Software engineering Unit 5 (KCS601)

Software Engineering (Dr. A.P.J. Abdul Kalam Technical University)

UNIT-5

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Software Maintainence & S/w Project Maintainenc

Software Evaluation :-

S/w evaluation process very considerably on the type of s/w being maintain. System change proposal are derived for system evaluation in the organisation. these change may involve existing requirements that have not been implemented in the released system.

1.) S/w change is an unavoidable process.

2.) S/w change occurs because of following reasons:

(i) New requirement emerge when the s/w is used.

(ii) The business environment change.

(iii) Error needs to be repaired.

(iv) New equipment must be accomodated.

(v) The performance of reliability may have to be improve.

3.) Organization have large investment in their s/w system. they are critical business to maintain the value of these business these s/w system must be change. and updated on appropriate time.

4.) S/w change strategies that could be applied seperately or together are as given below :-

(i) S/w maintainence :-
The change are made in the s/w due to requirement

(ii) Architectural transformation :-
It is a process of changing on architecture into another form.

(iii) ~~Architectural transformation~~ Software Reengineering :-
New feature can be ~~affected to~~ added to existing system and then the system is reconstructed for better use of it in future.

S/w Maintainence -

1) s/w maintainence is an activity in which the program is modified after it has been put into use.

2) Maintainence is the process in which changes are implemented by either modifying the existing system architecture or by adding new component to the system.

s/w maintainence is recognized as an important part of s/w life cycle. It is process of changing system. s/w after it has been delivered to the customer. Analysed and programmer suspend more time in maintaining s/w program.

then, they spend in writing the program and so the cost of s/w maintainence is quite high.

"s/w maintainence is modification of s/w product after delivery to correct faults to improve performance of other attributes or to adopt the product to the modified environment"

NEED FOR S/W Maintainence :-

1.) Usually the system requirements are changing and to meet these requirement. Some change are incorporated in the system.

2.) The maintain system remain useful in their working environment :-

→ maintainence is applicable to s/w develop using any s/w life cycle model. The system changes enhancement maintainence must be in order to :-

(a) Correct fault
(b) Improve the design
(c) Implement enhancement
(d) Adoption of environment. (different H/w or s/w)
(e) Replacement of old s/w by new s/w.

3.) Error undetected during s/w development may be found during the use and require connection.

4) With time new technologies are introduced such as new H/w, operating system etc. The I/O therefore must be modified to adopt the new modified environment.

Types of Software Maintainence :-

S/w maintainence can be categorized into following four types :-

1. Corrective Maintainence
2. Adaptive Maintainence
3. Perfective Maintainence.
4. Preventive Maintainence.

① **Corrective Maintainence :-** It means the maintainence for correcting the s/w fault. Corrective maintainence involves changing a s/w application to remove error and bugs. While in s/w development a quite attention is paid to remove all error & bugs but even the some errors and bugs are left uncovered and they come in notice after the system has been in operation. Reporting error can be :-

1) **Coding error :-** These are the error in coding procedure These errors are relatively cheap to removed Comparitivit to others errors.

2) **Design error :-** These are the errors in design, these are more expensive as they involve the rewritting of several program components.

3) **Requirement error :-** These error cause due to incomple requirement specifications, these are most expansion to repair because of extensive system redesign which may be necessary.

② **Adapative Maintainence :-** It means for adapting the change in environment (different Computers or different operating system)

This type of maintainence is concern with external changes even if the S/w is error free. These changes may be :-

(i) Rules, law, regulation and localization that effects the application.
(ii) New operating system.
(iii) Hardware (H/w) configuration changes.
(iv) Changes in supporting utilities.

(3) Perfective Maintainence :- It means modifying or enhancing the system to meet the new requirements. Perfective maintainence is an activity that we undertake to improve the maintability, performance & other attributes of our applications. It includes all changes, insertion, deletion, modification, extension and enhancement made to the application to meet evolving or expanding user needs.
Expension in requirement can take the form of enhancement of existing system functionality...

Introduction of Re-Engineering :-

It means having a re-look or an entity, such as process, task, design, approach, strategies, using engineer principle to bring improvement. In other words Re-engineering means to use of new technology to gain a significant improvement in quality, reliability, performance robustness and usability.

S/w reengineering means restructure and rewriting part or all the s/w engineering system.

Old system that must still be maintained are some time called legacy system. Most of the legacy system may be poorly structured and their documentation may be either out of the or the non existing. The developer of these system having left the organization. There may be no one in the organization who really understand these system in detail.

S/w re-engineering is concern with taking existing legacy system and re-implementing them to make them more maintainable. All of the parts of this re-engineering process, the system may be redocumented or re-structured. It may be translated as a more et modern programming language, implemented on existing H/w technology.

The IBM user group guide define s/w re-engineering "the process of modifying the internal mechanism of a system or program or the data structure of a system or program without changing in functionality".

Techniques Of Re-engineering :-

In this two technologies are used :-

1.) Reversed engineering.
2.) Forward Engineering.

1.) Reverse Engineering :-

In reverse engineering, we disintegrate the s/w in parts and components. It understands its design architecture, & application from all angles. In reverse engineering, we analyse the s/w by breaking it down to suggest improvement. The reverse engineering process remove problems, difficulties and area of improvement. In writing use of better technology, design, methods and tools.

2.) Forward Engineering :-

In forward engineering we take the existing s/w produ and re-design it as a new system by moving it forward to new architecture or new platform in an effort to improve over all behaviour quality such as performance, recovery, reliability or etc.

Activities involved in Re-engineering phase :-

(1) Source code Tranjaction :-

The program is converted from a old programming lang. to a more modern programing language or to different language - source level tranjaction may be required for the following reasons :-

(i) H/w platform update
(ii) Staff skill shortage.
(iii) organizational policies changes.

(2) Reverse engineering -

(3) Program structure improvement -

The control structure of the program is analysed and modified to make it easier to understand i.e., it involves transforming a system from one representation form to another without change in functionality.

There are the various types of restructure techniques and some are discuss below :-

(i) Control flow driven restructure.
(ii) Efficiency driven restructure.

(4) Program Modularization :-

Related parts of program are grouped together and where appropriate redundancy is remove. In some case, this stage may involves architectural transformation were a centralize system intended for a single computer is modified to run on a distributed platform.

(5) Data - Re-engineering :-

Data Re-engineering provides an automated means to transform in perfect data from multiple legacy and external sources into an accurate view of business system. The data re-engg. improves accuracy, time lines, customer service and relation and also reduce a cost. (finally, clean up and restructure data)

Benefits of S/w Re-engineering S/w :-

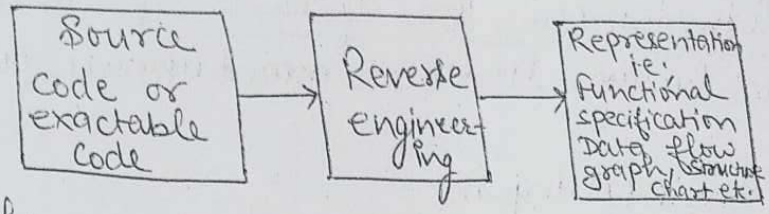
1) Cost :- Evidence from a no. of U.S. project sugge that re-engineering an existing S/w system cost significantly less than new system development.

2) Lower Risk :- S/w re-engineering is based on incre-mental improvement of system rather than syste replacement. The risk of losing critical S/w Knowledg is reduced.

3) Better use of existing staff :- The skill of existing staff can be better utilized by re-engineering.

4) Incremental development :- The development is n carried out as a whole.

Reverse Engineering :-



The process of reverse engg. is to extract the information from the existing s/w. The reverse engg. can be defined as -

s/w reverse engg. is a process of analyzing a syst to identify the system components and their inter-relationship and to relate representation of the systen in an other form or at a high level of abstraction

I/P of reverse engg. process is sour Code and O/P is high level Representation of system i.e; functional specification data in flow graph, Structu Chart etc..

The motivation for using reverse engg. is due to proble of re-implementing existing s/w in different language to meet the need of time. There are three approach to solve this problem.

1) Re-writing the existing system manually :-

The first approach allow change in program structure but is very time consuming.

2) Use automated large translator :-

Use automated large translator from which we generate the code quickly but it is not well structure with poor quality, and difficult to understand. Hence, it result higher maintainence cost.

③ Re-designing & Reimplement the system :- It produces high quality s/w having lower & maintainence cost.

Goals of Reverse Engineering :-

① Facilitating s/w Reuse :-
Reverse engg. can help detect candidates for reusable s/w component from present system.

② Generating alternate views :-
Reverse engg. tool facilitated to generate graphical representation from other forms i.e; data flow diagram, control flow diagram, structure chart, & E.R. diagramet.

③ Recovery loss information :-
In this way, to recover the loss inform from the existing system.

④ Detecting side effects :-
Initial design that can lead to side effects that harm the system performance in several ways. It can help to detect problems before user report them as a bug.

SCM Process :-

1.) Determining / Defining Process.
2.) Version Control.
3.) Change Control Process - Change control process ensure that the changes to the system are control and that their effect on the system can be predicted Change ~~of~~ control is an essential step in S/w life cycle. The change control can be carried out using following steps :-

(i) A change request initiate a change.
(ii) The configuration object is, "checkout", the database.
(iii) The change are applied to the object.
(iv) The object is then "checked in" to the database where, automatic version control is apply.

4.) Configuration audit :- Audit or review are used ensure that changes have been properly implemented It is conducted by the "S/w Quality ensurance Group".

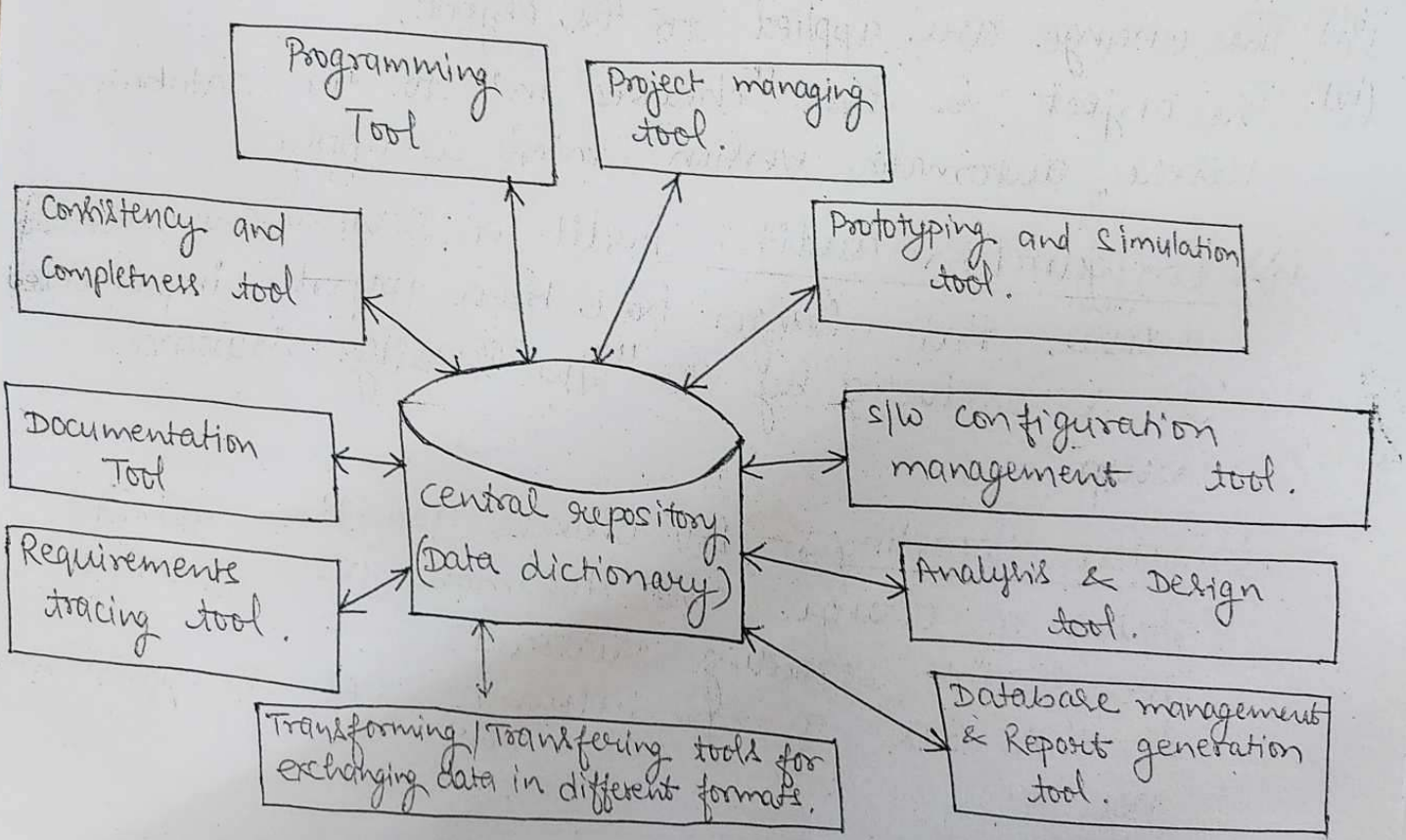
5.) Status Reporting :- All changes and the current status of change and document are recorded in a status according database.
In this task of SCM following type of question are ask—

1. What happen?
2. Who did it?
3. When did it happen?
4. What else will be effected?

Overview of Case Tools :-

The case tool automate the project management activities, manage all the work products. The case tool assist to perform various activities such as analyze, design, coding, testing. S/w engineering and project managers make use of case tool. The use of case tool in the s/w development process reduce the significant amount of efforts. Case tool helps s/w engg. to produce the high quality s/w efficiency.

Architecture of Case Environment :-



Architecture of case environment :-

Figure given below shows a general architecture of a case environment central of this architecture is repository, the most critical and important feature of a case environment. The complete information about meta models, Methods, fuse line, process model etc. is availa in the repository. This information can be shared by different team member efficiently their by improving the project management as a whole.

Repository must main the data available that require them.

Example of case tool which support the different stage of S/w life cycle

(i) S/w requirement tool :-

A no. of tools are proposed for modeling, tracing, and analyzing requirement. Exp turbo analyst, oracle's designer 2000, Relational rose, Ms-access.

(ii) S/w design tool :-

These tools are used to support the system design stages for sale. They can be used to support design, verification, optimization.

(iii) S/w Construction tool :-

S/w construction tools are the tools which are used to code / implement the S/w and hence, transform the S/w requirement into working product can be classified as program editor, Tool for creating & modifying program Exp - Visual Studio.

Compilers - These are the S/W which translate high level large into executable code.

Interpretor - Interpretor are tools which supports line by line execution of program.

Debugger - These tools are used for debugging the program.

(iv) S/W Testing Tools -
These are the automated tool that support various activities of S/W testing state of SDLC (A) test generator tool (B) test execution & evolution tool (C) test management tool.

(v) S/W maintainence tool.

(vi) S/W Quality tool.

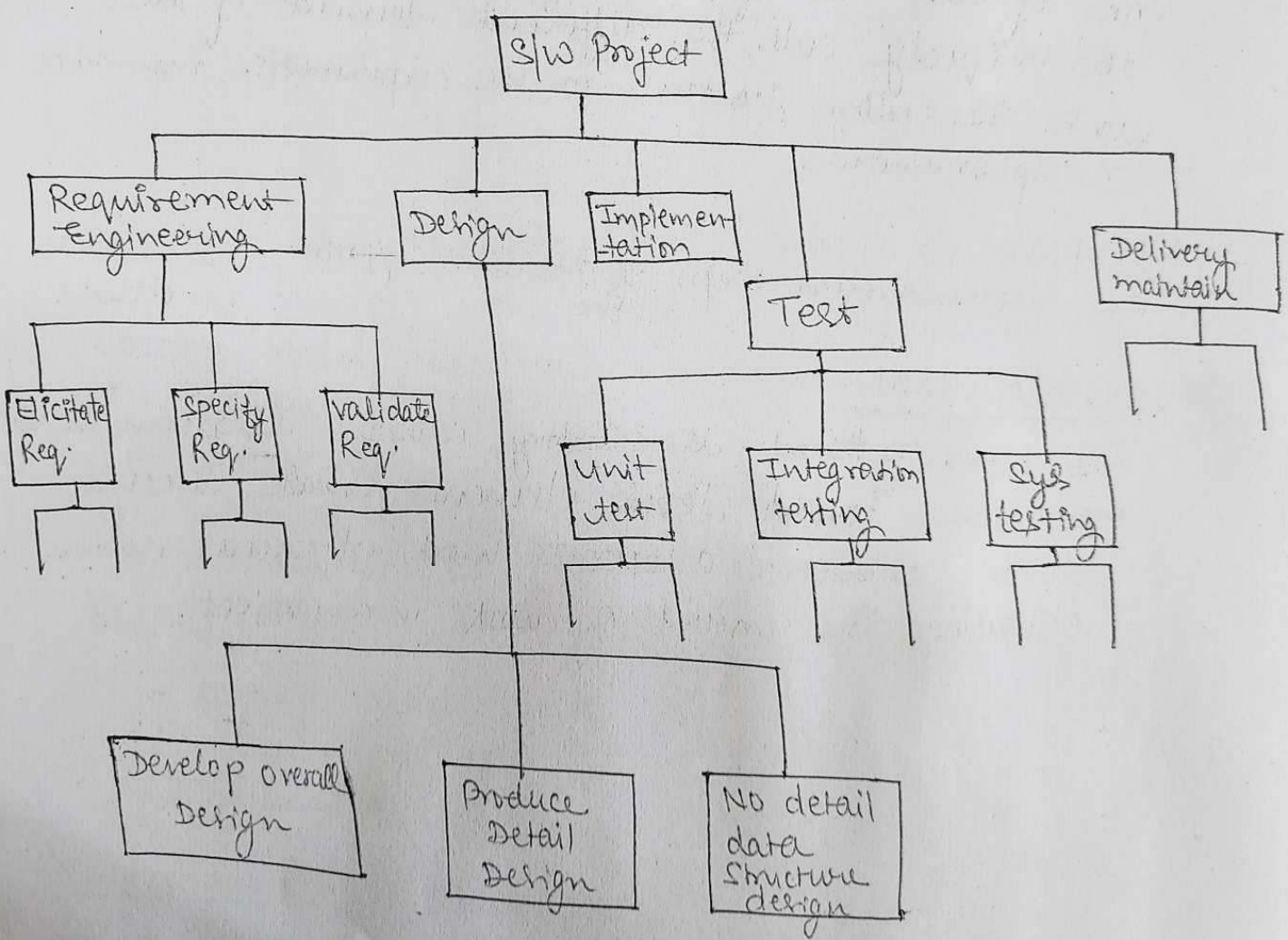
(vii) Configuration Management tool

(viii) Project Management tool ...

Technique used for S/W Project Scheduling :-

1) Work Breakdown Structure (WBS)
2) Activity charts.
3) Project Evolution Review Technique (PERT).
4) Gantt chart.
5) Critical Path method (CPM).

(1.) Work Breakdown Structure (WBS) :-



Major features of WBS :-

1) Structure :-
Different desktop application offers functionality to easily create this kind of diagram.

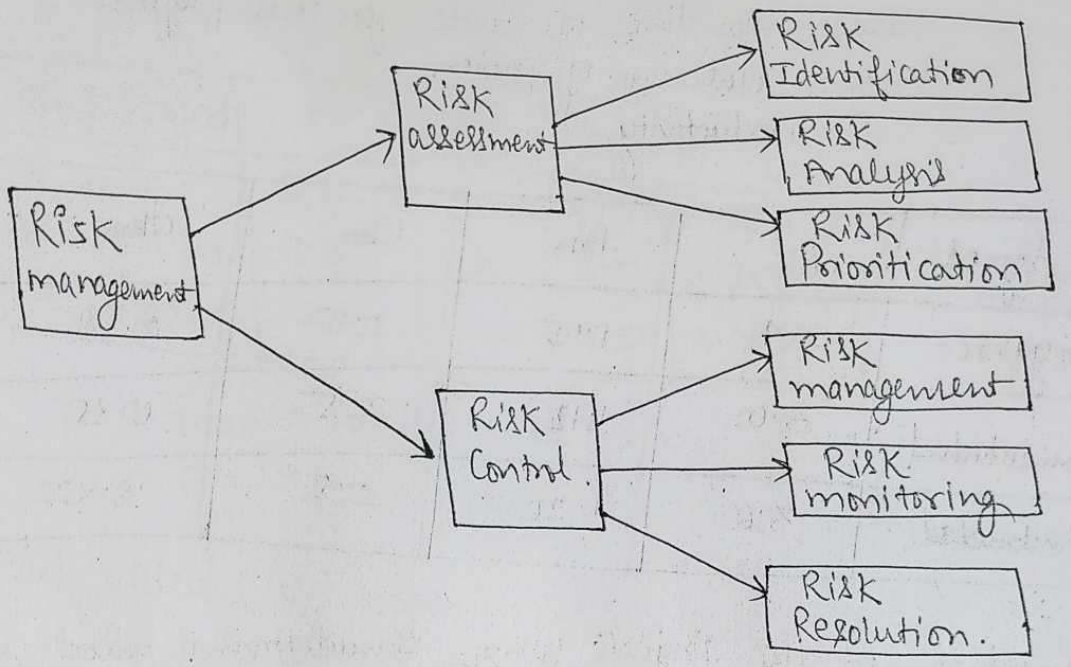
2) Description :-
Each WBS element should be described with a title. The meaning of each title should be clear.

3) Coding :-
One of the main feature of WBS is the ability to uniquely code the different element of the work. The coding system can be alphabetic, numeric or alphanumeric.

4) Deep :-
The recommended deep of the WBS digram is 3 to 4 level.

5) Level of detail :-
The rule of thumb is creating a WBS diagram is to make the lowest level element small enough to be considered a seperate work element. when estimating the amount of work in a project.

RISK MANAGEMENT ACTIVITY :-



COCOMO (constructive cost model) :-

Cocomo model was propoted by Bohem in 1981
Cocomo Model has three different model that reflect the complexity.

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

Similarly, there are 3 classes of S/w project :-

1. Organic Model Project.
2. Semi-dettached.
3. Embedded.

1) BASIC MODEL :-

$E = ab (KLOC)^{bb}$

$D = C_b (E)^{db}$

$SS = E/D.$

$P = \frac{KLOC}{E}$

Where, E = Effort apply in person-month.
D = Development time in month.
KLOC = Kilo line of code for the project
SS = total no. of person
P = Productivity.

S/W Project	ab	bb	Cb	db
organic	2.4	1.05	2.5	0.38
Semidetached	3.0	1.12	2.5	0.35
Embedded	3.6	1.20	2.5	0.32

Q. Consider a S/W Project using Semidetached mode with 3000 line of code, we will obtain estimation for this project as follow :-
Effort estimation. (E)
Duration estimation. (D)
Person estimation.

$E = a_b (KLOC)^{b_b}$
$= 3.0 (3[redacted])^{1.12}$
$= 135.36$ person-month

$D = C_b (E)^{d_b}$
$= 2.5 (135.36)^{.35}$
$= 13.93$ month

Average Staff Size (SS) $= E/D$
$= \frac{135.36}{13.93} = 9.717$ person approximately.

2.) Intermediate Model:-

$E = a(KLOC)^b$ EAF

Development $= (LE)^d$
(Tdev)

EAF = Effort adjustment factor (is multiplication differently type of cost driver)

S/W Project	a	b	c	d
organic	3.2	1.05	2.5	0.38
Semidetached	3.0	1.12	2.5	0.35
Embedded	2.8	1.20	2.5	0.32

Tdev = development time in month.

E = Effort apply person-month.

1.) The value of size in KLOC and different cost to driver for a project given below:-

Size = 200 KLOC

cost drivers: S/w reliability = 1.15
use of S/w tool = 0.91
product complexity = 0.85
Execution time = 1
} = 0.889

$\Rightarrow (1.15) * (0.91) * (0.85) * (1.00)$

0.889

For organic:- $E = 3.2(200)^{1.05} \times 0.889$

$= 741.53$ person-month.

For semi-detached:- $E = 3.0(200)^{1.12} \times 0.889$

$= 1007.34$

$= 1008$ person-month.

S/W Requirement specification (SRS) :-

1) That general activity that a common to all proces are :-

(a) Requirement Elicitation.
(b) Requirement Analysis.
(c) Requirement Validation.
(d) Requirement Management.

(a) REQUIREMENT ELICITATION :-

(i) It mean requirement discovery per expressed syste requirements.

(ii) The most commonly used elicitation technique is to conduct meeting. It involve technical staff working with customers in order to find the services that the system should provide.

Elicitation Procedure :-

In this procedure contain following step :-

(i) **Identify Relevant source of information →**

Exp User Customers
domain expert.

(ii) Determine information is needed by asking questions.

(iii) Analyze the gathered information.

(iv) Confirming your understanding of the requireme with the user.

(v) Create requirement statement.

process

Problems in Requirement elicitation:-

(i) User enables to explain his requirements.
(ii) Less knowledge of technology.
(iii) Use of different language by developer & user.

(b) REQIREMENT ANALYSIS:-

Who play important Role in requirement gathering/ Analysis →

Documentation:-

(a) **System design documentation** → The purpose of this documentation is to provide technical detail of the system. It contains -
   (i) Feasibility issues.
   (ii) Formulation of the problem.
   (iii) Overview of the system, its sub-system & their interface.
   (iv) Input & source documents.
   (v) output reports.
   (vi) Data dictionary.

(b) **S/w documentation** :- It consists of following:-
   (i) Hardware specification
   (ii) System software specification.
   (iii) Application s/w specification.
   (iv) Database design & file design.

(c) **operational documentation** :-
Its goal to help the operation staff run program in proper order, distribute the old handles the errors.

(d) Use reference documentation →

(i) objective of documentation → provide the purpose & use for document.

(ii) Input documents → It covers complete list of input documents used by the system.

(iii) output Report → It contain complete list of all report.

(iv) Processing logic & error condition → It provide list of processing logic for each output report & error condition.

Feasibilities Study :-

Types-

1. Technical feasibility :- It is S/w, H/w design approach
2. operational feasibility :- It is the measure of how people are able to work with system.
3. Economic feasibility :- Cost/benefit analysis is used to determine benefits & savings..

(C) REQUIREMENT VALIDATION :- (Optimistic)

Concurrency Control technique.

1. Read phase
2. validation phase
3. Write phase.

READ PHASE :- During this phase, the system execute transaction T_i. It reads the value of various data items, and stores them in variable local to T_i. It performs all write operation on temporary local variables without update of the actual database.

COST BENEFIT ANALYSIS - To determine the economic feasibility on the basis of direct cost, indirect cost, tangable cost, infurgable cost, tangable or intangable benefits.

1.) Cost :- (i) Direct / Toangible Cost
(ii) Indirect / Intangible Cost.

① Direct cost - is directly associated with the project such as cost of buying of equipment ~~of~~ ≠ or H/w, S/w, salary, cost involve in preparation of physical location, such as - A.C, light, wiring.

② Indirect cost - It involves time spends by user in discussing problem with system analyze gathering the data about the problem etc.

Tangible / Direct benefits :-

(i) Decrease salary cost.
(ii) Preventary costly but frequent errors.
(iii) Increase in production.
(iv) Increase control over inventory level.

Intangible benefits :-

(i) Better service to customer.
(ii) Superior quality of product.
(iii) Develop a new image in market.
(iv) Creating new customer services.

Different approaches for information modeling :-

(1) Informal approach :-

It is not very risk ful approach but suitable only for small project.

(2) Formal approach (Structured approach) :-

The data flow diagram and data dictionary are tools for structured analysis.

(3) Structured Analysis & design Technique :-

Exp - Top-down and bottom-up approach

(4) ER-Model :-

S/w Requirement Specification document :-

The SRS document should clearly document these aspect of a system.

1) Functional Requirement.
2) Non-functional Requirement.
3) Goal Implementation.

Goals of SRS documents :-

1) Feedback to Customer
2) Problem decompotition.
3) Input to design specification.
4) Production validation check.

characteristics of Good S/w Requirement Specification :-

(i) Completeness.
(ii) Consistence.
(iii) Accurate.
(iv) Modifiable.
(v) Testable.
(vi) Unambigious.
(vii) Validate.

WHAT ARE THE ISO 9001 Requirements ?

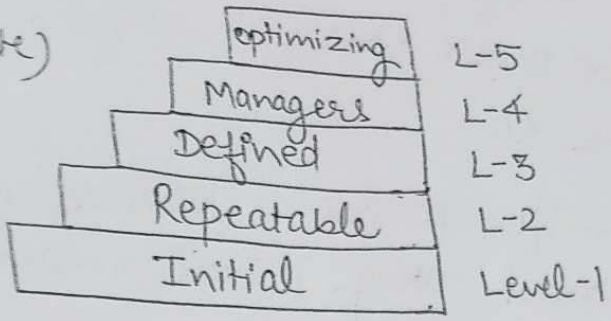
(i) Management Responsibility.
(ii) Quality System.
(iii) Contract Review.
(iv) Design Control.
(v) Document control.
(vi) Purchasing.
(vii) Product identification.
(viii) Inspection & Testing.
(ix) Quality Records.
(x) Quality Audit.

Benefits of ISO 9000 certification:-

(i) Continuous Improvement.
(ii) Eliminate verification.
(iii) Higher Quality.
(iv) Improve Customer Satisfaction.
(v) Increase employee perception.
(vi) Better product & Services.
(vii) Greater quality assurance.
(viii) Improve profit level.
(ix) Improve Communication.
(x) Refuse Cost.

SEI-CMM Model (Capability Maturity Model):-

(Software Engg. Institute)



(1.) The S/w engg. institute (SEI) - has develop a comprehensive process meta model emphasizing process maturity.

(2.) CMM is used in assign how well an organization process allow to complete & manage new S/w project.

(3.) various process maturity levels are:-

(i) Initial:- few process are defined and individual efforts are taken. They are immature. As a result a stable environment is not available for S/w development. Further, Success or failure of a project depend on team member.

(ii) Repeatable:- The level-2 focus on establishing basic project management policy, In this experience with earlier project is used for managing new project of similar nature. The manager are able to predict the cost & seperate of a project based on earlier experience.

(iii) Defined:- The process is standardized, documented & follow. All the projects are documented & approved version of s/w process which is useful in developing & supporting s/w.

(iv) Managed:- Both the s/w process & products are understood and controlled using detail measures.

(v) Optimizing:- Establishied mechanism to plan & changes innovative & idea Technologies can be tested.

VALIDATION PHASE :- Transaction Ti perform a validation test to determine whether it can copy to the database the temporary local variables that holds the results of write operations without causing a vailation of Serializability.

Write phase :- If transaction T_i sucessed in validation then the system applies the actual updates to the database otherwise system rollback the transaction T_i

For the validation Test :-

(i) Start (T_i)
(ii) validation (T_i)
(iii) Finish (T_i)

DESIGN MODEL :- The main elements of design models are :-

(i) Data design - Eg E-R diagram, data dictionary.

(ii) Architecture Design - Data flow diagram.

(iii) Interface design - Data flow diagram, Control flow diagram.

(iv) Component level design - State transition diagram.

Good s/w design :- Good s/w design must process

(i) Correctness
(ii) Understandable
(iii) Efficiency.

Features of s/w design -

Architecture Design :-

(i) It is a process for identifying the sub-system making up the system and frame work for sub-system control and communication.

(ii) Its goal is to establish overall structure of s/w system.

(iii) It represent the link b/w design specification.

(iv) In it local system components and communication b/w them are identified.

(v) The common activity in design process are -

(i) System structure.
(ii) Control Modelling.
(iii) Modular decomposition.

(vi) The commonly used architectural styles are:-

(i) Data central architecture.
(ii) Data flow architecture.
(iii) Call return architecture.