Quality Management

Software Project Quality Management

- The Activities that Determine Quality POLICIES, OBJECTIVES, RESPONSIBILITIES.
- It includes the PLANNING, ASSURANCE and CONTROL of the POLICIES, PROCEDURES and PROCESSES
- Forecast the End Result Quality during the Development Stages
- Special Characteristic of Software:
  - Increasing Criticality and Importance of Software
  - Intangibility of software is a source for Unpredicted Errors
  - Software Errors are **accumulating** through the project life cycle

Software **Product** Quality Factors

- Product Operation:
    - Correctness (follow specifications),
    - Reliability (number of errors, fault tolerance, simplicity),
    - Efficient (optimize resources usage: storage, memory, CPU)
    - Integrity (access control & audit to processes and data)
    - Usability (ease of use/training, operation)
- Product Revision (changes, enhancements)
    - Testing (effort required, regression tests)
    - Flexibility (effort required to modify the functionality)
    - Maintenance (effort required to locate and fix a bug: modularity, no duplication of code, documentation)
- Product Flexibility (Transition)
    - Portability (change h/w, operating system, compiler, etc)
    - Interoperability (integrate with other systems, flexible data and interface structures)
    - Reusability (can be used as part of another application as a whole or parts − platform free, modular design)

Software Quality Standards

- ISO 9001 (International Organization for Standardization)
  - Defines the needs from a monitor & control system to check quality
  - **<u>Certification</u>** of the Design, Development, Production, Installation an Service Processes
  - Describes the fundamental features of Quality Management System (QMS)
  - Useful in selecting a sub-contractor with "best practices" quality processes.
  - Deals with quality of the development process, not with the quality of the product

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ISO 9001 Principles

– Determine the NEEDS and Expectations of the customer

– Establish Quality Policy and imply the actual quality objectives

– Design the project activities to include the quality objectives

– Assign responsible parties to all the quality objectives

– Allocate enough and knowledgeable resources

– Implement methods to measure the quality objectives in each process

– Collect & Analyze the Measurements and Identify discrepancies

– Define action items to eliminate the cause of the discrepancies

– Documentation (follows *quality manual*) of the actual (updated) operation of an activity that includes objectives, plans, procedures and records

– The QMS is well managed and knowledgeable resources are assigned to the Quality Management Process.

– Demonstrate that the *Production Process* is well defined, designed, recorded, communicated and measured.

– Sub-Contractors and Purchasing are managed in the same manners.

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CMM – Capability Maturity Model

- Software Development Methods and Tools which are Likely to produce Quality Software
- Software Companies are assigned a level (1 to 5) of Process Maturity that indicates the quality of their software production practices
- Level 1: Initial Level
  - Default level, no defined quality process throughout the organization. Some projects may adopt some measures.
- Level 2: Repeatable Level
  - Basic Project Management in place, not in the activities level
- Level 3: Defined Level
  - Project Management Plan is well defined at all levels
- Level 4: Managed Level
  - Products & Processes are Measured and Controlled
- Level 5: Optimizing Level
  - Process Improvement is introduced based on documented data gathered from previous projects, processes.

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Quality Planning

- Identify the Project Quality Standards
- Determine how to Satisfy the Standards
- Inputs:
  - Enterprise Factors (law, regulations, standards)
  - Organizational Factors (QA policies)
  - Scope Statement (objectives, thresholds, acceptance criteria, performance criteria, etc.)
  - Project Management Plan
- Tools & Techniques
  - Cost Benefit Analysis
    - Cost Of Quality: Expenses associated with the Project Quality Management
    - Benefit: Less Rework, higher productivity, lower cost, higher stakeholder satisfaction
  - Benchmarking Compare the project process practices to other projects to get ideas for improvements
  - Others: Brainstorming, Flowcharts

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Quality Planning - Output

- Quality Management Plan
  - How the project management will implement the quality policy
  - Quality Control Plan
  - Quality Assurance Plan
  - Continuous Improvement Plan
- Quality Metrics
  - Detailed Plan of what will be measured, actual values
- Quality Checklist
  - Structured tool. Process, Activity based. Templates can be available from prior projects or QA organizations.
- Quality Baseline
  - The quality OBJECTIVES of the project
  - The basis for measuring and reporting
- Process Improvement Plan
  - Identification of WASTE and NON-VALUE ADDED activities
  - Set TARGETS for Improved performance

Techniques for Enhancing Software Quality-

Early testing will ensure that any defects do not snowball into larger, more complicated issues.

Implement quality controls from the beginning

Echo the importance of quality assurance through the entire software development process

Testing should be repeated as each development element is applied.

Encourage innovations

Communication is key

Plan for a changeable environment

Have a risk register

Producing software quality requires long-term thinking and strategy

Outline your deliverables

Review, revise, and remember

Software Testing

LEVELS OF TESTING.

Integration testing: Ensuring that software components or functions operate together.

Unit testing: Validating that each software unit performs as expected. A unit is the smallest testable component of an application.

System Testing:System Testing is a level of testing that validates the complete and fully integrated software product: