Module - V

Software Testing & Maintenance

[1] (S) Quality =

* It is the degree of conformnce of a (S) to its functional & non-functional reqs & expectations.
* It is a complx & multi-layered concept that must be described from 5 point.

   1) Excellence view
   2) User view
   3) Manufacturing "
   4) Product "
   5) Value-based "

* Factors of (S) Quality are —

1) Efficiency :
   The ability of (S) to perform well / achieve a rslt without wasted energy, resource, effort, time.

2) Flexibility :
   Effort required to modify an op^n systm

3) Functionality :
   Ability of (S) to carry out the C/s as desired.

4) Portability :
   Ability of (S) to be transferred easily from 1 location to anothr.

5) Testability :
   Ability of (S) to be easily tested.

6) Usability :
   Degree of (S)'s ease of use.

[2] (S) Quality Dilemma :

* If you produce a (S) system that has bad quality, you lose b/z no 1 will want to buy it.
* Any time (S) and business come togthr there is an inhrnt conflict b/w 'get it done fast' & 'do a gd job'.
* The dilemma (lodes on.) quality, speed & feature set is the delimma in (S).
   (ex 3-ed minni from Bachieve in (S).
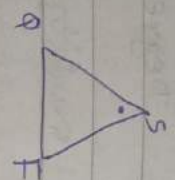   2a2 a 2 norm to achieve กรมณ์ ทรดี้ กริ์)
* Any (S) project that has 3 core element :
   the speed at which the (S) ship,
   the fidelity of feature set & the quality of the underlying code-base.
* The A makes clear that as you move towards 1 gool, you tend to move away from others —
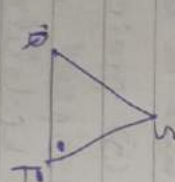
Speed

Quality   features
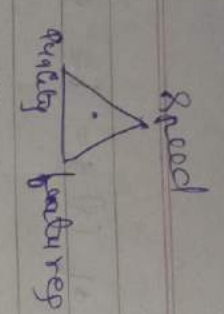
I Speed Dailemma :

(q the most common things that
develops heap from upper managmnt
is 'we need to ship, & we need to
ship now'.

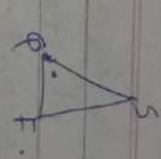## II Features Dilemma :

multi-billion dollar companies
hue shipped with incomplete feature
sets only to make modest improvments
later on'

→ the cost of Quality ⟹ cost of conformance
is ÷ into   cost of non−
                     conformance

→ BPR [Business Process re−eng]:
* It is the analysis & redesign of
core business processes to achieve
the substantial improvmnts in its
performance, productivity & quality.
* Need of BPR −
a) promotes quality.
b) increased efficiency
c) Better rslts & products
d) cost & time reduction.

3

Achieving (S) Quality =
* (s) Quality is the rslt of gd project
managmnt & solid (8) eng practice.
*)(s) eng methodg
2) Prjct mangmnt technique } h/p a (s) team
3) Quality central action } to achieve high
4) (8) Quality assurance   (s) Quality.

III Quality Dilemma :

(s) Engineers should make every
effort to produce high-Quality
systms. But undue (too Quor−sive)
emphasis on code quality can kill the (8)

I (s) engineering methods:
1st stp is to build high-quality (s) & to understand the prblm to be solved.

ii) project Managmnt Techniques:
Hlp the project managr to
* use estimation to verify that daily dates are achievable.
* conduct risk planning to avoid any chaos.

iii) Quality control:
Provides monitoring the (s) developmnt process to ensure that quality assurance procedures & standards are being followed.

iv) Quality Assurance of (s) (SQA):
It is a set of activities for ensuring quality in (s) eng process.
Ensures that developed (s) meets & complies with the defined Quality specifications.
SQA is an ongoing process within the (s) developmnt life cycle.

[4] Testing =
* process of executing a prgm to find errors.

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* To make our (s) perform well it should be error-free.
* If testing is done successfully it will remove all the errors from the (s).

* principles of Testing:
→ All the tsts should meet the cust req.
→ To make our (s) testing should be performed by a third party.
→ All the tests to be conducted should be planned bfre implmnting it.

* Testing is classified into 3 categories-
1) Functional (T). → Unit (T), Integration (T),
    Smoke, UAT, Localisn^

2) Non Functional (T)→ Performance, Load,
    Endurance, scalabili-
    ty, usability, etc.
    Globalisn^, et c.

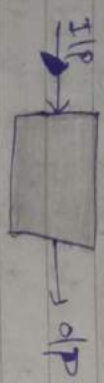3) Maintenance → Regression,
    maintenance

→ Black-box (T) ____ white-box (T).
* It is carried out to | It is conducted to
test functionality | test prgm & its
of the prgm. | implmn^, in ordr to
    improve code efficiency

* Also → Behavioral (T),
The tester in this case has a set of i/p values of the i/p value Irrespective desired
≠ results.

* I/P → [box] → o/p

Also → Structural (T).
Here, design & sty of the code are known to the tester.

* State (T) objectives explicitly.
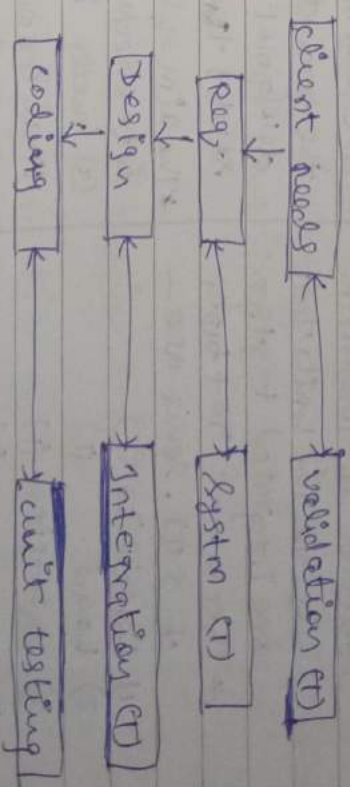* Develop a continuous improvement approach for the (T) process.

I/P → [diagram] o/p
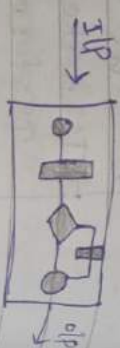
→ Strategic approach to (S) testing:
* test strategy is an outline that describes the testing approach of (S) development cycle.

* All testing strategies have follow Characteristics:
* Bfre begins with testing, effective technical reviews must be conducted to eliminate obvious errors.
* Testing proceeds in an outward manner.
* Diffrent types of (S) (T) Strategies —
  1) Model based T.S
  2) Methodical T.S
  3) Analytic T.S
  4) Reactive T.S
  5) Consultative T.S.

→ Strategic issues:
* Specify product req in a quantifiable manner long bfre (T).
* State (T) objectives explicitly.
* Develop a continuous improvement approach for the (T) process.

[5] → Levels of (T) =

client needs → validation (T)
Req → System (T)
Design → Integration (T)
coding → unit testing

I unit (T):
* type of (S) (T) where individual components of a (S) are tested.
* prepare i/o to validate each unit of (S)
* performs as designed
* (T) is performed under white-box (T) approach

I Integration (T):
* type of (T) where (S) modules are integrated logically & tested as a grp.
* conducted to evaluate the compliance of a system with a system req.

III. System (T):

* It is a block box (T) technique conducted on a complete integrated system to evaluate the system's compliance with its req.

* Purpose of S.(T) is to detect any inconsistencies b/w the units that are integrated together.

* There are 50+ types of S.(T), some are —

1) Usability (T)
2) Load (T)
3) Regression (T)
4) Recovery (T)
5) Functional (T)
6) Security (T) —

IV. Validation (T):

* Process of checking that a (S) system meets specifications & that is fulfils its intended purpose.

* (S) verification:
  Process of evaluating (S) to determine whether the products of a given development phase satisfy the condi-

* The aim of (S) verifi" is to check that the (S) meets its stated req.

→ Art of Debugging =

* It is a systematic process of identifying, analysing & fixing bugs in the (S).

* occurs as a consequence of successful testing.

* considered necessary in most of the newly developed (S).

by a representative grp of end-users at the developer's side.

handled over to the users to use it under their production envmnt only for (T) purpose.

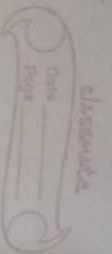## VII Regression (T):

* whenever a (S) product is updated with new code, feature (functionality, it is tested thoroughly to detect if there is any -ve impact of the added code.

[6] Software Maintenance =

* once the (S) is delivered & deployed

IV. Alpha (T):

* conducted in the organization & tested

VI Beta (T):

After (S) is tested internally, it is

(m) → maintnce

it enters the (m) phase.
* It is the process of modifying a (S) product after it has been delivered to the cust to art facitto to improve performance.
* 4 types of (m) activities —

(1) Corrective (m):
* It is concerned with lixing errors that are to changes is the observed when (S) is in enurmnt like hardwar use.
* It deals with the repair of defects found in day-tod by the Influence which System OS

(2) Adaptive (m):
* It is concerned with adapting (s) existing System, processes in enurmnt like hardwar or os.
* Term envrnmnt here refers to tondi-g & the Influence which act on the system.

(3) Perfective (m):
* Mainly dials with implementing new/changed user req.
* Involves making (1)-af enhancemnts to the system's performance

(4) Preventive (m):
* Involves performing activities to prevent the occurnce of errors
* It comprises docum updating code optimization & code restructuring.

→ (S) Supportability:
* capability of supporting a (S) system over its whole product life.
* covers the whole life cycle once it enters into service.

[7] Reengineering =
* Applin of Technology & mangmnt science to the modification of existing System, processes in ordr to make thm more expensive.
* Refers to —

(a) BPR: [Business process Reeng]
* It is the analysis & redesign of core business processes to achieve the substantial Improvmnts in its performnce, productivity & quality.
* Need of BPR:
  * promotes quality
  * cost & time reduction
  * fixed efficiency.
* A BPR model —
  * There is no start & end to BPR
  * it is evolutionary process
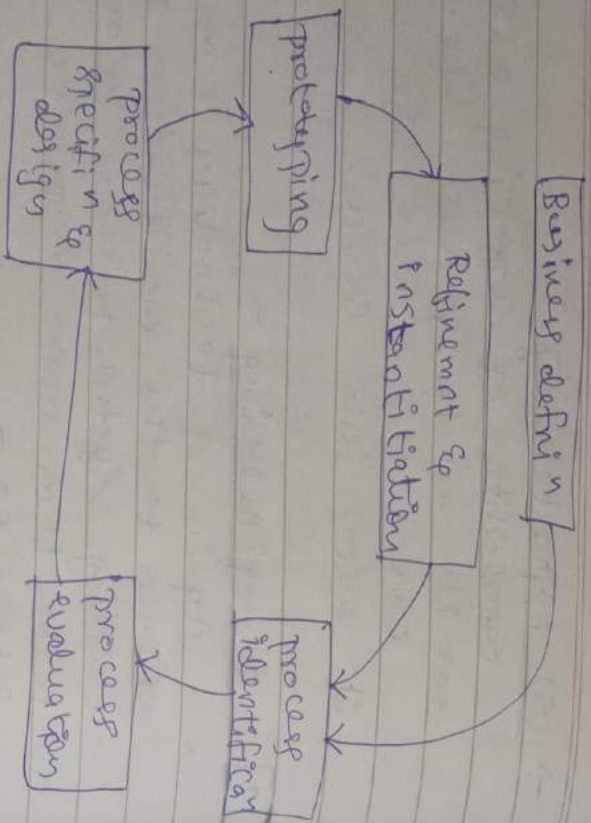
Left page

[Business defin] → [Refinemat & instantiation] → [prototyping]

[Process specifn & design] ← [Process identificn]

[process evaluation]

fig : A BPR model.

(b) (S) Reengineering :

* It is the examination, analysis & alteration of an existing (S) system
* mostly used in the context where a legacy system is thrubed

* 4 general reeng objectives —
1) preparation for (a) enhancement
2) Improve maintainability.
3) migration
4) Improve reliability.

Right page

conceptual design → starting phase of planning.

the process of planning

(alteration)

Rethink → forward eng (Refinemat)

reverse eng. (abstraction)

Req → Design → Re-code
existing system

Implem- ntation

compare quality

Req → Design → Implemen- tation
Target system.

fig : General model for (S) eng.

⇒

Forward eng :	Reverse eng :
* Appln are developed with gvn req.	* Appln are developed into for the system are collected frm the gvn appln.
* Takes more time for development	* takes less time for development.
* production is started with gvn req	* production is started by taking existing product
* requires high proficiency skills	* requires proficiency not required

Reverse eng:

| Existing Systm product | → | Review of design/comp. | → | Redesign & Improve Systm |

forward eng:

| Systm product req | → | design & implemⁿ | → | New systm product |