UNIT – V

Risk management: Reactive vs. Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan.
Quality Management: Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews, Statistical Software quality Assurance, The Capability Maturity Model Integration (CMMI), Software reliability, The ISO 9000 quality standards.

Risk Management

Risk is an undesired event or circumstance that occur while a project is underway It is necessary for the project manager to anticipate and identify different risks that a project may be susceptible to Risk Management. It aims at reducing the impact of all kinds of risk that may effect a project by identifying, analyzing and managing them

Reactive Vs Proactive risk
Reactive : It monitors the projects likely risk and resources are set aside.
Proactive: Risk are identified, their probability and impact is accessed

Software Risk
It involve 2 characteristics
Uncertainty : Risk may or may not happen
Loss : If risk is reality unwanted loss or consequences will occur
It includes
1)Project Risk
2)Technical Risk
3)Business Risk
4)Known Risk
5)Unpredictable Risk
6) Predictable risk

Project risk: Threaten the project plan and affect schedule and resultant cost
Technical risk: Threaten the quality and timeliness of software to be produced
Business risk: Threaten the viability of software to be built
Known risk: These risks can be recovered from careful evaluation
Predictable risk: Risks are identified by past project experience
Unpredictable risk: Risks that occur and may be difficult to identify

Risk Identification

It concerned with identification of risk

Step1: Identify all possible risks

Step2: Create item check list

Step3: Categorize into risk components-Performance risk, cost risk, support risk and schedule risk

Step4: Divide the risk into one of 4 categories

Negligible-0

Marginal-1

Critical-2

Risk Identification

Risk Identification includes

Product size

Business impact

Development environment

Process definition

Customer characteristics

Technology to be built

Staff size and experience

Risk Projection

Also called risk estimation. It estimates the impact of risk on the project and the product. Estimation is done by using Risk Table. Risk projection addresses risk in 2 ways

Risk	Category	Probability	Impact	RMMM
Size estimate may be significantly low	PS	60%	2	
Larger no. of users than planned	PS	30%	3	
Less reuse than planned	PS	70%	2	
End user resist system	BU	40%	3	

Likelihood or probability that the risk is real(L_i)

Consequences(X_i)

Risk Projection
Steps in Risk projection
1. Estimate L_i for each risk
2. Estimate the consequence X_i
3. Estimate the impact
4. Draw the risk table

Ignore the risk where the management concern is low i.e., risk having impact high or low with low probability of occurrence
Consider all risks where management concern is high i.e., high impact with high or moderate probability of occurrence or low impact with high probability of occurrence

Risk Projection
Projection

The impact of each risk is assessed by Impact values
Catastrophic-1 Critical-2 Marginal-3 Negligible-4

Risk Refinement

Also called Risk assessment
Refines the risk table in reviewing the risk impact based on the following three factors
a.Nature: Likely problems if risk occurs
b.Scope: Just how serious is it?
c.Timing: When and how long

It is based on Risk Elaboration
Calculate Risk exposure RE=P*C
Where P is probability and C is cost of project if risk occurs
Risk Mitigation Monitoring And Management (RMMM)
Its goal is to assist project team in developing a strategy for dealing with risk
There are three issues of RMMM
1) Risk Avoidance
2)Risk Monitoring and
3)Risk Management

Risk Mitigation Monitoring And Management (RMMM)

Risk Mitigation
Proactive planning for risk avoidance
Risk Monitoring
Assessing whether predicted risk occur or not
Ensuring risk aversion steps are being properly applied
Collection of information for future risk analysis
Determine which risks caused which problems
Risk Mitigation Monitoring And Management (RMMM)

Risk ManagementContingency planning
Actions to be taken in the event that mitigation steps have failed and the risk has become a live problem Devise RMMP(Risk Mitigation Monitoring And Management Plan)

RMMM plan

It documents all work performed as a part of risk analysis.

Each risk is documented individually by using a Risk Information Sheet.

RIS is maintained by using a database system Quality Management

Quality Concepts

Variation control is the heart of quality control

Form one project to another, we want to minimize the difference between the predicted resources needed to complete a project and the actual resources used, including staff, equipment, and calendar time

Quality of design

Refers to characteristics that designers specify for the end product

Quality Management

Quality of conformance

Degree to which design specifications are followed in manufacturing the product

Quality control

Series of inspections, reviews, and tests used to ensure conformance of a work product to its specifications

Quality assurance

Consists of a set of auditing and reporting functions that assess the effectiveness and completeness of quality control activities

Cost of Quality

Prevention costs

Quality planning, formal technical reviews, test equipment, training

Appraisal costs

In-process and inter-process inspection, equipment calibration and maintenance, testing

Failure costs

rework, repair, failure mode analysis

External failure costs

Complaint resolution, product return and replacement, help line support, warranty work

Software Quality Assurance

Software quality assurance (SQA) is the concern of every software engineer to reduce cost and improve product time-to-market.

A Software Quality Assurance Plan is not merely another name for a test plan, though test plans are

included in an SQA plan.

SQA activities are performed on every software project.

Use of metrics is an important part of developing a strategy to improve the quality of both software processes and work products.

Software Quality Assurance

Definition of Software Quality serves to emphasize:

Conformance to software requirements is the foundation from which software quality is measured.

Specified standards are used to define the development criteria that are used to guide the manner in which software is engineered.
Software must conform to implicit requirements (ease of use, maintainability, reliability, etc.) as well as its explicit requirements.

SQA Activities

Prepare SQA plan for the project.

Participate in the development of the project's software process description.

Review software engineering activities to verify compliance with the defined software process.

Audit designated software work products to verify compliance with those defined as part of the software process.

Ensure that any deviations in software or work products are documented and handled according to a documented procedure.

Record any evidence of noncompliance and reports them to management.

Software Reviews

Purpose is to find errors before they are passed on to another software engineering activity or released to the customer.

Software engineers (and others) conduct formal technical reviews (FTRs) for software quality assurance.

Using formal technical reviews (walkthroughs or inspections) is an effective means for improving software quality.

Formal Technical Review

A FTR is a software quality control activity performed by software engineers and others.The objectives are:

To uncover errors in function, logic or implementation for any representation of the software.

To verify that the software under review meets its requirements.

To ensure that the software has been represented according to predefined standards.

To achieve software that is developed in a uniform manner and

To make projects more manageable.

Review meeting in FTR

The Review meeting in a FTR should abide to the following constraints
Review meeting members should be between three and five.
Every person should prepare for the meeting and should not require more than two hours of work for each person.
The duration of the review meeting should be less than two hours.

The focus of FTR is on a work product that is requirement specification, a detailed component design, a source code listing for a component.

The individual who has developed the work product i.e, the producer informs the project leader that the work product is complete and that a review is required.

The project leader contacts a review leader, who evaluates the product for readiness, generates copy of product material and distributes them to two or three review members for advance preparation .

Each reviewer is expected to spend between one and two hours reviewing the product, making notes

The review leader also reviews the product and establish an agenda for the review meeting

The review meeting is attended by review leader, all reviewers and the producer.

One of the reviewer act as a recorder,who notes down all important points discussed in the meeting.

The meeting(FTR) is started by introducing the agenda of meeting and then **the producer introduces his product. Then the producer "walkthrough" the** product, the reviewers raise issues which they have prepared in advance.

If errors are found the recorder notes down

Review reporting and Record keeping

During the FTR, a reviewer(recorder) records all issues that have been raised

A review summary report answers three questions

What was reviewed?

Who reviewed it?

What were the findings and conclusions?

Review summary report is a single page form with possible attachments

The review issues list serves two purposes

To identify problem areas in the product

To serve as an action item checklist that guides the producer as corrections are made

Review Guidelines

Review the product, not the producer

Set an agenda and maintain it

Limit debate and rebuttal

Enunciate problem areas, but don't attempt to solve **every problem** noted

Take return notes

Limit the number of participants and insist upon advance preparation.

Develop a checklist for each product i.e likely to be reviewed

Allocate resources and schedule time for FTRS

Conduct meaningful training for all reviewer

Review your early reviews

Software Defects

Industry studies suggest that design activities
introduce 50-65% of all defects or errors
during the software process

Review techniques have been shown to be up
to 75% effective in uncovering design flaws
which ultimately reduces the cost of
subsequent activities in the software process

Statistical Quality Assurance

Information about software defects is collected and categorized.

Each defect is traced back to its cause

Using the Pareto principle (80% of the defects can be traced to 20% of the causes) isolate the "vital few" defect causes.

Move to correct the problems that caused the defects in the "vital few"

Six Sigma for Software Engineering

The most widely used strategy for statistical quality assurance

Three core steps:

1. Define customer requirements, deliverables, and project goals via well-defined methods of customer communication.
2. Measure each existing process and its output to determine current quality performance (e.g., compute defect metrics)
3. Analyze defect metrics and determine vital few causes.

For an existing process that needs improvement

1. Improve process by eliminating the root causes for defects
2. Control future work to ensure that future work does not reintroduce causes of defects

If new processes are being developed

1. Design each new process to avoid root causes of defects and to meet customer requirements
2. Verify that the process model will avoid defects and meet customer requirements

Software Reliability

Defined as the probability of failure free operation of a computer program in a specified environment for a specified time period

Can be measured directly and estimated using historical and developmental data

Software reliability problems can usually be traced back to errors in design or implementation.

Measures of Reliability

Mean time between failure (MTBF) = MTTF + MTTR

MTTF = mean time to failure

MTTR = mean time to repair

Availability = [MTTF / (MTTF + MTTR)] x 100%

ISO 9000 Quality Standards

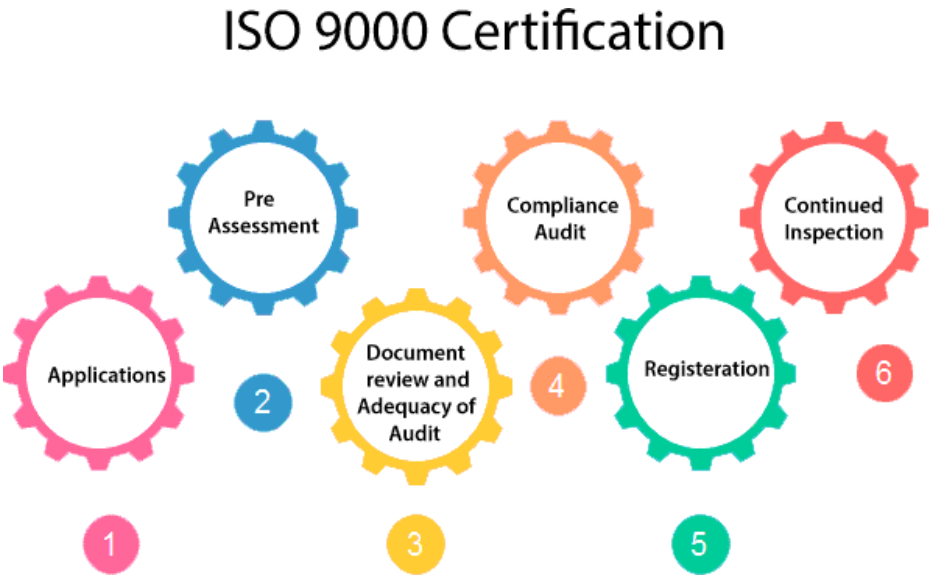
ISO (International Standards Organization) is a group or consortium of 63 countries established to plan and fosters standardization. ISO declared its 9000 series of standards in 1987. It serves as a reference for the contract between independent parties. The ISO 9000 standard determines the guidelines for maintaining a quality system. The ISO standard mainly addresses operational methods and organizational methods such as responsibilities, reporting, etc. ISO 9000 defines a set of guidelines for the production process and is not directly concerned about the product itself.

Types of ISO 9000 Quality Standards

The ISO 9000 series of standards is based on the assumption that if a proper stage is followed for production, then good quality products are bound to follow automatically. The types of industries to which the various ISO standards apply are as follows.

1. **ISO 9001:** This standard applies to the organizations engaged in design, development, production, and servicing of goods. This is the standard that applies to most software development organizations.
2. **ISO 9002:** This standard applies to those organizations which do not design products but are only involved in the production. Examples of these category industries contain steel and car manufacturing industries that buy the product and plants designs from external sources and are engaged in only manufacturing those products. Therefore, ISO 9002 does not apply to software development organizations.
3. **ISO 9003:** This standard applies to organizations that are involved only in the installation and testing of the products. For example, Gas companies.

An organization determines to obtain ISO 9000 certification applies to ISO registrar office for registration. The process consists of the following stages:



1. **Application:** Once an organization decided to go for ISO certification, it applies to the registrar for registration.
2. **Pre-Assessment:** During this stage, the registrar makes a rough assessment of the organization.
3. **Document review and Adequacy of Audit:** During this stage, the registrar reviews the document submitted by the organization and suggest an improvement.
4. **Compliance Audit:** During this stage, the registrar checks whether the organization has compiled the suggestion made by it during the review or not.
5. **Registration:** The Registrar awards the ISO certification after the successful completion of all the phases.
6. **Continued Inspection:** The registrar continued to monitor the organization time by time.