Quality Improvement 26
Real processes
• Cleanroom
• RUP
• XP

Product Quality
• Acceptable: usable, learnable, compatible
• Efficient: response time, memory use
• Dependable: safe, reliable, secure
• Maintainable: documented, structured

[Fig. 1.2, 24.2]

Quality Management
• Organization
  – defining standards
  – defining processes
• Project
  – quality plan
  – checking outcome

Quality Plan
• Product Quality Requirements
  – safety/reliability analysis
  – too good and over budget ≠ quality
• Development plan
  – standards, documentation
  – required validation and verification actions
  – release plan, config. management
• Process risks
Quality assessment

- External attributes
  - what is required
  - measurable after completion (maybe)
  - cannot be measured during development

- Internal attributes
  - can be measured during development
  - predict external attributes (maybe)
    - learn from experience

Measurement process

- Choose measurements
  - Goal - Question - Metric (GQM)
- Select components
- Measure
- Identify anomalous values
  - compared to normal product / company values
- Analyse anomalous components

Interpretation of metrics

Quality
- perfect
- quite good
- useless

Measure: change requests / time
Quality Standards

- Save work
  - no need to reinvent
  - supported by tools
- Capture “good practice”
- Can define levels of quality
- Improve communication
- Product / Process / ISO 9001

ISO 9001

Process improvement activities

- Product
- Measure
- Act
- Process
- Measure
- Act
- Management

Quality attributes

- maintainability
- usability
- reliability
- understandability
- visibility
- robustness
- certification

Standards

- variable names
- user documents
- version mgm
- inspection proc.
- milestones
- change control
- ISO 9001
- CMMI

Process Quality Fig. 26.2

- People actually follow it:
  - acceptable, usable, learnable
- It delivers:
  - efficient, in time, acceptable product quality
- Manageable
  - visible, robust to problems, reliable, adaptable
- Supportable
  - documented, structured, measurable

Process measurement

- Resources required
  - time
  - money
- Occurrence of events
  - failed system builds
  - missed deadlines
  - missing process documents

Process analysis

- Questionnaires, interviews
  - honesty is the best policy?
- Ethnographic studies
  - observe the tribe
    [ insert Dilbert cartoon ]
Implementing change

Capability Maturity Model 26.5

• Process areas (22 in CMMI)
• Maturity levels
  0. incomplete
  1. performed
  2. managed
  3. defined
  4. quantitatively managed
  5. optimizing

Various CMMs

• Staged CMM
  – classify organisation
• Continuous CMM
  – classify each practice (next slide)

• The "CMM Principle"
  – P-CMM 22.2 People management processes

What is the company goal?

• Usually level 3 is good enough
  – unless you’re NASA
  – or a new company in India
• The lower end of the scale
  -1. We don’t care about quality
  -2. Let’s do all the paperwork - but not the job
  -3. Quality is for the weak.
    Real programmers need no documentation
Real Processes

- A combination of “best practices”
- Need to be adapted
  - start with a standard
  - adapt
  - introduce
  - monitor - change
- Supported by tools and standards

Cleanroom (1987) 15.1

- Goal: zero-defect software
- Ingredients
  - formal specification
  - incremental development
  - structured programming
  - static verification (inspections - no tests!)
  - statistical system testing
- Teams
  - specification
  - development
  - certification

Rational Unified Process

- Goals:
  - realistic
  - reuse
  - tool support
- Incremental and iterative
- OO, UML, visual models, components
- Quality: support processes, transition

Traditional vs. Agile

- Follow a plan
- Change costs
- Frozen requirements contract
- Documentation
- Deliverables at a deadline
- People
- Embrace change
- User stories, tests, customer involvement
- Working software
- Time-boxed
- smaller increments

Agile principle | Scrum | Extreme Programming
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Incremental planning and development | Sprints, sprint backlog, planning poker | Implement user stories, story cards, planning poker |
Customer involvement | Product owner, demo at end of sprint | Customer representative in development team |
People, process | Scrum meetings, sustainable pace (time-boxed) | Pair programming, collective ownership of code sustainable pace |
Embrace change | Change occurs from one sprint to the next | Continuous integration and release test-first development |
Maintain simplicity | Refactoring, no anticipation of future requirements | Refactoring, no anticipation of future requirements |
Prevas project model (detailed)