UNIT - I - 25 marks

The S/w Problem & S/w Process

PAGE NO.:

DATE : / /

The S/w Problem:

The three Parameter that often drive and define a S/w Project are

⇒ cost

⇒ Schedule

⇒ Quality.

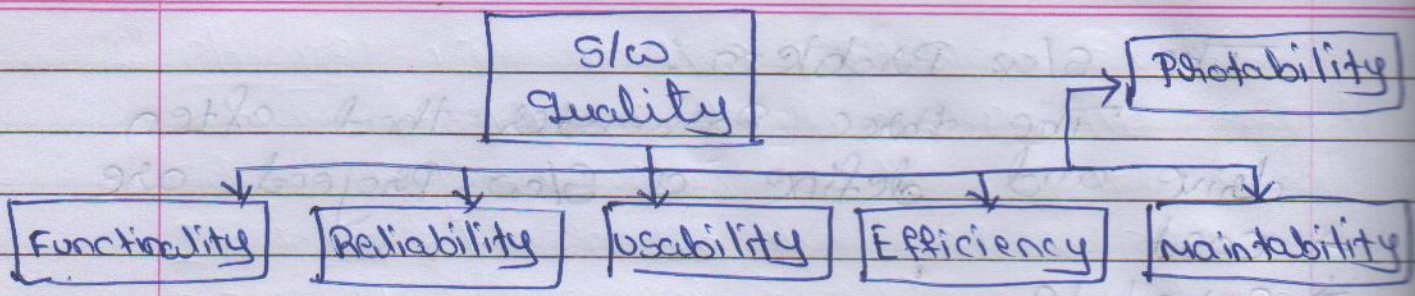
The S/w should be Produced at reasonable cost, in a resonable time, and should be of good quality.

Cost of developing a system is the cost of the resources used for the system, which in the case of S/w are manPower, H/w & S/w & other support resources. Generally the manPower component is Predominant as S/w development is largely labor-intensive.

⇒ Hence the cost of S/w Project is measured in terms of Persons Per month.

Schedule is an important factor in many projects. Business trends are dictating that time-to-market of a Product should be reduced that is, the cycle time from concept to delivery should be small.

Quality is one of major factor driving S/w engineering. The international standard on S/w Product quality suggests that S/w quality comprises six main attributes as shown in the fig. These are attributes can be defined as follows:



1) Functionality : The capability to provide functions which meet stated & implied needs when the S/w is used.

2. Reliability : The capability to provide failure-free service.

3. Usability : The capability to be understood learned & used.

4. Efficiency : The capability to provide appropriate performance relative to the amount of resources used.

5 Maintainability : The capability to be modified for purposes of making corrections, improvements, or adaptation

6 Portability : The capability to be adapted for different specified environments.

Therefore reducing the cost & the cycle-time for S/w development and also assuring the quality of the S/w are the central goals of S/w engineering.

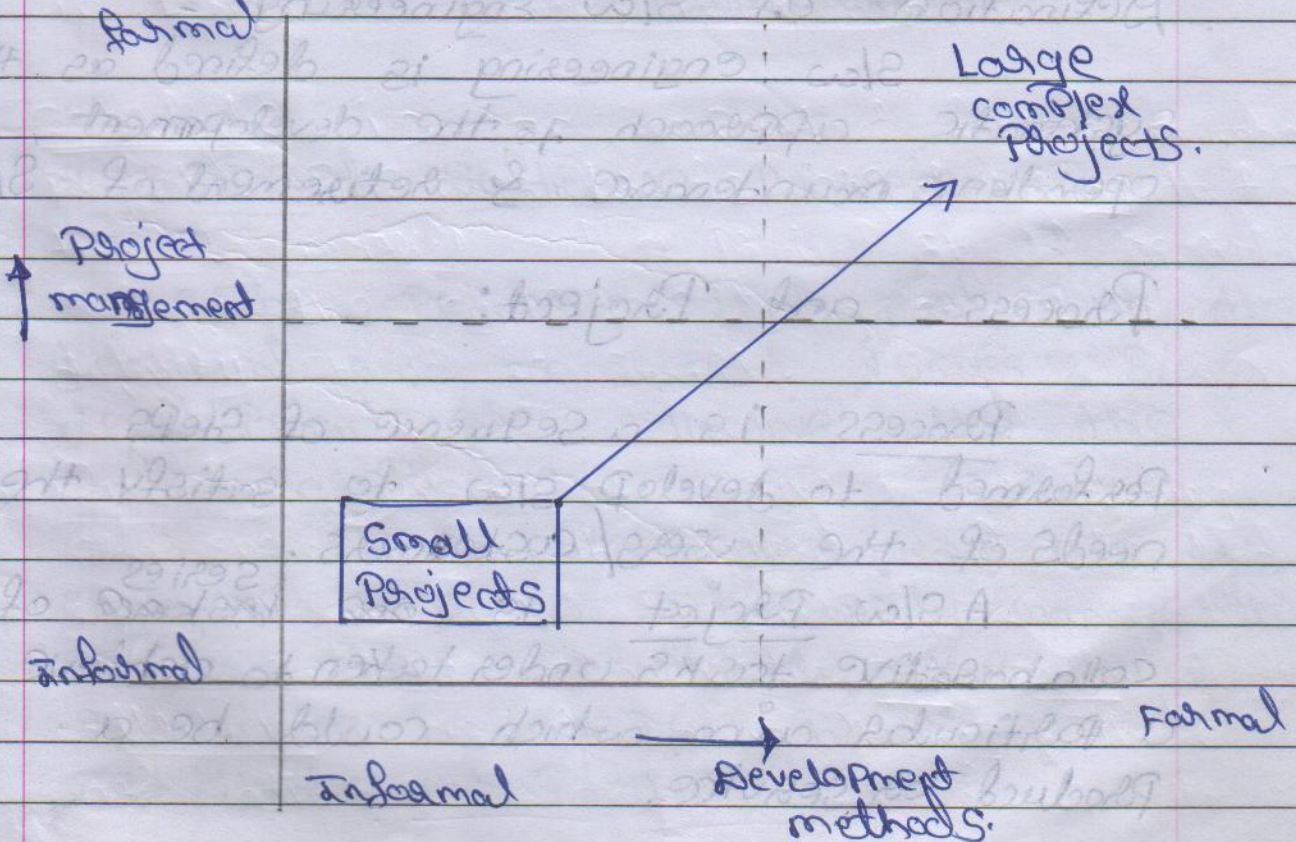
PAGE NO.:
DATE: / /

⇒ Scale and change :-

Another fundament Problem of engineering is scale. Development of very large system requires a very different set of methods compared to developing a small system.

for eg :- consider the problem of couting people in a room versus taking a census (population) of a country. Both are essentially counting problems. But the methods used for counting people in a room will just not work when taking a census count.

In small projects, informal methods for development and management can be used. However for large projects, both have to be much more formal.



PAGE NO.:
DATE: / /

Change is another problem of domain which must be handled. As the complete set of requirements for the system is generally not known in the earlier phases or may not be stated clearly and as development proceeds & time passes, additional requirements are identified, which need to be incorporated in the S/w being developed.

And some times even after changes in requirements are therefore a characteristic of the problem domain.

Software Processes :-

~~Process & Project~~:

Definition of S/w Engineering :-

S/w engineering is defined as the systematic approach to the development, operation, maintenance, & retirement of S/w.

Process and Project:

Process is a sequence of steps performed to develop S/w to satisfy the needs of the users/customers.

A S/w Project is a series of collaborative tasks undertaken to achieve a particular aim which could be a product or service.

Process	Project
A Process is ongoing/repetative & does not have an end	A Project has a beginning and an end.
A Process is a repetative sequence of tasks.	The sequence of tasks in a Project is not repetative.
A Process has an objective that is typically defined around the ongoing operation of the Process ex:- "Provide the ongoing maintenance for Tata motors"	A Project has an objective or outcome to be accomplished & the Project ends when that objective is accomplished. For ex:- "Find a replacement ignition switch that will solve the Problem with tata motors"

Component Software Processes.

The Processes that deal with the technical and management issues of S/w development are collective called the Software Process.

As a S/w Project will have to engineer a solution and properly manage the Project, there are clearly two major components in a S/w Process—

1) Development Process

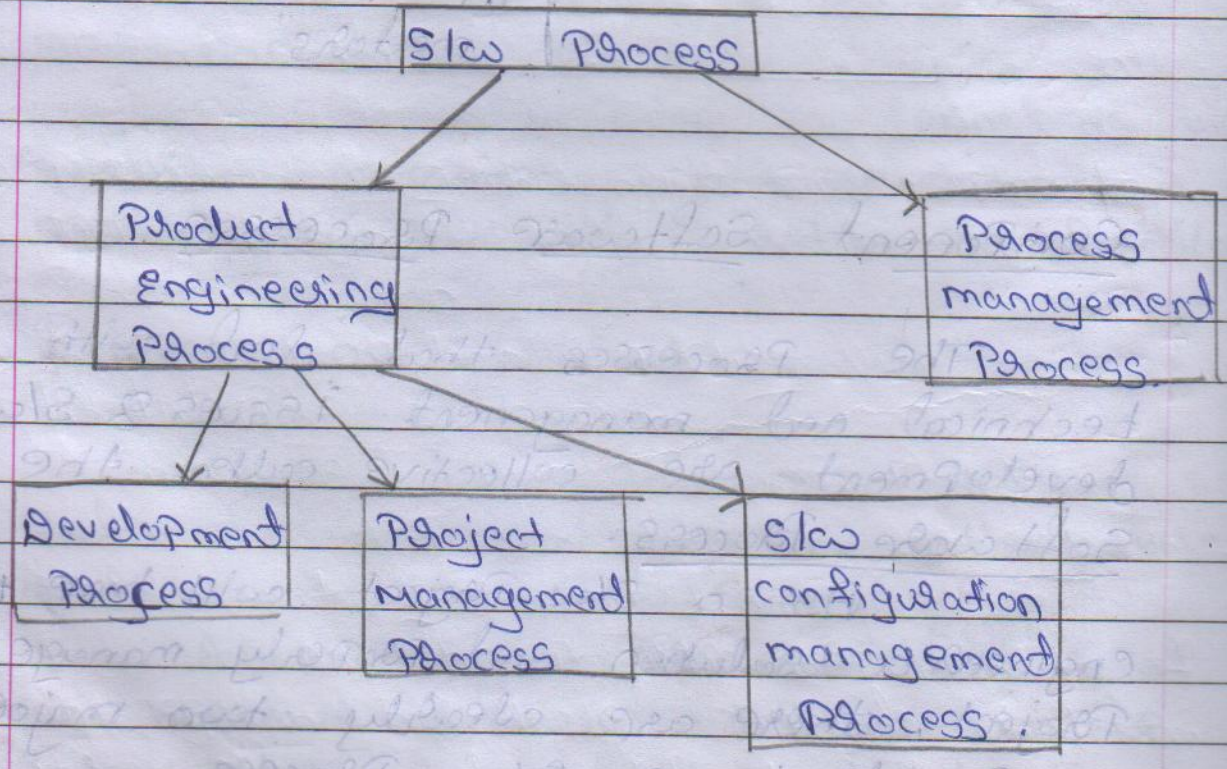
2) Project Management Process.

The development process specifies all the engineering activities that need to be performed.

The Mangament Process specifies how to Plan and contsal these activities so that cost, schedule, quality and other objectives are met.

As the development process generally do not focus on evolution and changes, to handle them another process called

(3) S/w configuration contsal Process is used. The objective of this component Process is to Primarily deal with managing change so that the integrity Product is not violated.



Software Process.

The whole Process of understanding the current Process, analyzing its Properties, determining how to improve, & then affecting the improvement is done by (4) Process management Process component.

Software Development Process Models:-

In S/w Engineering, a s/w development methodology is Splitting of S/w development work into distinct Phases activities with intent & better Planning & Management.

The common methodologies include

1) waterfall model
2) Prototyping
3) Iterative Development
4) Rational unified Process.
5) Time boxing model
6) Extreme Programming & Agile Processes.

⇒ Water fall model:

The simplest Process model is the water fall model, which states that Phases are organized in a linear order. It was Proposed by Royce.

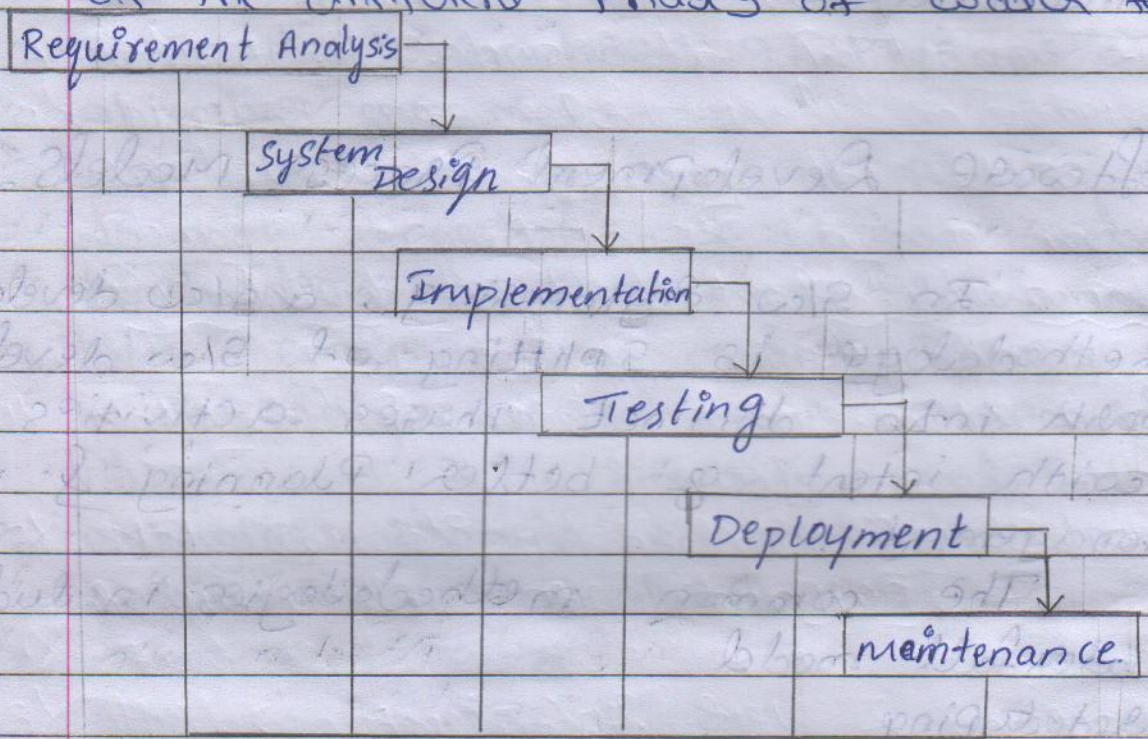
In a water fall, each Phase must be completed before the next Phase begins.

* SDLC - Software Development Life Cycle

PAGE NO.:
DATE: / /

In water fall model the s/w development is divided into seperate phases. The output of one phase acts as the Input for the next phase

The following digram is a representation of the different phases of water fall model



1) Requirement gathering & analysis.
2) System Design
3) Implementation
4) Integration & Testing
5) Deployment of system
6) maintenance.

Requirement Gathering & analysis :-

All the possible requirements of the system has to be gathered & documented in a requirement specification document.

PAGE NO.:
DATE: / /

System Design :-
The system design helps in specifying H/w & S/w requirements & helps in defining the overall system architecture.

Implementation :-
with the I/P from the system design, the system is first developed in small program called units, which are later integrated in the next phase. Each unit is developed & tested for its functionality, which is refered as unit Testing.

Integration & Testing :-
All the units developed in the implementation phase are integrated into a system & the system is tested for any faults & failures.

Deployment of system :-
once the testing is done the product is deployed in the customer environment.

Maintenance :-
There are some issues which come up in the client environment. To fix these issues, Patches are released. Maintenance is done to deliver these changes in the customer environment.

PAGE NO.:
DATE: / /

Advantages of waterfall model:

1) It is simple.
2) It is easy to administrate.
3) works well for smaller Projects where the requirements are very well understood.
4) Phases are Processed & completed one at a time.

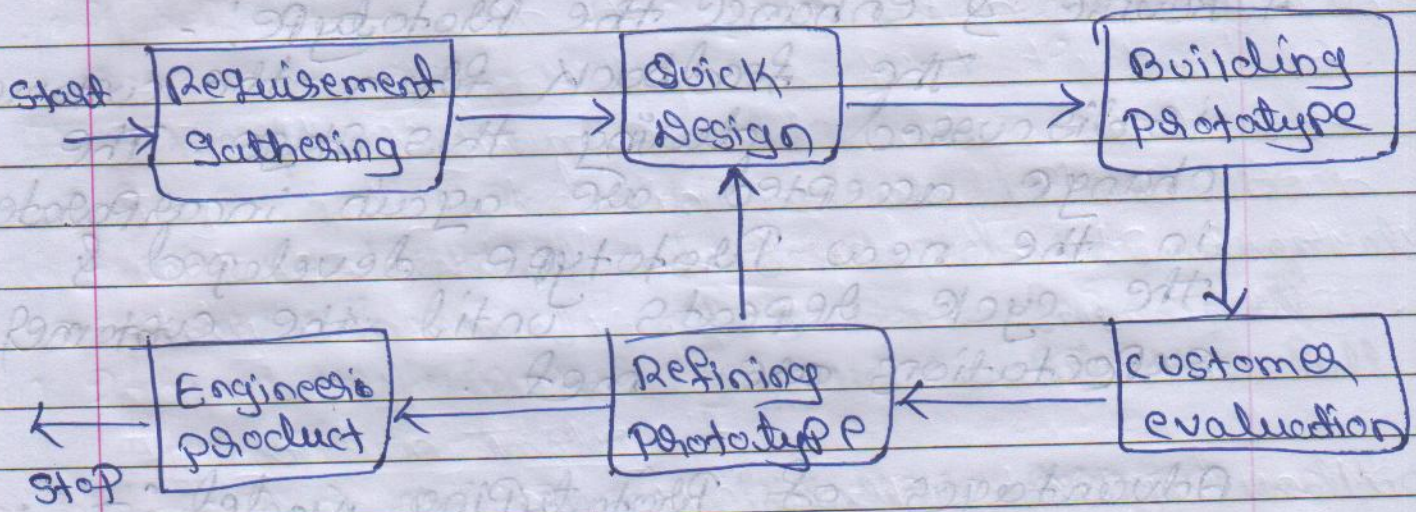
Disadvantages of waterfall model:

1) Not a good model for complex & projects.
2) Not suitable for the projects where requirements are changing
3) High amounts of risk & uncertainty.
4) No working S/w is Produced until the last Phase of model is Processed.

⇒ **Prototyping**. The goal of Prototyping model is to over come the draw back of waterfall model. The Basic idea here is that instead of freezing the requirements before any ~~desing~~ design/coding can Proceed, a Prototype is ~~built~~ built to help understand the requirements.

PAGE NO.:
DATE: / /

The prototype are usually not complete systems & many of the details are not built in the Prototype. The goal is to provide a system with overall functionality.



Steps

1) Basic requirement Identification :-
This step involves understanding the very basics product requirements in terms of user interface.

2) Developing the initial Prototype :-
The initial Prototype is developed in this stage, where the very basic requirements are showcased & user interface are provided. The model may not work exactly.

3) customer evaluation :-
The prototype is then presented to

customer. The feedback is collected in an organize manner & are used for further enhancements in the Product under development.

4 Revise & enhance the Prototype :-
The feedback from the customer is discussed during this stage. The change accepted are again incorporated in the new Prototype developed & the cycle repeats until the customer expectations are met.

Advantages of Prototyping model :-

1) Increased user involvement in the Product development.
2) Reduces time & cost as the defects can be detected much earlier.
3) Missing functionality can be identified easily.
4) confusing or difficult functions can be identified.

Disadvantages of Prototyping model :-

1) user may get confused in the Prototypes and actual systems.
2) This methodology may increase the

complexity of the system as scope of the system may expand beyond original Plans.

3) The effort invested in building Prototypes may be too much if it is not monitored properly.

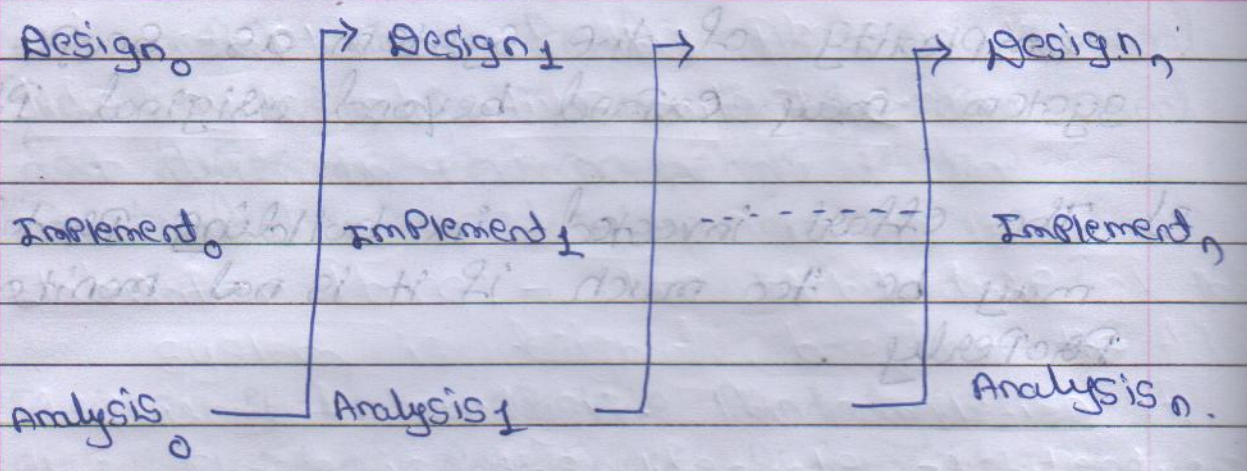
⇒ Iterative Development:~

The basic idea is that the software should be developed in increments, each increment adds some functional capability to the system until the full system is implement.

At each iteration design modifica-tions are made and new functional capabilities are added.

A Project control List is created that contains all the tasks that must be performed to obtain final implemenation.

Each iteration consists of removing the next task from the Project control list, designing the implemantation for the selected task, coding & testing the implemendation, performing an analysis of the partial system obtained after this step, & the updating the list. These three Phases are called design, Implemendation, & analysis Phase. The Process is iterated until the Project control list is empty. The iterative model is as shown in the fig.



Advantages of Iterative Development :-

1) Some working functionality can be developed quickly & early in the life cycle

2. Results are obtained earlier & periodically

3) Testing & debugging during smaller iteration is easy.

4 with every iteration, operational Product is delivered.

Disadvantage of Iterative Development :

1) More resource may be required
2) Not suitable for smaller projects
3) Management complexity is more.
4) More Management attention is required

PAGE NO.:
DATE: / /

Rational unified Process :- (RUP)

It is another iterative process model that was designed by Rational. It was designed for object-oriented development using unified Modeling language (UML).

RUP proposes that development of s/w be divided into cycles, each cycle delivers a fully working system. Each cycle consists of four Phases:

1) Inception Phase
2) Elaboration Phase
3) construction Phase
4) Transition Phase.

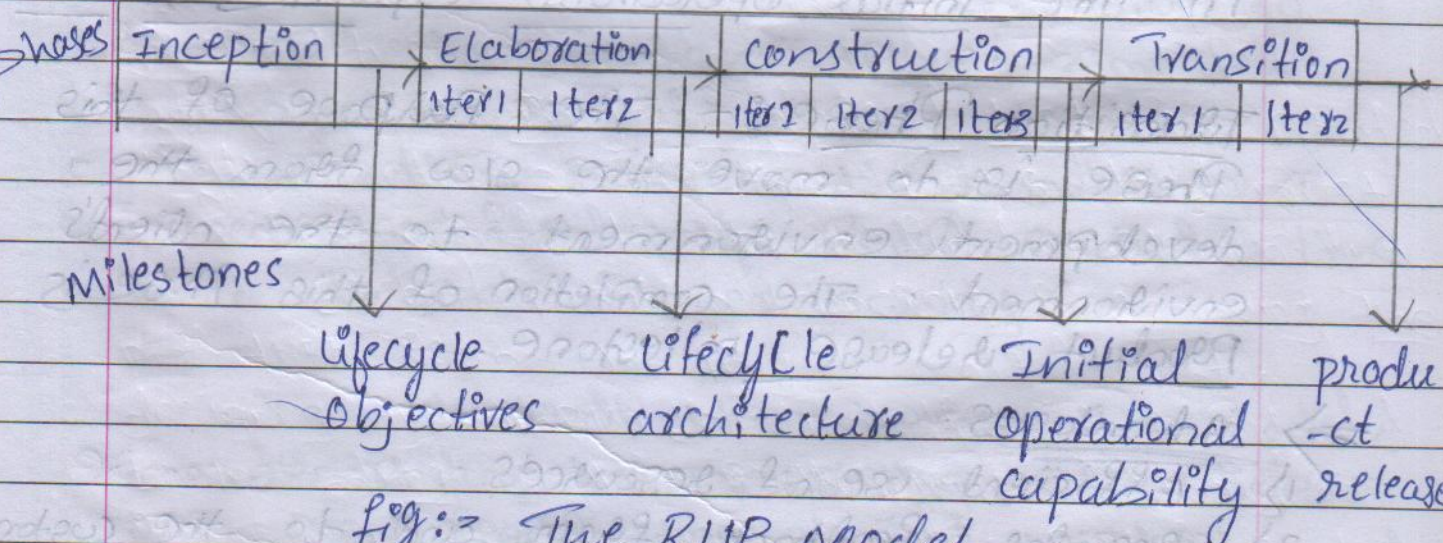


fig:- The RUP Model.

Each Phase has a defined function, & completion of each Phase is a well defined milestone in the project.

Inception Phase:- The purpose is to establish the goals and scope of the project

and completion of this Phase is the life cycle objectives mile stone.

Elaboration Phase:- The architecture of the system is designed, based on the detailed requirement analysis. The completion of this Phase is the lifecycle architecture mile stone.

Construction Phase:- The S/w is built and Tested. This Phase results in the S/w Product to be delivered, along with associated user & other manuals. and successfully completing this Phase results in the initial operational capability milestone

Transition Phase:- The Purpose of this Phase is to move the S/w from the development environment to the client's environment. The completion of this Phase is Product release milestone.

⇒ Advantages.

1) Efficient use of resources.
2) Regular feedback from and to the customer
3) Improved control
4) Improved risk management.

PAGE NO.:
DATE : / /

⇒ Disadvantage of RUP.

1) The process may be too complex to implement.
2) We need an expert to fully adopt this process.

Time boxing Model

To speedup development Parallelism between the different iterations can be employed. That is the new iteration commences before the system produced by the current iteration is released and here development of new release happens in Parallel with development of the current release.

By starting an iteration before the previous iteration has completed, it is possible to reduce the average delivery time for iteration.

In time mangement, timeboxing allocates a fixed time period, called a time box, to each Planned activity.

To illustrate the use of this model, consider a time box consisting of 3 stages: requirement specification, build, & deployment. The requirement stage is executed to produce list of requirements, & a high level design. The build team develops the code & performs the testing. The tested code is handed over to the deployment team which performs Predeployment test

& then install the system for Production use. These three stages are such that they can be done in approximately equal time in an iteration.

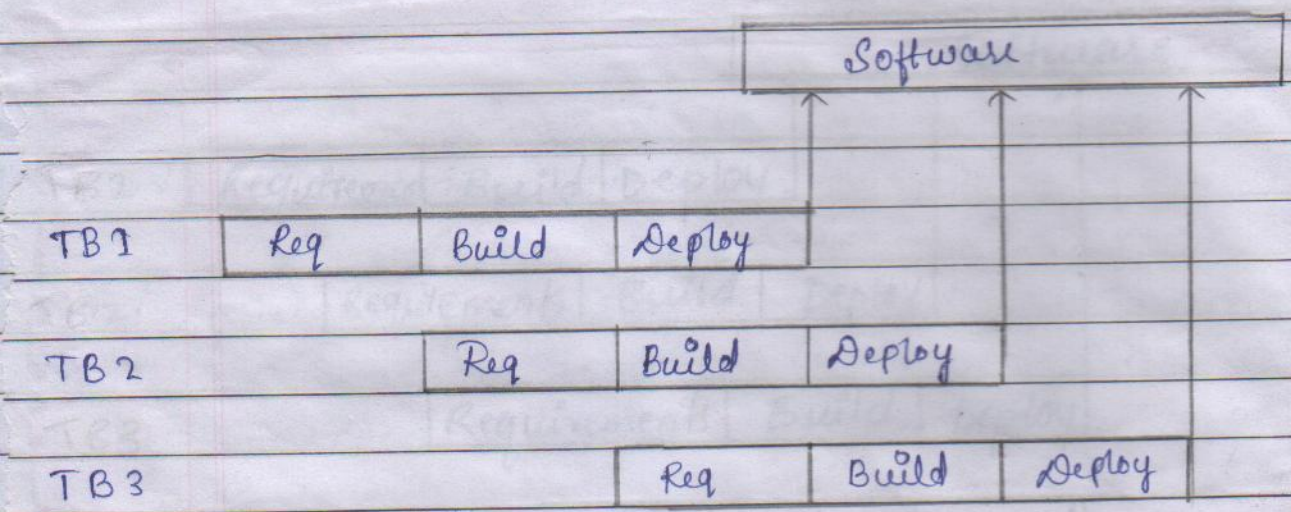


Fig. 8- Executing the timeboxing process model

Advantages:-

1) Speeds up the development Process & shortens the delivery time.
2) well suited to develop Projects with a number of features in short time Period.

Disadvantages:-

1) Project Management becomes more complex.
2) Not suited to Projects in which entire development work cannot be divided into multiple iteration of almost equal duration.