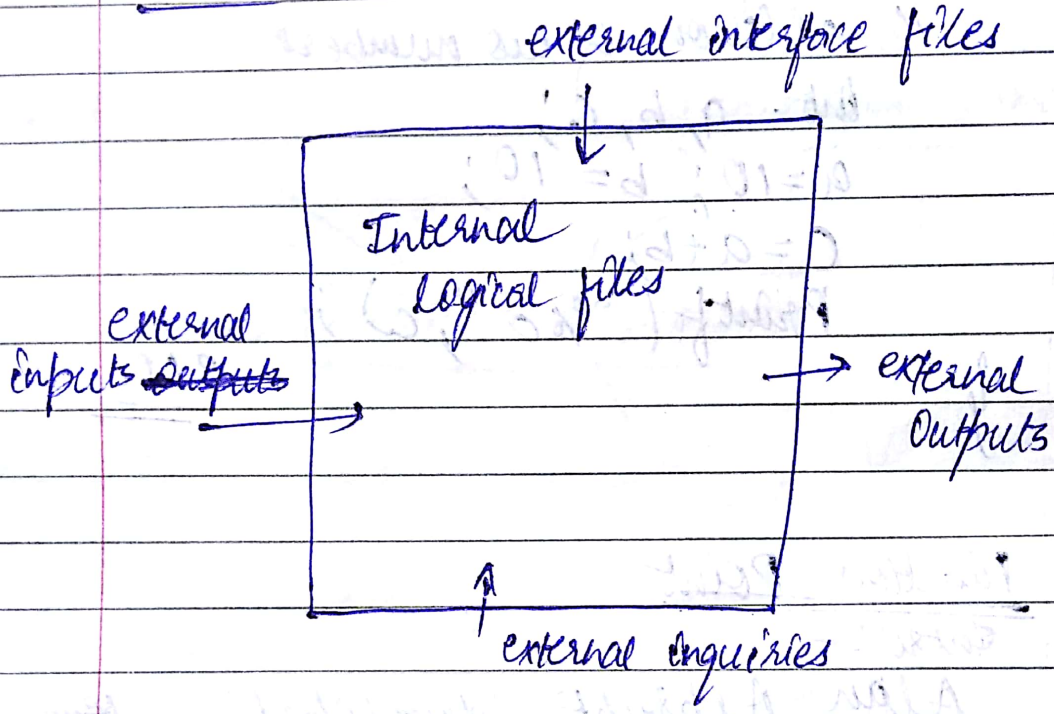
The five functional units are divided into 2 categories :-

1. Data function types.
   a) Internal logical files
   b) External interface files.
2. Transaction function type
   a) External inputs
   b) External outputs
   c) External inquiry.

Special features

1. They are based on system users external view of the system.
2. They are independent of the language, tools or methods used for implementation.

FPA



Procedure for calculating FP

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

z_{ij} = no. of functional units.
w_{ij} = Weighing factors.

Table

Fractional Units	Weighing factors. Low	Average	High
External inputs	3	4	6
" outputs	4	5	7
" inquiries	3	4	6
Internal logic files	7	10	15.
External interface files	5	7	10

$F.P = UFP * CAF$

$CAF = 0.65 + 0.01 \times \Sigma f_i$

Σf_i = 14 Questions × Weighing factors.

Scale

0	1	2	3	4	5
No influence	Incidental	Moderate	Average	Significant	Essential

FP → Function pt
UFP → Unadjusted Func^n pt
CAF → Complexity adjustment factor

Ques Consider a project with the following functional units :-

No of User inputs — 50
No of User Outputs - 40
" " Inquiries - 35
" " Logical files - 6

Assume all CAF and weighting factors are average. Compute the FP for the project

Step 1 ⊛ UFP = (50×4) + (40×5) + (35×4) + (6×10) + (4×7)
= 628

CAF = 0.65 + 0.01 * Σfi
= 0.65 + 0.01 * (14×3)
= 1.07

FP = UFP * CAF
= 628 * 1.07
= 672

Ques An application has the following :-
10 low external inputs,
12 high external Outputs,
20 low logical files,
15 high interfaces, 12 average inquiries
& Value of CAF is 1.10. Calculate the FP

Soln.

3×10	= 30
4×12	= 84
7×20	= 140
10×15	= 150
4×12	= 48
	452 = UFP

CAF = 1.10

FP = UFP * CAF = 452 × 1.10 = 497.2

Ques Consider a project with following parameter

→ External inputs
- a) 10 with low complexity
- b) 15 with average "
- c) 17 with high "

→ External Outputs
- a) 6 with low
- b) 13 with high

→ Ext. Enquiries
- a) 3 with low
- b) 4 with avg
- c) 2 with high

→ Logical files
- a) 2 with avg
- b) 1 with high

→ Interfaces with low

In addition to above system require
- (a) significant data communication
- (b) performance is very critical
- (c) design code maybe moderately reusable
- (d) system is not design for multiple installation.

Other CAF are treated as average.

Sol^n UFP = (10 × 3) + (15 × 4) + (17 × 6) + (6 × 4) + (13 × 7) + (3 × 3) + (4 × 4) + (2 × 6) + (2 × 10) + (1 × 15) + (9 × 5)

= 424

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$\Sigma f_i = 3 \times 10 + 4 + 5 + 2 + 0$
$= 41$

$CAF = 0.65 + 0.01 \times 41$
$= 1.06.$

$FP. = 1.06 \times 424$
$= 449.44$

Risk Management (6 marks or short notes)

Risk is defined as the possibility of loss. It is the isability to achieve program objective within defined cost, schedule and technical constraints.

* Types of Risk

(1.) Development process risk
- a Developer errors
- b Natural disaster
- c Poor management objectives.

(2.) Product Risk
- a- Project risk
- b Technical risk
- c Businessiness risk

Risk in software budget management

1.) Generic risk
- a) Unstable Requirements
- i) Inedequate time for testing etc.

2.) Project specific Risk
Inedequate resources allocated to project

3.) Business Risk -
- a) The organisation does not know how to sell product
- b) The organisation does not want the product.

4) Bohem's Risk Items.
a) short falls
b) Unrealistic schedules and budget
c) developing the ~~too~~ wrong uses interface
d) developing the wrong s/w functions.
e) Real time performance short falls

Reactive Risk - Proactive Risk strategies

→ Reactive strategies - 1.) It monitors the project for ~~slightly risk~~ likely risk
2.) The s/w team does nothing about risk until something goes wrong

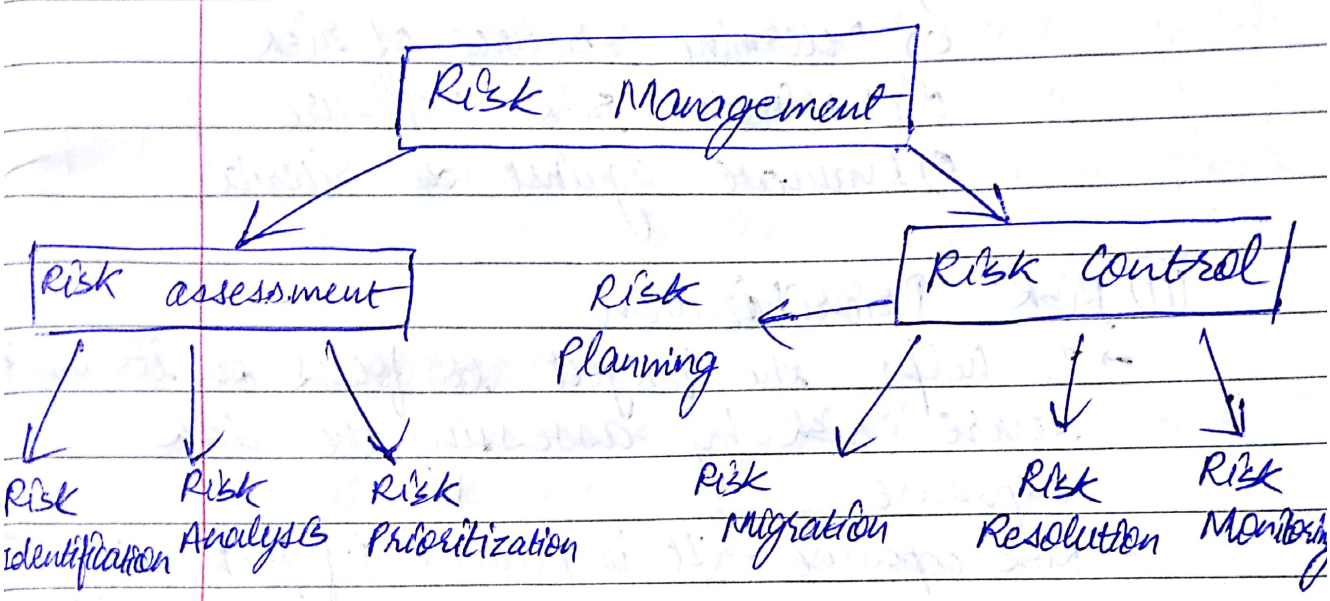
→ Proactive Risk :-
Potential risk are identify, risks impact are assessed and they are ranked by process

Risk Management categories

1.) Risk avoidance
a) Risk anticipation
Various risk anticipation rules are listed according to standards from previous projects and experience and also mentioned by project managers.

b) Risk tools.
Risk ~~rules~~ tools are used to test whether the s/w is risk free

2) Risk Detection -
a) Risk analysis
b) Risk categories
c) Risk prioritisation



14/08/2018

Risk Management Process

1. **Risk Assessment**

It is the process of examining a project and identifying areas of potential risk. It includes the following :-

i) **Risk Identification**

It is a systematic attempt to specify threats to the project plan. The main activities are :- a) Identify Risk
b) Define risk attributes
c) Documentation
d) communicate

ii) **Risk analysis**

→ After identifying the risk, the project mananager needs to analyse the risk.

→ Uncertainty and loss are two characteristics of risk.
→ The main activities are :-
a) Group similar risk
b) Determine risk drivers
c) Determine source of risk
d) Estimate risk exposure
e) Evaluate against criteria

iii) Risk Prioritization
→ It helps the project to focus on its most severe risk by assessing the risk exposure
→ Risk exposure - It is product of probability of incuring our loss due to the risk and the potential magnitude of loss.

(2.) Risk Control
It is the process of managing risk to achieve desired outcomes. It involves the following activities :-
1. Risk planning
2. Risk Mitigation
3. Risk Resolution
4. Risk Monitoring

i) Risk Planning -
It produces a plan for dealing with each significant risk. It contains the 3 strategies :-
a) Risk avoidance
a) Risk avoidance - To avoid risk from occuring

the project team prepare risk plan (RMP - Risk management plan) before the commencement of project.

b) Risk minimization :-
It attempts to reduce the impact of risk

c) Risk contigency Plan :- The possibility of contigency planning arrises when efforts fail and risk becomes a reality

ii) Risk Mitigation
It is proactive strategy of trying to find ways to either decrease the possibility of risk event happening or impact of it.

iii) Risk Resolution
It is the execution of plans for dealing with each risk. The risk that have a high impact should have an emergency plan.

iv) Risk Monitoring
It is the project tracking activity with 3 objectives :-
a. To assess whether predicted risk do, infact occur.
b. To ensure the risk plan define for the specific risk are properly applied.
c) To collect information that can be used for future risk analysis

→ RMMM (Risk Mitigation, Monitoring, Management
{Short Note}

TUT Class

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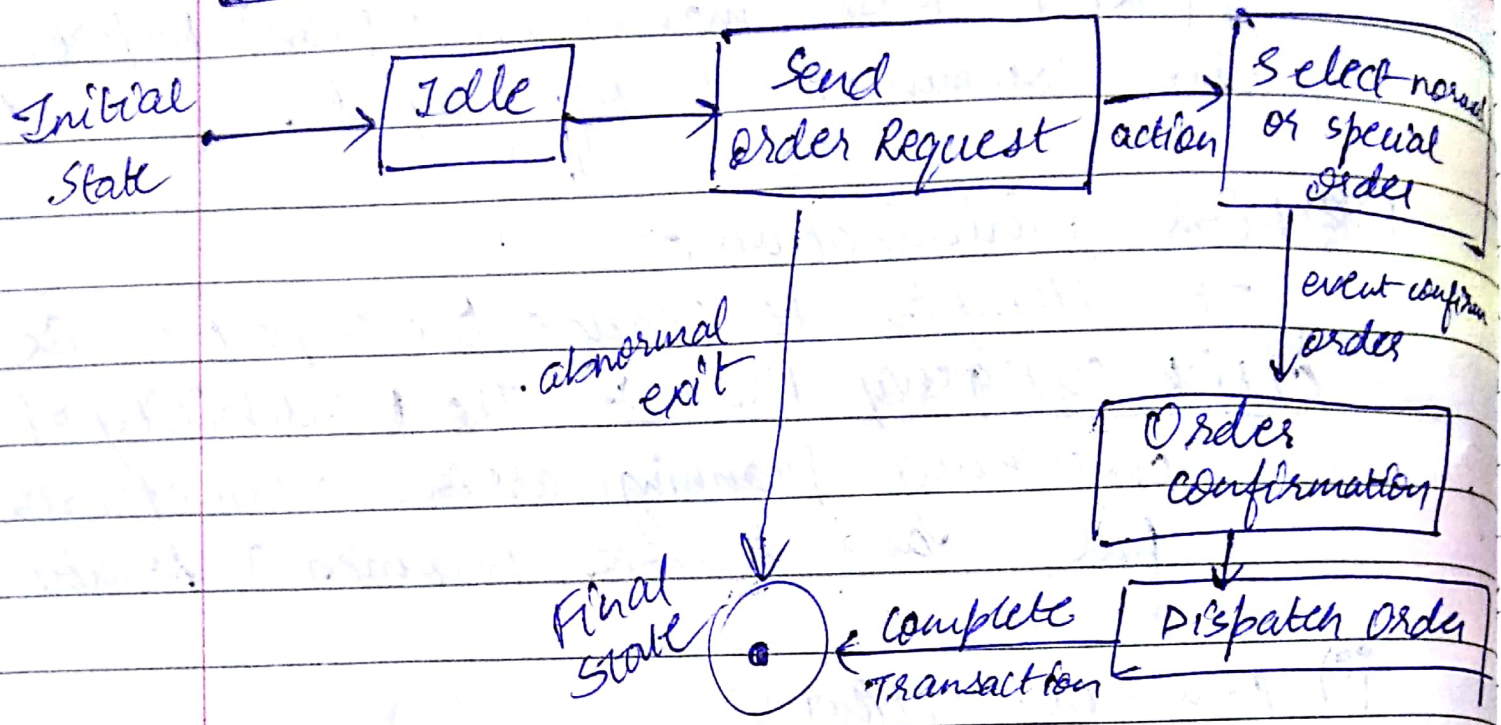
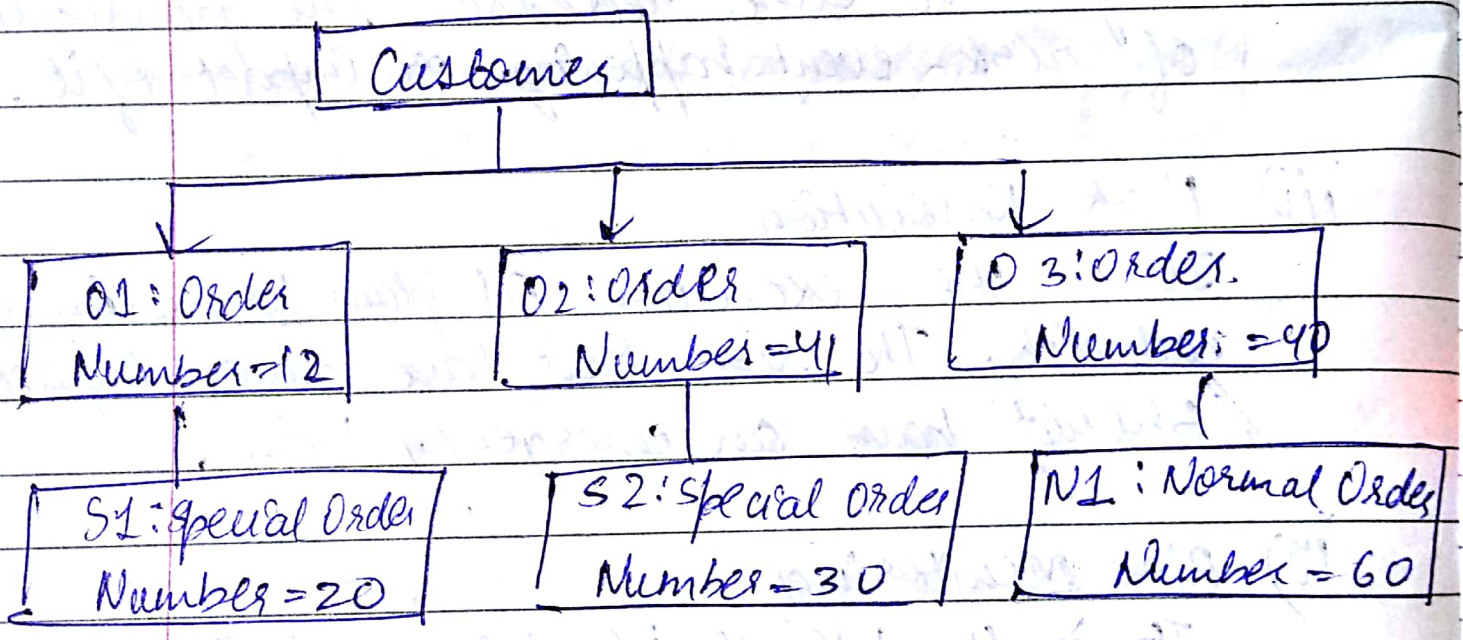
State Chart Diagram





Cost estimation

COCOMO - Model
(Constructive Cost Modelling)

Modes
- Organic — 2-50 KLOC
- semi-detached — 50-300 KLOC
- Embedded — >300 KLOC

Model
1) Basic
2) Intermediate
3) Complete

Project	a_b	b_b	c_b	d_b
Organic	2.4	1.05	2.5	0.38
Semi-detached	3.0	1.12	2.5	0.35
Embedded	3.6	1.20	2.5	0.32

Calculation of development effort

General

$$E = a_b (KLOC)^{b_b} PM$$

effort

Ex — $E = 2.4 (KLOC)^{1.05} PM$

a_b & b_b are constant

PM-Per person per month

KLOC - 1000 line of code

Estimation of development time:

$$T_{due} = c_b (E)^{d_b} \text{ Months}$$

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(3) Average staff size = $\frac{\text{Effort}}{T_{dev}}$ persons

(4) Productivity = $\frac{KLOC}{\text{Effort}}$ KLOC/PM

Ques Suppose that a project was estimated to be 400 KLOC. Calculate the effort and development time for each of the 3 modes.

Sol^n $E = a_b (KLOC)^{b_b}$ PM

Organic

$E = 2.4(400)^{1.05}$ PM
$= 1295.31$ PM

$T_{dev} = 2.5(1295.31)^{0.38}$
$= 38.07$ Months

Semi-detached

$E = 3.0(400)^{1.12}$ PM
$= 2462.79$ PM

$T_{dev} = 2.5(2462.79)^{0.35}$
$= 38.45$ Months

Embedded

$E = 3.6(400)^{1.2}$ PM
$= 4772.81$ PM

$T_{dev} = 2.5(4772.81)^{0.32}$
$= 37.596$ Months.

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Ques A Project size of 200 KLOC is to be developed. The software development team has average experience on similar type of projects. The project schedule is not very tight. Calculate effort, dev. time, Avg staff size & Productivity.

Sol^n $E = 3.0(200)^{1.12}$ PM

$= 1133.11$

$T_{due} = 2.5(1133.11)^{0.35}$

$= 29.30$

Avg staff size $= \frac{377.70}{19.95} = 18.932$

$= \frac{1133.11}{29.30} = 38.666$

Productivity $= \frac{200}{1133.11} = 0.176$

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COCOMO Model 1

Introduction :- It was proposed by Bohem
Acc to Bohem s/w cost estimation should be done through stages

1. Basic COCOMO Model
   i) It gives approximation estimate of the project parameters. A basic COCOMO approx. mode is given by following exp

$$\text{Effort} = a(KLOC)^{bb} PM$$
$$T_{dev} = C_b(E)^{db} \text{ Months}$$

2) Intermediate Model
   i) The basic COCOMO assumes that effort & development time are functions of product size alone. However a host of other parameter besides the product size effect the effort reqd. to develop the product as well as the development time.
   ii) The intermediate model recognizes this fact and refines the initial estimate obtained using the basic COCOMO expressions by using a set of 15 cost drivers based on various attributes of software development

3) Complete COCOMO Model
   i) It considers the characteristics of sub-system and estimates the effort and development

time as the sum of estimates for the sub-system.

ii) The cost of each subsystem is estimated seperately.

The following are subsystem components

a. Database part

c. UI part

d. Communication Part

Modes of COCOMO Model

Mode	Project Size	Nature of Project	Innovation	Deadline of Project	Development Environment
1.) Organic	2 - 50 KLOC	Small size project, experienced developess in family environment For eg: Payroll System, etc	Little	~~Med~~ Not Tight	Familiar and Inhouse
2.) Semi detached	15 - 300 KLOC	Medium size project, Medium size team, Avg previous experience on similar project For eg: Utility System like Compiler, etc	Medium	Medium	Medium

3) Embeded	>300 KLOC	Large project, real time system complex interface, very little previous exp^n for eg: Air traffic control etc.	significant	Tight	Complex hardware / customer interface is kept.

Assignment:
Write a short note on COCOMO II

27/08/2013

Software matrice

↳ matrix to measure any software.

Software matrix

The continous application of measurement based techniques to the software development process and its product to supply meaningful and timely management information together with the use of those techniques to improve that process and improve its product-

Categories of Matrices :-

1) **Product Matric**
It describes characteristics of the product such as :- size, complexity, efficiency, reliability, etc

2) **Process matric**
It describes effectiveness and quality of processes. For eg 1. Effort req. in a process,
2. Time to produce product
3 Maturity of process
4. No of defect found during testing

3) **Project matric**
It describes the project characteristics and execution.
Eg :- 1. Productivity
2. No of S/w developers
3. cost & schedule

Attributes of Effective S/w Matric

1. Simple & computable
2. Consistance and objective
3 Programming language independent

Token Count Method (Halll state Method)

Intro :- It is an ~~atcems~~ analytic tech. to measure size, developer effort & developer cost of s/w products

Method :-

For a given program

a. Let n_1 = be the no. of unique operators used in program

n_2 - be the no of unique operands used in program

N_1 - be the total no of operators used in program

N_2 - be the total no of operands used in the program

Advantages

1. Simple to calculate analysis of program.
2. Do not require indepth analysis of programming structure
3. Measure overall quality of program
4. Predicts maintainance effort
5. Useful in scheduling projects

Program Length $= N_1 + N_2$

Program Vocabulary $= n_1 + n_2$

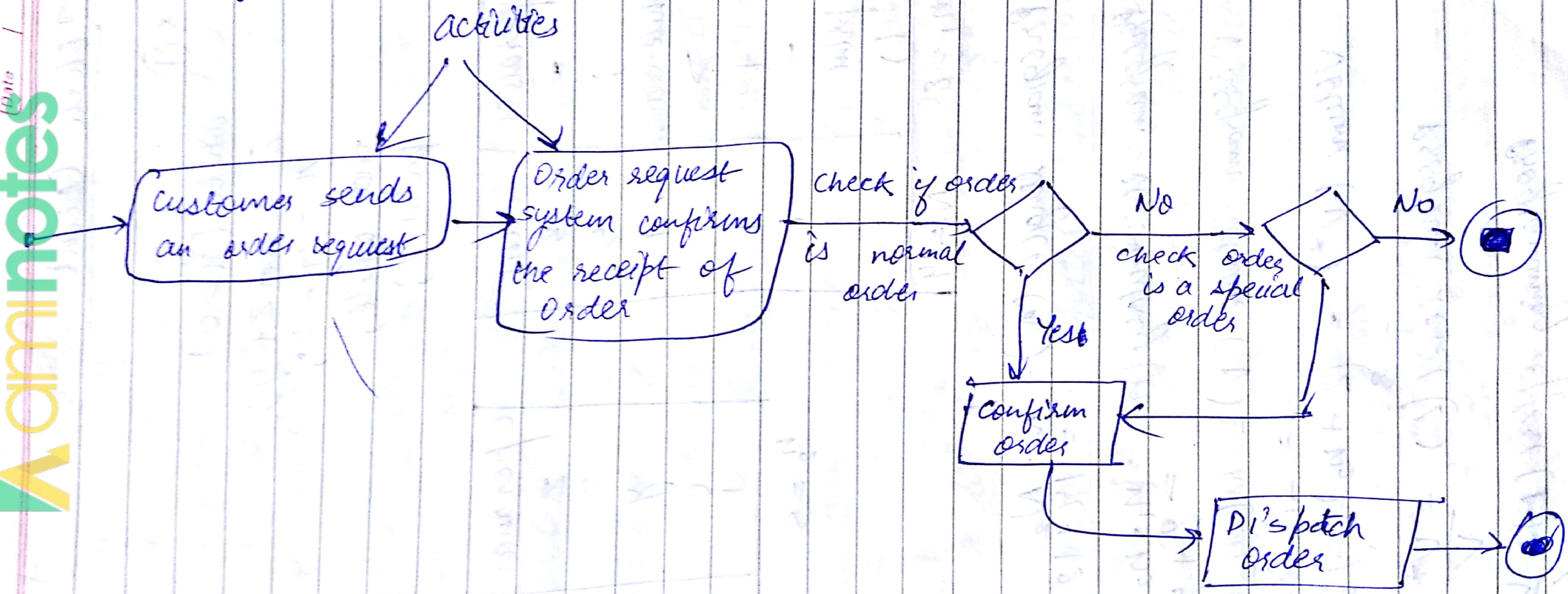
Program Volume $(V) = N \log_2 (n_1 + n_2)$

Potential Volume $(V^*) = (2 + n_2) \log_2 (2 + n_2)$

Program Level $= \frac{V^*}{V}$

Programming effort $(E) = \frac{V}{L}$

Activity Diagram



Token Count

Ex (1)

```
z = 0;
while (x > 0)
z = z + y;
x = x - 1;
end while;
print z;
```

operators	count
=	3
;	5
while-endwhile	1
>	1
+	1
-	1
print	1
()	1
$n_1 = 8$	$N_1 = 14$

operands	count
z	4
x	3
y	2
0	2
1	1
$n_2 = 5$	$N_2 = 12$

Program length (N) $= N_1 + N_2$
$= 14 + 12 = 26$

Program vocabulary (n) $= n_1 + n_2$
$= 8 + 5 = 13$

Program volume (V) $= N \log_2 (n_1 + n_2)$
$= 26 \log_2 13 = 96.2$

Volume (V^*) $= (2 + n_2) \log_2 (2 + n_2)$
$= 8$

Program level (L) $= \frac{V^*}{V} = 0.053$

Programming effort (E) $= \frac{V}{L} = 1159$

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Cost estimation

1. **Single variable model** - When the model makes the use of single basic variable to calculate all others it is said to be single variable model

2. **Multivariable model** - In some models several models are needed to describe the s/w development process and to estimate the time and cost

3. **Predictors** - The variable single or multiple that are input to the model to predict the behaviour of s/w development.

4. **Static single variable Models**

i) SEL (S/W Engineering Laboratory)
SEL of the university of Maryland has established a model - The SEL model

ii) **Walston Felix Model** (IBM 77)
It provides a relationship b/w delivered LOC (L in thousands of lines) & Effort E (E in person month)

SEL

$E = 1.4 L^{0.93}$

$DOC = 30.4 L^{0.90}$

$D = 4.6 L^{0.26}$

$L = (E/9)^{1/6}$

WF

$E = 5.2L^{(a)\ 0.91}$

$D = 4.1L^{(b)\ 0.36}$

$L = (E/a)^{1/b}$

where,
E - Effort in person month
DOC - Documentation in no. of pages
D - Duration in months
L - No of lines of code in thousands of line

Q- Compare the WF model with SEL model on a software development expected to involve 8 person year effort

i) Calculate the no of lines of source code that can be produced
ii) Calculate the duration of development
iii) Calculate the productivity in LOC by Py
iv) Calculate the average manning

Soln **SEL**

$L = (E/a)^{1/b} = (\$96/1.4)^{1/0.936}$

$= 94264$ LOC

$D = 4.6(94.264)^{0.26} = 15$ months

~~$D = 4.6(94.264)$~~

$D = 94264/8 = 11783$ LOC/Py

$M = 96\ PM = 64$ Person,
$15\ M$

WF

$L = (96/5.2)^{1/0.91} = 24632$ LOC

$D = 41(24.632)^{0.36}$

$= 13$ months

h

$$P = \frac{24632}{8} = 3079 \angle OC/PY$$

$$M = \frac{96}{13} \frac{PM}{M} = 74 \text{ Persons.}$$