# ISTQB TRAINING
# Chapter III: Static Techniques

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# Overview

- Static test techniques provide a powerful way to improve the quality and productivity of software development
- This chapter describes static test techniques, including reviews, and provides an overview of how they are conducted
- The fundamental objective of static testing is to improve the quality of software work products by assisting engineers to recognize and fix their own defects early in the software development process


# REVIEW AND THE TEST PROCESS

# Review and the test process

- Have two approaches can be used to achieve these objectives, **static testing** and **dynamic testing**
- **Dynamic testing:** Testing that involves the execution of the software of a component or system.
- **Static testing:** Testing of a component or system at specification or implementation level without execution of that software, e.g. reviews or static code analysis
- **Review:** An evaluation of a product or project status to ascertain (xác định) discrepancies from planned results and to recommend improvements. Examples include management review, informal review, technical review, inspection, and walkthrough
- Among the questions that arise are: How can we evaluate or analyze a requirements document, a design document, a test plan, or a user manual? How can we effectively preexits the source code before execution? One powerful technique that can be used is static testing, e.g. **reviews.** In principle all software work products can be tested using review techniques.

# Review and the test process

- Types of defects that are easier to find during static testing are: deviations (độ lệch) from standards, missing requirements, design defects, non-maintainable code and inconsistent interface specifications
- In addition to finding defects, the objectives of reviews are often also informational, communicational and educational, whereby participants learn about the content of software work products to help them understand the role of their own work and to plan for future stages of development.

# Review and the test process

- To summarize, the use of static testing, e.g. reviews, on software work products has various advantages:
  - Since static testing can start early in the life cycle, early feedback on quality issues can be established, e.g. an early validation of user requirements and not just late in the life cycle during acceptance testing.
  - By detecting defects at an early stage, rework costs are most often relatively low and thus a relatively cheap (rẻ) improvement of the quality of software products can be achieved
  - Since rework effort is substantially (đáng kể) reduced (giảm), development productivity figures are likely to increase (tăng lên).
  - The evaluation by a team has the additional advantage that there is an exchange of information between the participants.
  - Static tests contribute to an increased awareness (nhận thức) of quality issues

# REVIEW PROCESS

# Review process

- **Informal review**: A review not based on a formal (documented) procedure
- **Formal review**: A review characterized by documented procedures and requirements, e.g. inspection
- **Technical review:** A peer group discussion activity that focuses on achieving consensus (nhất trí) on the technical approach to be taken
- **Inspection** (thanh tra): A type of peer review that relies (dựa vào) on visual (trực quan) examination of documents to detect defects, e.g. violations (vi phạm) of development standards and non-conformance (k phù hợp) to higher level documentation. The most formal review technique and therefore always based on a documented procedure.
- **Entry criteria:** The set of generic (đặc điểm chung) and specific conditions for permitting a process to go forward with a defined task, e.g. test phase. The purpose of entry criteria is to prevent (ngăn chặn) a task from starting which would entail more (wasted) (lảng phí) effort compared to the effort needed to remove (loại bỏ) the failed entry criteria

# Review process

- **Metric:** A measurement (đo lường) scale and the method used for measurement.
- **Moderator/Inspection leader**: The leader and main person responsible for an inspection or other review process.
- **Peer review:** A review of a software work product by colleagues of the producer of the product for the purpose of identifying (xác định) defects and improvements. Examples are inspection, technical review and walkthrough
- **Scribe:** The person who records each defect mentioned (đề cập) and any suggestions for process improvement during a review meeting, on a logging form. The scribe has to ensure that the logging form is readable and understandable
- **Walkthrough:** A step-by-step presentation by the author of a document in order to gather (thu thập) information and to establish (thiết lập) a common understanding of its content

# Review process

## 2.1 Phases of a formal review

- Planning
- Kick-off
- Preparation
- Review meeting
- Rework
- Follow-up

# Review process

**Planning**: selecting the personnel, allocating (phân bổ) roles; defining the entry and exit criteria for more formal review types (e.g. inspection); and selecting which parts of documents to look at.

- To improve the effectiveness (hiệu quả) of the review, different roles are assigned to each of the participants
- Figure 3.1 shows the different roles within a review. The roles represent views of the document under review. Within reviews the following focuses can be identified (xác định):
  - focus on higher-level documents, e.g. does the design comply to the requirements
  - focus on standards, e.g. internal consistency (nhất quán), clarity, naming conventions (quy ước), templates
  - focus on related (liên quan) documents at the same level, e.g. interfaces between soft ware functions
  - focus on usage, e.g. for testability or maintainability.

# Review process

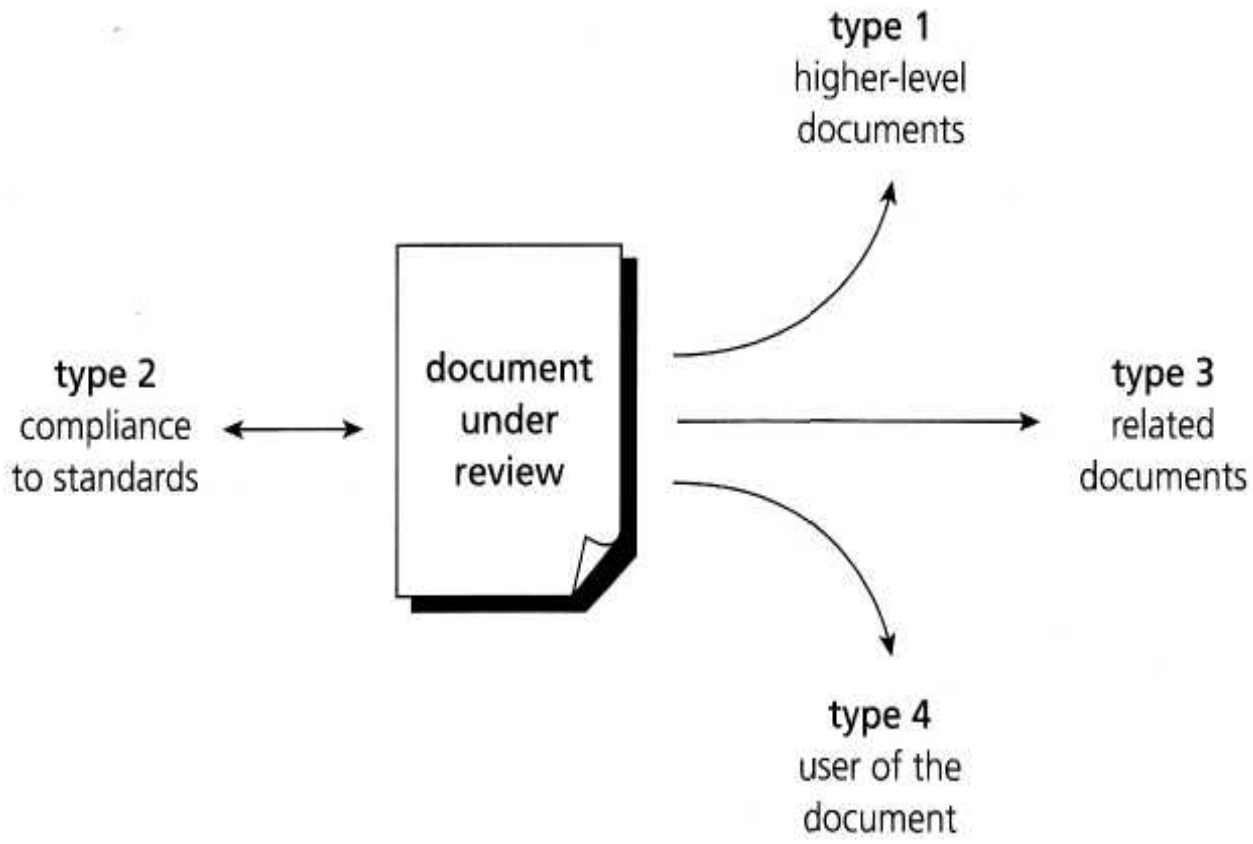


**FIGURE 3.1** Basic review roles for a document under review

# Review process

- **Kick-off**: distributing (phân loại) documents, explaining the objectives, process and documents to the participants and checking entry criteria (for more formal review types).
- **Individual (cá nhân) preparation**: work done by each of the participants on their own before the review meeting, noting potential (tiềm năng) defects, questions and comments.
- **Review meeting**: discussion or logging, with documented results or minutes (for more formal review types). The meeting participants may simply note defects, make recommendations (kiến nghị) for handling the defects, or make decisions about the defects.
- **Rework**: fixing defects found, typically done by the author.
- **Follow-up**: checking that defects have been addressed (giải quyết), gathering (thu thập) metrics and checking on exit criteria (for more formal review types).

# Review process

## 2.2 Roles and responsibilities

❖ A typical formal review will include the roles below:

- **Manager**: decides on the execution of reviews, allocates (sắp xếp) time in project schedules and determines (quyết định rõ) if the review objectives have been met (đáp ứng).
- **Moderator**: the person who leads the review of the document or set of documents, including planning the review, running the meeting, and follow-up after the meeting. If necessary, the moderator may mediate (hòa giải) between the various points of view (quan điểm) and is often the person upon whom the success of the review rests.
- **Author**: the writer or person with chief (9) responsibility (trách nhiệm) for the document(s) to be reviewed
- **Reviewers**: individuals with a specific technical or business background (also called checkers or inspectors) who, after the necessary preparation, identify (xác định) and describe findings (e.g. defects) in the product under review. Reviewers should be chosen to represent different perspectives (quan điểm) and roles in the review process, and should take part in any review meetings.
- **Scribe (or recorder):** documents all the issues, problems and open points that were identified during the meeting.

# Review process

## 2.3 Types of review

- A single document may be the subject of more than one review. If more than one type of review is used, the order may vary (thay đổi).
- **Walkthrough**

- **A walkthrough** is characterized (đặc trưng) by the author of the document under review guiding the participants through the document and his or her thought processes, to achieve (đạt được) a common understanding and to gather (thu thập) feedback

- The specific goals of a walkthrough depend on its role in the creation of the document. In general the following goals can be applicable
- To present the document to stakeholders (liên quan) both within and outside the soft ware discipline (kỷ luật), in order to gather information regarding (liên quan) the topic under documentation
- To explain (knowledge transfer) and evaluate the contents of the document
- To establish (thiết lập) a common understanding of the document
- To examine and discuss the validity of proposed solutions and the viability of alternatives (thay thế), establishing consensus (đồng thuận)
- Key characteristics:
- The meeting is led by the authors; often a separate (riêng lẻ) scribe is present
- Scenarios and dry runs may be used to validate the content.
- Separate pre-meeting preparation for reviewers is optional.

# Review process

**Technical review:**

- A **technical review** is a discussion meeting that focuses on achieving consensus (nhất trí) about the technical content of a document

**The goals of a technical review are to**:

- assess the value of technical concepts and alternatives in the product and project environment
- establish consistency (tính nhất quán) in the use and representation of technical concepts
- ensure, at an early stage, that technical concepts are used correctly
- inform participants of the technical content of the document

**Key characteristics of a technical review are:**

- It is a documented defect-detection process that involves peers and technical experts (chuyên môn).
- It is often performed as a peer review without management participation.
- Ideally it is led by a trained moderator, but possibly (có lẻ) also by a technical expert.
- A separate (tách biệt) preparation is carried out during which the product is examined and the defects are found.
- More formal characteristics such as the use of checklists and a logging list or issue log are optional.

# Review process

❖ *Inspection*

- **Inspection** is the most formal review type. The document under inspection is prepared and checked thoroughly by the reviewers before the meeting, comparing the work product with its sources and other referenced documents, and using rules and checklists

❖ The generally accepted goals of inspection are to:

- help the author to improve the quality of the document under inspection
- remove defects efficiently, as early as possible
- Improve product quality, by producing documents with a higher level of quality
- Create a common understanding by exchanging information among the inspection participants
- Train new employees in the organization's development process
- Learn from defects found and improve processes in order to prevent (ngăn ngừa) recurrence (sự phát sinh) of similar defects
- Sample a few pages or sections from a larger document in order to measure (đo lường) the typical quality of the document, leading to improved work by individuals (riêng, cá nhân) in the future, and to process improvements.

# Review process

❖ Key characteristics of an inspection are:

- It is usually led by a trained moderator (certainly not by the author).
- It uses defined roles during the process.
- It involves (bao gồm) peers to examine the product.
- Rules and checklists are used during the preparation phase.
- A separate preparation is carried out during which the product is examined and the defects are found.
- The defects found are documented in a logging list or issue log.
- A formal follow-up is carried out by the moderator applying exit criteria.
- Optionally, a causal analysis step is introduced to address process improve ment issues and learn from the defects found.
- Metrics are gathered and analyzed to optimize the process.

# Review process

### 3.2.4 Success factors for reviews

❖ Success factors for reviews include:

- Each review has a clear predefined (xác định) objective.
- The right people for the review objectives are involved.
- Defects found are welcomed, and expressed objectively (khách quan).
- People issues and psychological aspects are dealt (giải quyết) with (e.g. making it a positive experience for the author).
- Review techniques are applied that are suitable (phù hợp) to the type and level of software work products and reviewers.
- Checklists or roles are used if appropriate to increase effectiveness of defect identification.
- Training is given in review techniques, especially the more formal techniques, such as inspection.
- Management supports a good review process (e.g. by incorporating adequate time for review activities in project schedules).
- There is an emphasis (nhấn mạnh) on learning and process improvement.


# STATIC ANALYSIC BY TOOL

# Static analysic by tool

❖ ***Terms***

- **Compiler:** A software tool that translates programs expressed in a high order language into their machine language equivalents (tương đương)
- **Complexity:** The degree (mức độ) to which a component or system has a design and/or internal structure that is difficult to understand, maintain and verify (xác minh)
- **Control flow:** A sequence of events (paths) in the execution through a component or system.
- **Data flow:** An abstract representation (đại diện) of the sequence and possible changes of the state of data objects, where the state of an object is any of: creation, usage, or destruction (tiêu hủy)
- **Static analysis:** Analysis of software artifacts (sự giả tạo), e.g. requirements or code, carried out without execution of these software artifacts

# Static analysic by tool

- The objective of static analysis is to find defects in software source code and software models.
- Static analysis is performed without actually executing the software being examined by the tool, dynamic testing does execute the software code.
- Static analysis can locate defects that are hard to find in testing.
- As with reviews, static analysis finds defects rather than failures. Static analysis tools analyze program code (e.g. control flow and data flow), as well as generated output such as HTML and XML.

# Static analysic by tool

❖ The value of static analysis is:

- Early detection of defects prior (trước) to test execution.
- Early warning about suspicious aspects of the code or design, by the calculation of metrics, such as a high complexity measure.
- Identification of defects not easily found by dynamic testing.
- Detecting dependencies and inconsistencies in software models, such as links.
- Improved maintainability of code and design.
- Prevention (ngăn ngừa) of defects, if lessons are learned in development.

# Static analysic by tool

- **Typical defects discovered (phát hiện ra) by static analysis tools include:**
- Referencing a variable with an undefined value
- Inconsistent (không phù hợp) interface between modules and components
- Variables that are never used
- Unreachable (dead) code
- Programming standards violations (vi phạm)
- Security vulnerabilities
- Syntax violations of code and software models
- Static analysis tools are typically used by developers (checking against predefined rules or programming standards) before and during component and integranalysis ation testing, and by designers during software modeling. Static tools may produce a large number of warning messages, which need to be well managed to allow the most effective use of the tool.
- Compilers may offer some support for static analysis, including the calculation of metrics

# THANK YOU

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Am tường công nghệ - Thấu hiểu thông tin