Software Quality Assurance

by
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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

Many opinions ⇒ Statistical techniques

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Quality factors

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

Price?

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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
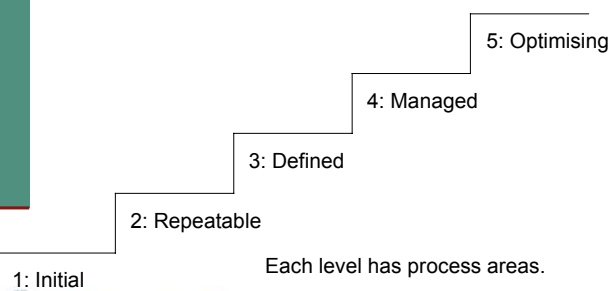
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TickIT

- 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

5: Optimising

4: Managed

3: Defined

2: Repeatable

Each level has process areas.

1: Initial

PA CMMI2

- Requirements Management
- Project Planning
- Project Monitoring and Control
- Supplier Agreement Management
- Measurement and Analysis
- Process and Product Quality Assurance
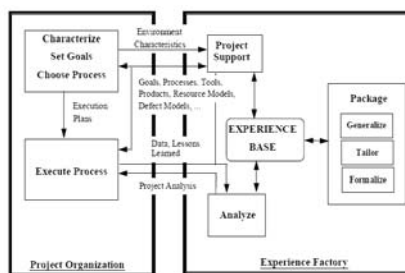- Configuration Management

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

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QIP

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

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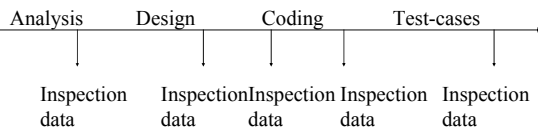
Experience factory

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QFD

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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   Inspection data

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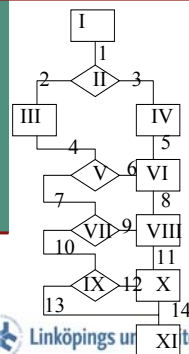Kristian Sandahl, IDA
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Research – predicting troubles

- 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

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Measuring complexity

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

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Example

$$V(G) = 14 - 11 + 2 = 5$$

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Function points

- Language-neutral combination of size and complexity
- Mostly used for administrative information systems
- Growing interest, but still a closed community

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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.

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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

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Usability

- Relevance
- Efficiency
- Attitude
- Learnability

Usability engineering:
  - Task analysis
  - Prototyping (HI-FI, LO-FI)

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Management

- What's get measured gets done
- Importance of feed-back
- 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

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Wisdom

communication

infrastructure

performance

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