Documenting Analysis and Test

Learning objectives

- Understand the purposes and importance of documentation
- Identify some key quality documents and their relations
- Understand the structure and content of 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

Metadata example: Chipmunk Document Template

Document Title

Approvals

issued by	*name* *signature* *date*
approved by	*name* *signature* *date*
distribution status	*(internal use only, restricted, ...)*
distribution list	*(people to whom the document must be sent)*

History

version	description

.....

Metadata may be provided or managed by tools. For example, version control system may maintain version history.

....

Chipmunk Document Template (continued)

Table of Contents

List of sections

Summary

Summarize the contents of the document. The summary should clearly explain the relevance of the document to its possible uses.

Goals of the document

Describe the purpose of this document: Who should read it, and why?

Required documents and references

Provide a reference to other documents and artifacts needed for understanding and exploiting this document. Provide a rationale for the provided references.

Glossary

Provide a glossary of terms required to understand this document.

Section 1

. . .

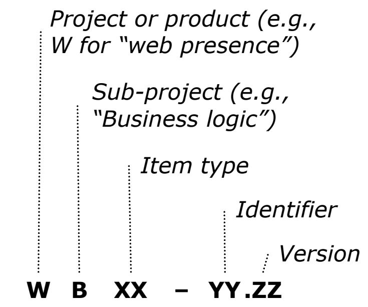
Section N

. . .

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

Standard Organization of a Plan

- Analysis and test items: items to be tested or analyzed
- Features to be tested: features considered in the plan
- Features not to be tested: Features not considered in the plan
- Approach: overall analysis and test approach
- Pass/Fail criteria: Rules that determine the status of an artifact
- Suspension and resumption criteria: Conditions to trigger suspension of test and analysis activities
- Risks and contingencies: Risks foreseen and contingency plans
- Deliverables: artifacts and documents that must be produced
- Task and schedule: description of analysis and test tasks (usually includes GANTT and PERT diagrams)
- Staff and responsibilities
- Environmental needs: Hardware and software

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