Documenting Analysis and Test

Learning objectives

- Be able to explain the purposes and importance of documentation
- Identify some key quality documents and their relations
- Be able to structure and provide content for key quality documents
- Appreciate needs and opportunities for automatically generating and managing documentation

Why Produce Quality Documentation?

- Monitor and assess the process
  - For internal use (*process visibility*)
  - For external authorities (certification, auditing)

- Improve the process
  - Maintain a body of knowledge reused across projects
  - Summarize and present data for process improvement

- Increase reusability of test suites and other artifacts within and across projects

Major categories of documents

- Planning documents
  - describe the organization of the quality process
  - include organization *strategies* and project *plans*

- Specification documents
  - describe test suites and test cases
    - (as well as artifacts for other quality tasks)
  - test design specifications, test case specification, checklists, analysis procedure specifications

- Reporting documents
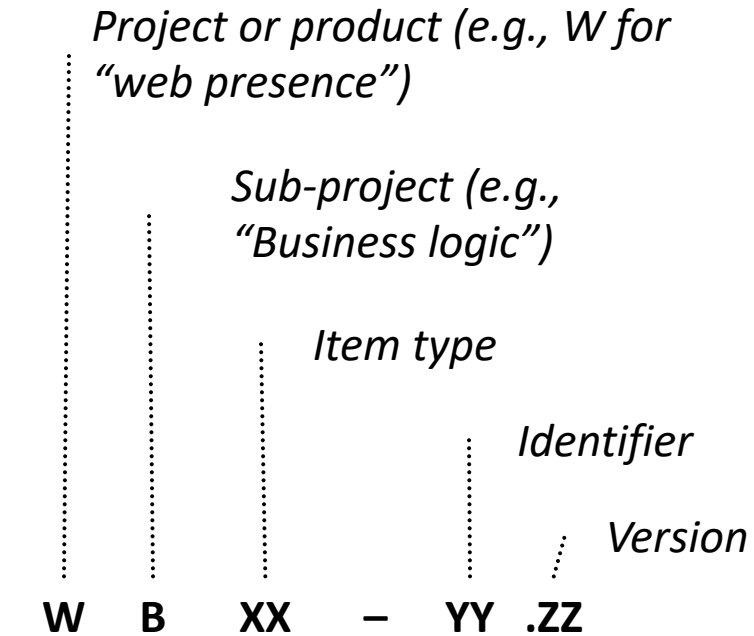 - Details and summary of analysis and test results

Metadata

- Documents should include *metadata* to facilitate management
    - **Approval**: persons responsible for the document
    - **History** of the document
    - **Table of Contents**
    - **Summary**: relevance and possible uses of the document
    - **Goals**: purpose of the document– Who should read it, and why?
    - **Required documents and references**: reference to documents and artifacts needed for understanding and exploiting this document
    - **Glossary**: technical terms used in the document

Naming conventions

- Naming conventions help people identify documents quickly

- A typical standard for document names include keywords indicating
  - general scope of the document (project and part)
  - kind of document (for example, test plan)
  - specific document identity
  - version

Sample naming standard

Project or product (e.g., W for "web presence")

Sub-project (e.g., "Business logic")

Item type

Identifier

Version

W   B   XX   –   YY .ZZ

example:
W   B   12   –   22 .04

Might specify version 4 of document 12-22 (quality monitoring procedures for third-party software components) of web presence project, business logic subsystem.

Analysis and test strategy

- Strategy document describes quality guidelines for sets of projects (usually for an entire company or organization)

- Varies among organizations

- Few key elements:
common quality requirements across products

- May depend on business conditions - examples
  - safety-critical software producer may need to satisfy minimum dependability requirements defined by a certification authority
  - embedded software department may need to ensure portability across product lines

- Sets out requirements on other quality documents

Analysis and Test Plan

- Standardized structure see next slide
- Overall quality plan comprises several individual plans
  - Each individual plan indicates the items to be verified through analysis or testing
  - Example: documents to be inspected, code to be analyzed or tested, ...
- May refer to the whole system or part of it
  - Example: subsystem or a set of units
- May not address all aspects of quality activities
  - Should indicate features to be verified and excluded
    - Example: for a GUI– might deal only with functional properties and not with usability (if a distinct team handles usability testing)
  - Indication of excluded features is important
    - omitted testing is a major cause of failure in large projects

Test Design Specification Documents

- Same purpose as other software design documentation:
  - Guiding further development
  - Preparing for maintenance
- Test design specification documents:
  - describe complete test suites
  - may be divided into
    - unit, integration, system, acceptance suites (organize by granularity)
    - functional, structural, performance suites (organized by objectives)
    - …
  - include all the information needed for
    - initial selection of test cases
    - maintenance of the test suite over time
  - identify features to be verified (cross-reference to specification or design document
  - include description of testing procedure and pass/fail criteria (references to scaffolding and oracles)
  - includes (logically) a list of test cases

Test case specification document

- Complete test design for individual test case
- Defines
  - test inputs
  - required environmental conditions
  - procedures for test execution
  - expected outputs
- Indicates
  - item to be tested (reference to design document)
- Describes dependence on execution of other test cases
- Is labeled with a unique identifier

Test and Analysis Reports

- Report test and analysis results
- Serve
  - Developers
    - identify open faults
    - schedule fixes and revisions
  - Test designers
    - assess and refine their approach see chapter 20
- Prioritized list of open faults: the core of the fault handling and repair procedure
- Failure reports must be
  - consolidated and categorized to manage repair effort systematically
  - prioritized to properly allocate effort and handle all faults

Summary reports and detailed logs

- Summary reports track progress and status
  - may be simple confirmation that build-and-test cycle ran successfully
  - may provide information to guide attention to trouble spots
- Include summary tables with
  - executed test suites
  - number of failures
  - breakdown of failures into
    - repeated from prior test execution,
    - new failures
    - test cases that previously failed but now execute correctly
- May be prescribed by a certifying authority

Isn't this a lot of work?

- Yes, but
    - Everything produced by hand is actually used
        - Always know the purpose of a document. Never expend effort on documents that are not used.
    - Parts can be automated
        - Humans make and explain decisions. Let machines do the rest.
- Designing effective quality documentation
    - Work backward from use, to output, to inputs
        - and consider characteristics of organization and project
    - Capture decisions and rationale at cheapest, easiest point and avoid repetition

Summary

- Mature software processes include documentation standards for all activities, including test and analysis

- Documentation can be inspected to
    - verify progress against schedule and quality goals
    - identify problems

- Documentation supports process visibility, monitoring, and standardization