

# Basic Software Engineering

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## CHAPTER - 2

# Software Quality Assurance





## Software Quality

- The software quality is the degree to which a component, system or process meets specified requirements and / or user / customer needs and expectations.
- Quality software is reasonably bug or defect free, delivered on time and within budget, meets requirements and / or expectations, and is maintainable.



## Key aspects of quality for the customer

- Good Design
- Good Functionality
- Reliable
- Consistent
- Integrity
- Good after sale
- Value for money





## Quality Assurance

- Quality Assurance is a planned & systematic pattern of all actions necessary to provide adequate confidence that a software conforms to established technical requirements.
- A set of activities designed to evaluate the process by which the software's are developed or manufactured.





## Software Quality Assurance & Key Aspects

- **Software Quality Assurance (SQA)** is the function of software quality that assures that the **standards**, **processes** and **procedures** are appropriate for the project and are correctly implemented.
- It is the Degree to which a system meets specified requirements and customer expectations.
- Quality Assurance – Auditing Process
- Quality Assurance – Reporting Process
- Quality Assurance – Decision analysis Process
- Quality Assurance – Monitoring Process







# General Principles of Quality Assurance

- Know what are you doing
- Know what you should be doing
- Know how to measure the difference





# General Principles of Quality Assurance

- Once the processes have been defined and implemented, Quality Assurance has the following responsibilities:
  1. Identify weaknesses in the processes.
  2. Correct those weaknesses to continually improve the process
  3. The quality management system under which the software system is created is normally based on one or more of the following models/standards:
    - CMMI (Capability Maturity Model Integration)
    - ISO 9000





# Software Quality Assurance Benefits

- Eliminate errors
- Improves the quality of the software
- Improving the process of Developing Software
- Create a mature software process





## Software Quality Control

- Software Quality Control is the set of procedures used by organizations to ensure that a software product will meet its quality goals at the best value to the customer, and to continually improve the organization's ability to produce software products in the future.



# Software Quality Control

- **Software Quality Control** is a set of activities for ensuring quality in software products.

It includes the following activities:

- **Reviews**
  - Requirement Review
  - Design Review
  - Code Review
  - Deployment Plan Review
  - Test Plan Review
  - Test Cases Review
- **Testing**
  - Unit Testing
  - Integration Testing
  - System Testing
  - Acceptance Testing





## Software Quality Control

- The process of Software Quality Control (SQC) is governed by Software Quality Assurance(SQA). While SQA is oriented towards prevention, SQC is oriented towards detection.



## Difference between SQA & SQC

Criteria	Software Quality Assurance (SQA)	Software Quality Control (SQC)
<i>Definition</i>	SQA is a set of activities for ensuring quality in software engineering processes (that ultimately result in quality in software products). The activities establish and evaluate the processes that produce products.	SQC is a set of activities for ensuring quality in software products. The activities focus on identifying defects in the actual products produced.
<i>Focus</i>	Process focused	Product focused
<i>Orientation</i>	Prevention oriented	Detection oriented
<i>Breadth</i>	Organization wide	Product/project specific
<i>Scope</i>	Relates to all products that will ever be created by a process	Relates to specific product
<i>Activities</i>	<ul style="list-style-type: none"> <li>• Process Definition and Implementation</li> <li>• Audits</li> <li>• Training</li> </ul>	<ul style="list-style-type: none"> <li>• Reviews</li> <li>• Testing</li> </ul>





# Fact Gathering Techniques & System Analysis

## Importance

- Most organizations now operate in an environment that is **rapidly changing**.
- The effect of this is to change their need for information. Even in less responsive organizations, information systems become outdated and need enhancing and extending.
- The process of replacement offers an opportunity to extend the capabilities of systems to **take advantage of new technological developments, or to enhance their usefulness to management and workforce.**







# Fact Gathering Techniques & System Analysis

## Importance

- Many organizations are driven by internal factors to grow and change the ways in which they operate, and this too provides a motivation for the development of new information systems.





## Functional Requirements

- Functional requirements describe **what a system does or is expected to do**, often referred to as its functionality.
- In the object-oriented approach which we are taking here, we shall initially employ use cases to document the functionality of the system.
- As we progress into the analysis stage, the detail of the functionality will be **recorded** in the data that we hold about objects, their **attributes and operations**.



## Functional Requirements

- **Descriptions of the processing** which the system will be required to carry out.
- **Details of the inputs** into the system from paper forms and documents, from interactions between people, such as telephone calls, and from other systems.
- **Details of the outputs** that are expected from the system in the form of printed documents and reports, screen displays and transfers to other systems.
- **Details of data** that must be held in the system.



# Non-functional Requirements

- Non-functional requirements are those which describe aspects of the system that are **concerned with how well it provides the functional requirements.**

**These include the following:**

- **Performance criteria** such as desired response times for updating data in the system or retrieving data from the system.
- **Anticipated volumes of data**, either in terms of throughput or of what must be stored.
- **Security considerations.**



## Fact Finding Techniques

- There are five main fact finding techniques that are used by analysts to Investigate requirements.
1. Background Reading
  2. Interviewing
  3. Observation
  4. Document Sampling
  5. Questionnaires



## Background Reading

- If an **analyst** is employed within the organization that is the subject of the fact gathering exercise, then it is likely that he or she will already have a **good understanding** of the organization and its **business objectives**.
- If, however, he or she is going in as an **outside consultant**, then one of the first tasks is to try to gain an understanding of the organization. Background reading or research is part of that process.







## Background Reading

- The kind of **documents** that are suitable sources of information include the following:
  - company reports,
  - organization charts,
  - policy manuals,
  - job descriptions,
  - reports and
  - documentation of existing systems





# Interviewing

- Interviewing is probably the most widely used fact finding technique; it is also the one that requires the most skill and sensitivity.

## Advantages and disadvantages

- **Personal contact allows** the analyst to be responsive and adapt to what the user says. Because of this, interviews produce high quality information.
- The analyst can **probe in greater depth** about the person's work than can be achieved with other methods.
- Interviews are **time-consuming** and can be the **most costly** form of fact gathering.
- Interview results require the analyst to work on them after the interview: the **transcription** of tape recordings or writing up of notes.
- If different interviews provide conflicting information, it can be difficult to resolve later.



## Observation

- Observation of people at work provides firsthand experience of the way that the current system operates.
- Data are **collected in real time** and **can have a high level of validity** if care is taken in how the technique is used.
- Observation can be used to **verify information from other sources** or to look for exceptions to the standard procedure.
- **Baseline data** about the performance of the existing system and of users can be collected.



## Observation

- Most people **do not like being observed** and are likely to behave differently from the way in which they would normally behave. This can distort findings and affect the validity.
- Observation requires a **trained and skilled observer** for it to be most effective.
- There may be **logistical problems** for the analyst, for example, if the staff to be observed work shifts or travel long distances in order to do their job.
- There may also be **ethical problems** if the person being observed deals with sensitive private or personal data or directly with members of the public, for example in a doctor's surgery.



## Document Sampling

- Firstly, the analyst will collect copies of blank and completed documents during the course of interviews and observation sessions.
- These will be used to determine the information that is used by people in their work, and the inputs to and outputs from processes which they carry out, either manually or using an existing computer system.
- Ideally, where there is an existing system, screen shots should also be collected in order to understand the inputs and outputs of the existing system.



# Questionnaires

- Questionnaires are a research instrument that can be applied to fact finding in system development projects.
- They consist of a **series of written questions**. The questionnaire designer usually limits the range of replies that the respondent can make by giving them a choice of options.
- If there are more options, the multiple choice type of question is often used when the answer is factual, whereas scaled questions are used if the answer involves an element of subjectivity.





## Questionnaires

- Some questions do not have a fixed number of responses, and must be left open-ended for the respondent to enter what they like.
- Where the respondent has a limited number of choices, these are usually coded with a number which speeds up data entry if the responses are to be analyzed by computer software.



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