UNIT 3 Quality Planning and Risk Management

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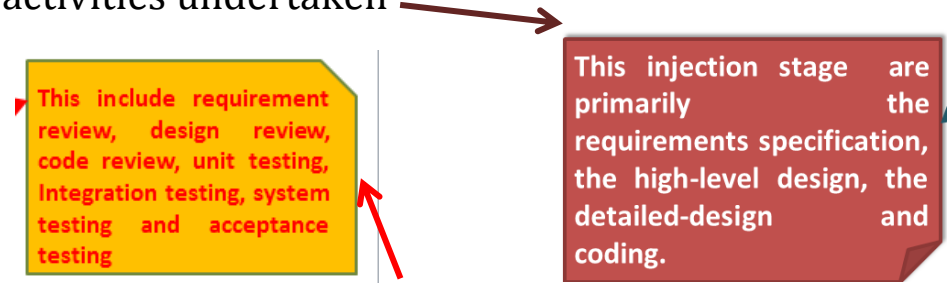
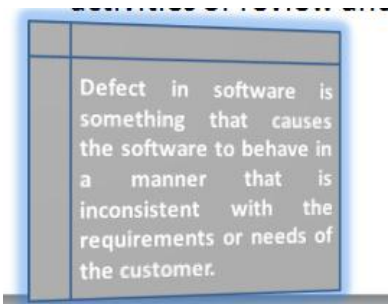
Unit	Unit Name	Sub Unit	Topics	No. of Lectures	Reference Chapter/Additional Reading	Teaching Methodology
3	Quality Planning and Risk Management	3.1	Introduction to Quality Management	1	PJ#7, Page No 145-150, SPMIP#4, Page No. 64	Chalk and Talk, Topic Presentation.
		3.2	Quantitative Quality Management Planning	1	PJ#7, Page No 151-157, SPMIP#4, Page No. 66	
		3.3	Need for Risk Management	1	PJ#8, Page No 159-163, SPMIP#5, Page No. 79	
		3.4	Risk Assessment	1	PJ#8, Page No 163-166, SPMIP#5, Page No. 83	
		3.5	Risk Control	1	PJ#8, Page No 166-170, SPMIP#5, Page No. 86	

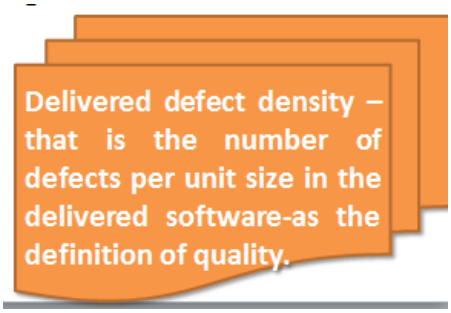
3.1 Introduction to Quality Management

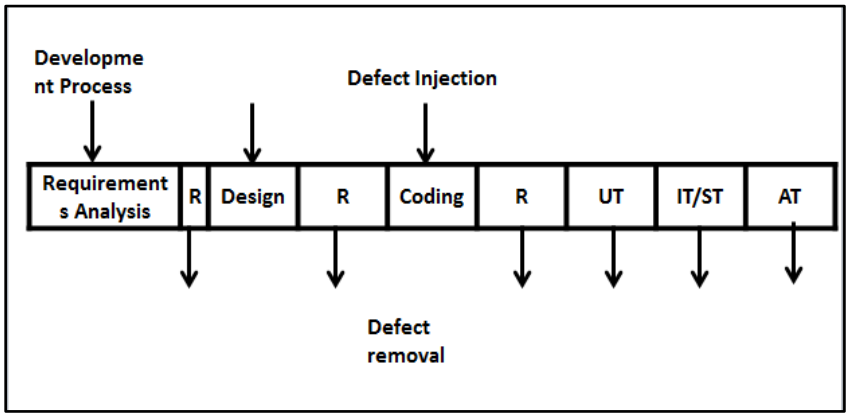
- Software development is highly people oriented activity.
  - Defects can be injected in software at any stage during its evaluation.
  - Defects can be injected in all the transformation activities undertaken



  - For delivery of high-quality software, active removal of defects in necessary.
  - This removal takes place through the quality control activities of review and testing.







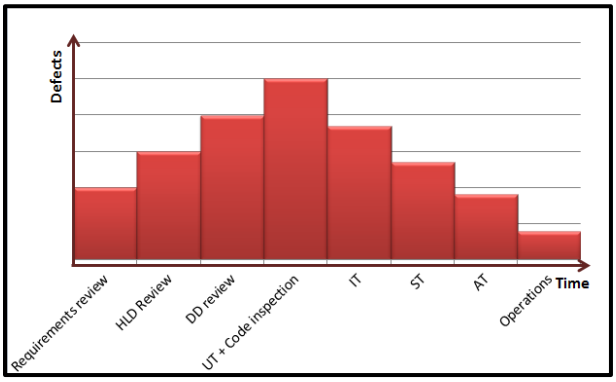
- Techniques to manage quality, are
  - Procedural Approach to Quality Management
  - Quantitative Approaches to Quality Management
- **Procedural Approach to Quality Management**
  - To detect defects we need to performing *reviews or testing*.
    - Reviews are structured, human-oriented processes.
    - Testing is the process of executing software in an attempt to identify defects.
  - In procedural approach to quality management, ***procedures and guideline*** for the review and testing activities are established.
  - Procedural approach is the execution of certain processes at defined points to detect defects.

- This approach is highly dependent on the ***quality of the procedure*** and the ***quality of its executions***.
- Procedure approach does not allow claims to be made about the percentage of defects removed or the quality of the software following the procedure's completion.
- A key drawback of this approach is the lack of quantitative means only visible factor to project managers is whether the quality control tasks are executed.

- **Quantitative Approaches to Quality Management**
  - Based on analysis of data you can decide whether more testing or reviews are needed.
    - If controls are applied during the project based on quantitative data to achieve quantitate quality goal, then we can say that a quantitative quality management approach is being applied.
  - **Quantitative quality management has two key aspects:**
    - Setting quantitative quality goal
    - Managing software development process quantitatively so that quality goal is met.
    - Following approaches we can use to quantitatively control the quality of the software
      - Software reliability model.
      - Defect removal efficiency (DRE).

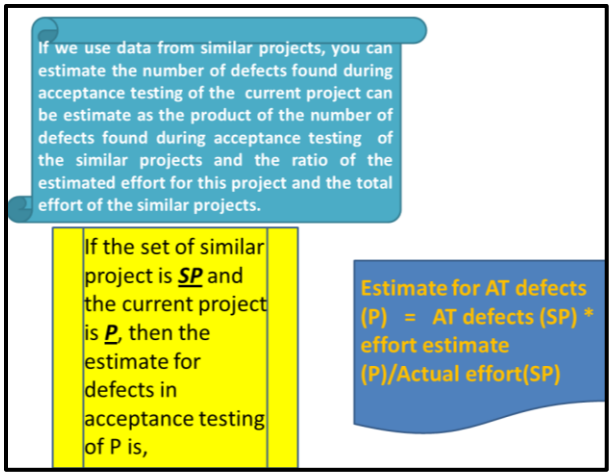
- Defect prediction
- SPC

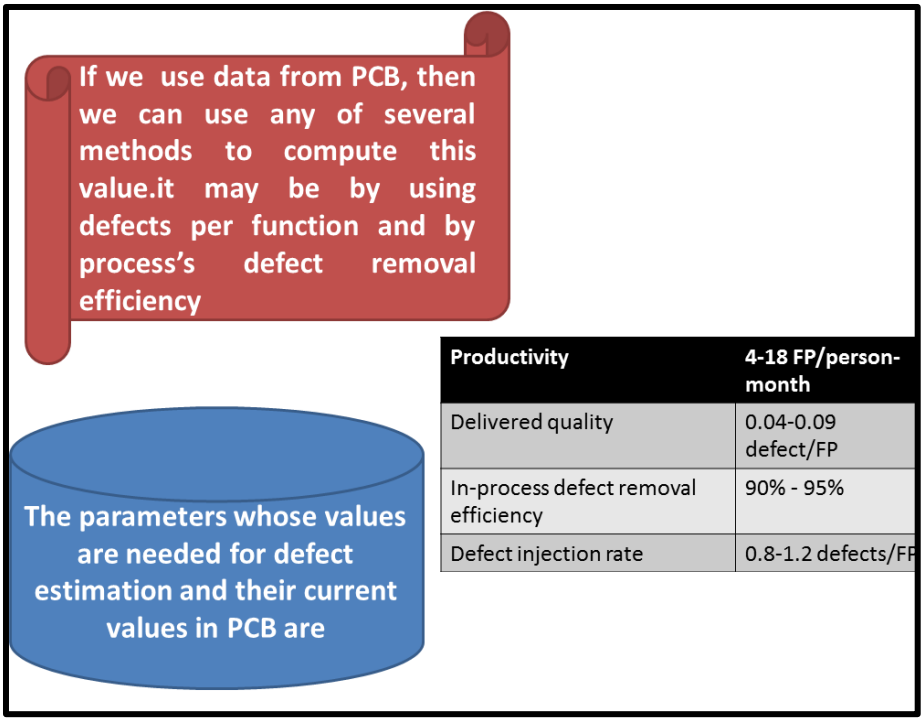
- **Quantitative Quality Management through Defect Prediction**
  - Quality goal is set in terms of delivered defect density.
  - We need to estimating the defects that may be identified by various defect detection activities and then comparing the actual number of defects with the estimated defect levels.
  - Effectiveness of this approach is depends on one key factor: *"how well we can predict the defect levels at different stage of the project."*
  - By using defect removal efficiency and defect injection rate ,we can do prediction.
    - If defect injection rate of each phase is known and the DRE for each of the QC activities is known then the expected defect level at each QC activity can be predicted by using the size of the system.
    - The number of defects found at the start of the project is small, but keeps increasing until it reaches a peak, before it begins to decline again.



3.2 Quantitative Quality Management Planning

- Quantitative quality management has three key aspects:
  - Setting quantitative quality goal
  - Managing software development process quantitatively so that quality goal is met.
- For both issues, data on past projects from the PDB or PCB are used.
  - In PCB defect data are normalized with respect to size of effort.
    - If information normalized with respect to size will be used for predicting defect levels, a size estimate in FP will be needed
- 1. Setting the Quality Goal
  - Project managers at Infosys set quality goals during the planning stages.
    - Quality goal for a project generally is the expected number of defects found during acceptance testing.
    - You can set the quality goal according to what is computed using past data.
    - Two primary sources can be used for setting the quality goal:
      - Past data from similar project
      - Data from the PCB.





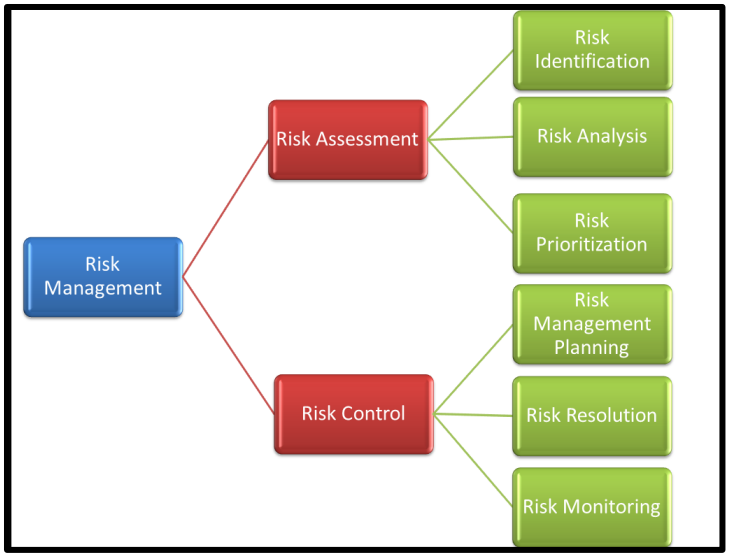
- If you set quality target as *the number of defects per function point (FP)*,you estimate size in function point and the expected number of defects is the product of the quality figure and the estimated size. The following sequence of steps is used.
    - Set the quality goal in terms of defects per FP.
    - Estimate the expected productivity level for the project.
    - Estimated the size in FP as (expected Productivity * estimate effort).
    - Estimate the number of AT defect as (quality goal * estimate size)
- If you set quality target as *process's defect removal efficiency*, you can determine the number of defects to be expected during AT from the defect injection rate, the target in-process removal efficiency and the estimated size. The following sequence of steps is used.
    - Set the quality goal in terms of defects removal efficiency.

- Estimate total number of defects from the defect injection rate and the estimate size or by the effort-based defect injection rate and the effort estimation.
- Estimate the number of AT defects from the total number of defects and the quality goal.

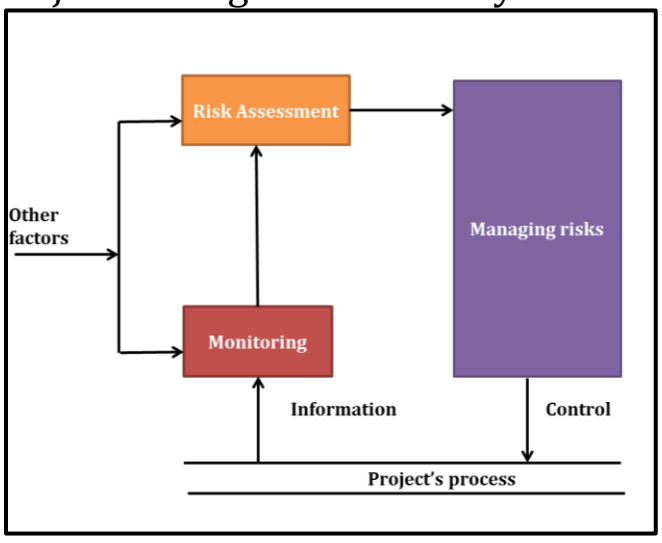
- **2. Quality Process Planning**
  - If quality goal has been set based on the data from some similar projects and the quality goal is higher than that of the similar projects, it is unreasonable to expect that following the same process as used in the earlier projects will achieve hi9gher quality goal.
    - If the quality goal is set higher than the quality level given is the PCB.
  - **Estimating defects for Other Stages**
    - The approach for estimating defect levels for other phases is similar to the approach for estimating the defects in AT.
      - From the estimation of the total number of defects that will be introduced, you forecast the defect levels for the various testing stages by using the percentage distribution of defects as given in the PCB.
      - Alternatively, you can forecast defects for the various phases based on past data from similar projects.

3.3 Need for Risk Management

- Risk management is an attempt to minimize the chance of failure caused by unplanned events.
- The aim of risk management is to minimize the impact of risks in the project that are undertaken.
- Risk management has two key components:
  - Risk Assessment
  - Risk control



- The purpose of the risk assessment task is to identify the risks, analyze them, and then prioritize them.
    - Risk prioritization determines where the extra effort for risk management should be spent to get the maximum benefit from the risk management efforts.
- For each risk that will be handled, risk management plans must be delivered and then executed.
- Risk management task can be combined into three key activities:
    - Project risk is clearly and complete understood.
    - Risks are continuously and visible monitored.
    - Project management actively controls risks.



3.4 Risk Assessment

- At Infosys, risk assessment consists of the traditional two components:
    - Risk identification
        - It focuses on enumerating possible risks to the project.
    - Risk prioritization
        - It considers all aspects of all risks and then prioritizes them.
- **Risk Identification**
    - Identifying risk is an exercise in predicting what can go wrong.
    - There is no general guideline for performing this task of predicting.
    - It is an explicit activity and requiring the project leader to explicitly think about possible risks will help in identifying risks.
    - Following methods are used for risk identification:
        - Checklists of possible risks.
        - Interviews, meetings and brainstorming
        - Review of plans, processes and work products
        - survey
    - Checklists of possible risks
        - It is most common techniques for risk identification.
        - This list can help a project leader in identifying risk for the current project.
- **Risk Prioritization**
    - Prioritization requires analyzing the possible effects of the risk event.
        - If risk materializes, what will be the loss to the project?

- The loss includes a direct loss, loss due to lost business opportunity or future business, loss due to employee morale.
- Based on possible consequences and the probability of the risk event occurring, the risk exposure can be computed.
- This value represents the expected loss" for a risk.

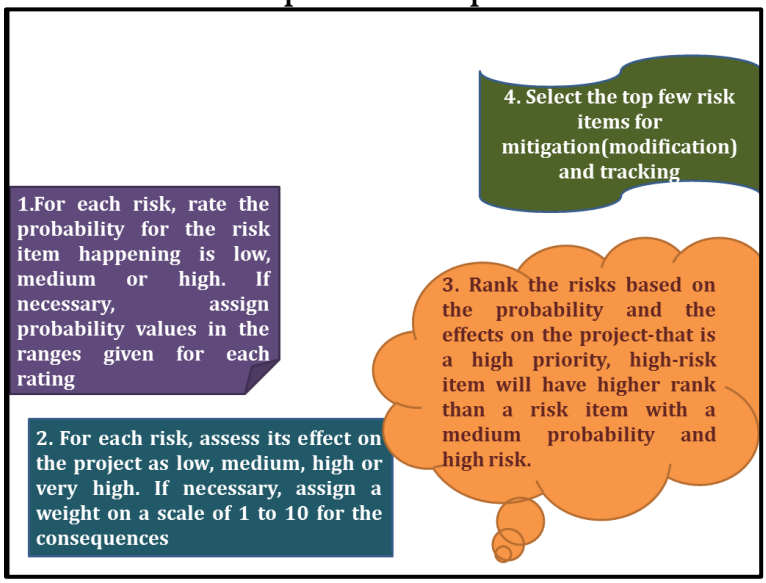
- Risk prioritization requires a quantitative assessment of the risk probability and risk consequences.
  - The probability of risk occurring is categorized in the following category with its range

Level of Consequence	Range
Low	0-3
Medium	3-7
High	7-9
Very high	9-10

Probability	Range
Low	0.0-0.3
Medium	0.3-0.7
High	0.7-1.0

  - The consequences are measured in monetary term(risk impact is viewed as being on scale of 1-10) in following category with its range

- The basic steps in risk prioritization are as follows:



3.5 Risk Control

- Minimizing the risk effects is done in the second phase of risk management that is risk control.
    - It is involves planning of risk mitigation, and followed by execution of the plan
    - Monitoring of the risks.
- **Risk Management Planning**
    - The main task is to identify the actions needed to minimize the risk consequences.
        - These steps are generally called *"risk mitigation steps"*.
    - In risk identification, we can list a commonly used risk mitigation steps for various risks is compiled to help the project leader in selecting a suitable risk mitigation steps.
        - PDB can also used to identify the risk and risk mitigation steps.
    - **Top ten Risk at Infosys**

Sequence Number	Risk Category	Risk Mitigation Step
1	Shortage of technically trained manpower	
2	Too many requirement changes	
3	Unclear requirements	
4	Manpower attrition	
5	Externally driven decisions forced in the project	
6	Not meeting performance requirements	
7	Unrealistic schedules	
8	Working on new technology	
9	Insufficient business knowledge	
10	Link failure/slow performance	

- **Risk Monitoring and Tracking**
  - Risks are probabilistic events, frequently depending on external factors the “threat” due to risk may change with time as factor change.
  - Risk in a project should not be treated as static and that reevaluation of risks needed to be done periodically.
  - Risk perception for the entire project needs to be revisited periodically.