

CHAPTER 7:

Basic concepts of software product quality

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Introduction

- Information is now a strategic resource for most companies, in which many activities are based on the exploitation of computer applications.
- For these companies, the reliability of their computer system and the quality of the software used are therefore crucial.

Quality

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A set of principles and methods organized into a global strategy, aimed at mobilizing the entire company, according to achieving complete customer satisfaction, at the lowest cost.

Definition of AFCERQ, French Association of Quality Circles

Quality is the ability of a product to satisfy the customer's needs by meeting their requirements in terms of volume, time, place and cost.

Definition recognized by most North American organizations

Quality

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Quality means “meeting requirements”

With this definition, to have a quality product the requirements must be measurable, and the product's requirements will either be met or not met.

Software testing and continuous quality improvement

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What is Quality Assurance (QA)?

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Quality Assurance (QA) is a process that ensures that a product or service meets specified requirements and standards.

In software development, QA focuses on improving the development processes to prevent defects in the final product. While software testing is a part of QA, it is not the only component. QA also involves defining standards and procedures, auditing, and reviewing both processes and outputs.

The purpose of QA is twofold:

To ensure that the software fulfills user requirements.

To ensure the software is free of defects.

Software Quality

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- **1. Intuitive Definition:** Quality is the conformity with the needs, the adequacy with the expected use, the degree of excellence or , simply, the value of something for someone
- **2. ISO definition:** Set of features and characteristics of a software product relating to its ability to satisfy expressed or implicit needs
- **3. IEEE Definition:** Software quality is:
 1. The degree to which a system, component, or process meets specified requirements.
 2. The degree to which a system, component, or process meets customer or user needs or expectations.

Statistics

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- 15% of the software delivered contains anomalies
- 30-40% of software content is transformed during maintenance
- 50% of development projects do not meet deadlines.

National Centre for Scientific Research

Causes of Software Quality Issues

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- ❑ **Poor Requirements Gathering:** Ambiguous, incomplete, or changing requirements lead to flaws in the software design and functionality
- ❑ **Lack of Documentation:** Incomplete or missing documentation can make the software difficult to maintain or upgrade.
- ❑ **Unskilled Development Team:** Inexperienced or undertrained developers may produce low-quality code
- ❑ **Poor Project Management :** Poor distribution of workneffective planning.
- ❑ **Miscommunication:** Misalignment between developers, managers, and clients can result in missed objectives.
- ❑ **Inadequate Code Review:** Failing to review code regularly allows errors to persist and spread.

Business Challenge

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- the quality
 - ▣ To build customer loyalty
 - ▣ Positive effect on company profits
 - ▣ Who needs to return compensation

Business Challenge

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- Non quality
 - ▣ Direct effects on sales of products or services
 - ▣ The profits of the company
- ▣ Indirect effects on wages and return on investment
- ▣ Indirect effects on employee valuation

Software quality evaluation

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➤ Evaluation Model

- This model defines the quality of the software through the quality of the product, the process and the service rendered. It is represented as a tree.

Quality assurance in software engineering

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According to IEEE

Software quality assurance is:

- 1. **A planned and systematic pattern** of all actions necessary to provide adequate confidence that an item or product conforms to established technical requirements.*
- 2. **A set of activities** designed to evaluate the process by which the products are developed or manufactured.*
contrasted with: quality control.

Quality control

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Processes and methods to control the work and observe if requirements are met. We focus on reviews and removal of defects before product delivery.

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Quality control activities are a part of the total range of quality assurance activities.

Quality control tasks

- Interpret the context
- Plan quality control activities
- Carry out tests (75% of the quality area)

Objectives of AQL activities in development

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- ✗ (1) Ensure an acceptable level of confidence that the software will comply with the technical functional requirements.
- ✗ (2) Ensure an acceptable level of confidence that the software will comply with management requirements regarding schedule and budget.
- ✗ (3) Initiation and management activities for the improvement and greatest efficiency of software development, maintenance and quality assurance activities.

Software quality plan:

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- ✗ It is a document describing the specific measures taken by a company to obtain the quality of the product or service in question.
- ✗ It includes **techniques and activities** of an operational nature that aim both to steer a process and to eliminate the causes of **unsatisfactory** operation at all phases of the quality loop in order to achieve the best efficiency. It contains: the product to which it is intended to be applied, the objectives relating to the quality of the product , the specific exclusions as well as the period of validity

Implementing the quality system:

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Quality System

system put in place by a company to verify compliance with the Quality Assurance procedure.

A **Quality System** is a set of coordinated activities and processes designed to ensure that an organization's products, services, and processes meet specific quality standards and satisfy customer expectations.

Static code verification: the review

Definition

- presentation/decision-making meeting
- led by the project manager or phase manager

• Types of reviews:

- **Project start review:** presentation of the project, schedule, approach
- **End of phase review :**
 - Existence and quality of the relevant documentation
 - adequacy of the point reached with the objects fixed at the start
- **Project End Review**
 - Analysis of encountered problems, methodological consequences
 - Preparation for maintenance

Static Code Verification: **Inspection**

- • **Definition**
 - In-depth inspection of a particular point
 - Conducted by a specialist in the inspected domain
- **Documents Inspected**
 - Documentation
 - Sources
 - Test records.
- **Principle**
 - Systematic examination of specific points
 - Search for potential defects
 - Verification of the application of certain rules

Static Code Verification: The Audit

Definition

- methodical examination of a given aspect (product, process)
- led by someone outside the development team:

customer, control organism ➡ external audit

quality assurance manager ➡ internal audit

Purpose

- existence and compliance of the PQL with the required requirements
- correct application of the PQL
- Project status
- verification of the configuration management process

Conclusion

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- Quality assurance (QA) plays a vital role in preventing defects and ensuring that the software meets the required standards before it is delivered. But QA isn't just about testing software for bugs; it's about improving processes and using the right tools to ensure that the final product is efficient, reliable, and fit for purpose.