Software Quality Assurance

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Perspectives of quality
- Transcendent – something we learn to recognize
- Product-based – measurable variable
- Usage-based – in the eyes of the beholder
- Manufacturing-based – conformance to requirements
- Value-based – market sets the value

Quality factors
- Correctness
- Reliability
- Efficiency
- Usability
- Integrity
- Maintainability
- Flexibility
- Testability
- Security
- Portability
- Reusability
- Interoperability
- Survivability
- Safety
- Manageability
- Supportability
- Replaceability
- Functionality

ISO 9000-3
- A guideline to apply ISO 9001 to software industry, which is built on the principles:
  - Principle 1 Customer focus
  - Principle 2 Leadership
  - Principle 3 Involvement of people
  - Principle 4 Process approach
  - Principle 5 System approach to management
  - Principle 6 Continual improvement
  - Principle 7 Factual approach to decision making
  - Principle 8 Mutually beneficial supplier relationships
TickIT

- An interpretation of ISO 9001 for software,
- a standard set of requirements on the competence and behavior of certification auditors,
- a standardized training course for certification auditors,
- a registration scheme for approved certification auditors,
- a system for accrediting certification bodies for conducting TickIT certifications,
- a logotype to be used on certificates to show TickIT certification.

Six sigma

- Statistical process control
- The variance of approved products should lie +/- 3 standard deviation from the mean = 3.4 faults per million
- Define
- Measure
- Analyze
- Improve
- Control

CMMI

1: Initial
2: Repeatable
3: Defined
4: Managed
5: Optimising

Each level has process areas.

PA CMMI2

- Requirements Management
- Project Planning
- Project Monitoring and Control
- Supplier Agreement Management
- Measurement and Analysis
- Process and Product Quality Assurance
- Configuration Management
PA CMMI3
- Requirements Development
- Technical Solution
- Product Integration
- Verification
- Validation
- Organizational Process Focus
- Organizational Process Definition
- Organizational Training
- Integrated Project Management
- Risk Management
- Decision Analysis and Resolution

QIP
1. Set quantifiable goals
2. Select processes
3. Run processes
4. Measure objectives
5. Analyse measurements
6. Package experience

Experience factory

QFD
Inspections in quality assurance
- Appraisal – defect detection
- Assurance – prediction of defects
- Control – adjust the process
- Improvement: reduce variation, increase precision

Analysis | Design | Coding | Test-cases
---|---|---|---
Inspection data | Inspection data | Inspection data | Inspection data

Research – predicting troubles
- Regression analysis from empirical material
- Often a linear combination between size and complexity
- Size can be measured in:
  - lines of code (KLOC)
  - function points
  - Halstead software science

Measuring complexity
- Cyclomatic number \( V(G) = e - n + 2 \)
- \( e \) = number of edges (arcs)
- \( n \) = number of nodes
- Due to McCabe(76)

Example
\[
V(G) = 14 - 11 + 2 = 5
\]
Function points
- Language-neutral combination of size and complexity
- Mostly used for administrative information systems
- Growing interest, but still a closed community

Factors in function point analysis
- Number of user inputs - distinct input applications, not online queries. Weight: 4
- Number of user outputs – distinct output applications: reports, lists. Weight: 5
- Number of user online queries requiring action by the system. Weight: 4
- Number of logical files – any group of information maintained for the user. Weight: 10
- Number of external interfaces – any computer-readable I/O. Weight: 7.
  - Sometimes a file might be counted twice.

Reliability
- The probability that the software executes with no failures during a specified time interval
- Approximation: MTTF/(1+MTTF)
- Reliability engineering:
  - Goal failure intensity
  - Operational profiles
  - Statistical Usage Testing

Usability
- Relevance
- Efficiency
- Attitude
- Learnability
- Usability engineering:
  - Task analysis
  - Prototyping (HI-FI, LO-FI)
Management

- What’s get measured gets done
- Importance of feedback
- Non-personal software
- Creating a passion for quality
- Live as you learn
- Incentive system
- Involve customers
- Set prioritized goals
- Quality is everybody’s responsibility
- Document how you will work with quality
- Improve continuously

=TQM

Wisdom

- Communication
- Infrastructure
- Performance

=TQM