Software Quality Engineering

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    Testing, Quality Assurance, and Quantiable Improvement
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Chapter 2: What Is Quality?

- Perspectives and Expectations
- Quality Frameworks and ISO-9126
- Correctness, Defect, and Quality
- A Historical Perspective

Perspectives and Expectations

- General:

  "good" software quality

- Perspectives:

  people/subject's view, software as object

- Expectations:

  quality characteristics & level

- In Kitchenham & Pfleeger (1996):

  . Transcendental view: seen/not-defined. . User view: fitness for purpose. . Manufacturing view: conform to specs. . Product view: inherent characteristics. . Value-based view: willing to pay.

Quality Perspectives

- Perspectives: subject and object
- Subject: people's perspectives

  . external/consumer: customers and users . internal/producer: developers, testers, and managers . other: 3rd party, indirect users, etc. . users generalized: other systems etc. . focus on external/consumer side

- Objects of our study:

  . software products, systems, and services . stand-alone, embedded, etc. . affect quality definitions/expectations

Quality Expectations

- Expectations from different people
- External/consumer expectations:

  . "good enough" for the price

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  -   fit-for-use, doing the "right things"
  -   conformance, doing \things right"
      -> validation and verification (V&V)
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  . customer vs user (price?) . internal vs external user . generalized user: other hw/sw/system/etc.

- Expectations for different software:

  . general: functionality & reliability, . usability: GUI/end-user/web/etc., . interoperability: embedded systems, . safety: safety-critical systems, etc.

- Internal/producer:

  . "good enough" for the cost

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-   mirror consumer side
-   functionality & correctness via V&V
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. cost: developers vs managers . service related: maintainability . interfacing units: interoperability . 3rd party: modularity

- Different expectations for different types of products and market segments too.
- Different QA/SQE activities needed.

ISO-9126 Quality Framework

- ISO 9126 quality characteristics:

  . Functionality: what is needed? . Reliability: function correctly. . Usability: effort to use. . Efficiency: resource needed. . Maintainability: correct/improve/adapt. . Portability: one environment to another.

- Impact and limitations:

  . Characteristics into sub-characteristics . Comprehensive framework . Strict hierarchy -> other alternatives

Other Quality Frameworks

- Adaptation of ISO-9126:

  . customized for companies

  e.g., IBM's CUPRIMDSO.

  . adapted to application domains

  reliability, usability, security for Web

- Other quality frameworks/mega-models

  . McCall: factors, criteria, and metrics . Basili: GQM (goal-question-metric) . SEI/CMM: process focus/levels . Dromey: component reflects Q-attributes . Defect-based view: common in industry cost of defect: by Boehm, NIST, etc.

Correctness, Defect and Quality

- High quality ~ low defect

  . intuitive notion related to correctness . quality problem ~ defect impact . widely accepted, but need better definitions

- Defect/bug definition

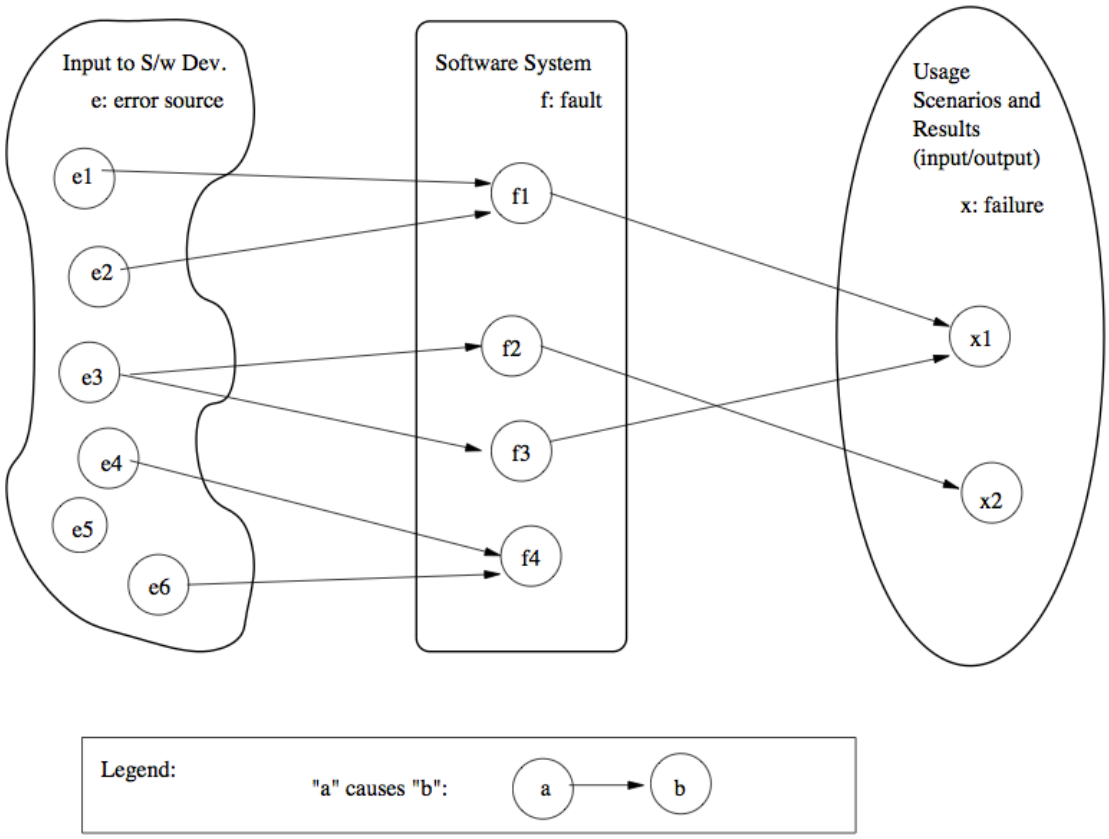
  . failure: external behavior deviation from expected behavior

  . fault: internal characteristics cause for failures

  . error: incorrect/missing human action error source: conceptual mistakes etc.

  . defect: error, fault, failure collectively

  . bug/debug: problematic terms, avoid



- Relations: errors -> faults -> failures

  not necessarily 1-1, Fig 2.1 (p.21) above

- Other issues:

  . QA as dealing with defect: Chapter 3 . defect handling/resolution: Chapter 4

Defining Quality in SQE

- Quality: views and attributes

View	Attribute	
	Correctness	Other
Customer (external)	Failures: reliability safety etc.	Maintainability Readability Portability Performance Installability Usability, etc.
Developer (internal)	Faults: count distr class etc.	Design Size Change Complexity presentation control data, etc.

- SQE focus: correctness-related.

Quality: Historical Perspective

- Software vs other products/systems:

  . pre-software/IT: manufacturing process -> physical-object attributes (defects)

  . service: manage expectations:

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  - 0 defect -> 0 defection
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  . IT and software: below

- The new meaning of quality in the information age (Prahalad & Krishnan 1999):

  . Conformance/adaptability/innovation . Traditional: conformance only . Domain specific (for info. age): specificity, stability, evolvability

- A historical perspective of SE, in 4 stages (Musa & Everett, 1990):

  . functional: focus on automation . schedule: timely/orderly product intro . cost: competitive marketplace . reliability: meet user expectations

- Historical perspectives based on:

  . measurement/feedback (Part IV), . process maturity, etc.

- So, what is software quality?

  many aspects/perspective, but correctness-centered in SQE