

Review Process

**Revision History:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Ver. No.** | **Date** | **Amendments made** | **Author** | **Reviewed By** | **Approved By** |
| 0.1 | 21st May,2009 | Draft | Abhishek Rautela |  |  |
| 1.0 | 04th June,2009 | Baseline Version | Abhishek Rautela | Mr. Sudhir Saxena | Mr. Sudhir Saxena |
| 1.0 | 04th Nov, 2010 | Updated & Reviewed | Neha Gupta | Abhishek Rautela | Mr. Sudhir Saxena |
| 2.0 | 19th April 2011 | Update section 3 5 &7 | Smriti | Abhishek Rautela | Mr. Sudhir Saxena |
| 2.1 | 30th March, 2012 | Amendment in review process and include Review Effectiveness | Rahul Raj | Dhananjay Kumar | GM Dua |
| 2.2  | 12th Dec 2015 | Update section 7 for review process as per in line with CMMI5 requirements | Rahul Raj | Dhananjay Kumar | Ajay Kumar Zalpuri |

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# *Objective*

This guideline describes the process for conducting meeting type of Reviews and also provides guidance which Review method should be used for reviewing various types of documents and software elements. The purpose of this document is also to ensure consistent and effective procedures for all types of reviews.

# *Scope*

The scope of this guideline is limited to Technical Reviews. Managerial Review of various Projects in terms of project monitoring, Tracking etc. as well as other Managerial Meetings are beyond the scope of this document.

# *Definitions, Acronyms and Abbreviations*

|  |  |
| --- | --- |
| **Abréviations** | **Description** |
| PL | Project Leader |
| PM | Project Manager |
| QMS | Quality Management System |

**Defect:** A variation from standard and/or requirements; any non-conformance

**Inspection:** A formal evaluation technique in which software requirements, design, or code are examined in detail by a group of persons other than the author(s) to detect faults, violation of development standards, and other problems.

**Metric:** A quantitative measure of the degree to which a system, components, or process posses a given attribute.

**Reviews:** A process or meeting during which a work product, or set of work products, is presented to project personnel, managers, users, customers, or other interested parties for comment or approval. Types include code review, design review, formal qualification review, requirements review, test readiness review etc.

**Walk-through:** A static analysis technique in which a designer or programmer leads members of the development team and other interested parties through a segment of documentation or code, and the participants ask questions and make comments about possible errors, violation of development standards, and other problems.

# *Introduction*

Reviews are an effective way to improve the quality of software element(s) and the documents that describe the design, architecture, or functional requirements of a system. Reviews are conducted:

1. to detect, categorize and ensure correction of errors.
2. to ensure that the requirements are met.
3. to ensure that a formal report is created.
4. to perform analysis to ascertain the type of error, the cause and the incidence level
5. to ensure that we are building the (i) right product (validation) and (ii) product right (verification).

Review will be technical and occur at various phases during the project life cycle.

The obvious benefit of formal reviews is the early discovery of software defects so that each defect may be corrected prior to the next step in the software engineering process.

Depending on the specific review objectives, the review’s structure, level of formality and its participants vary. Reviews have been categorized into two types. These are: **Inspection, and Structured Walkthrough.**

The methods described below are quite detailed and comprehensive. The Project Manager should adapt them as appropriate to the requirements of the project.

# *Inspection*

## **Overview**

This is one of the most comprehensive review techniques in common use. Inspection is a static analysis technique that relies on visual examination of development products to detect errors, violations of development standards, and other problems. Inspections are conducted by peers, and typically comprise of three to six participants. The inspection team is led by a moderator impartial to the software element(s) /document under examination. The moderator is not the author.

## **Objective**

The objective of the inspection is to detect and identify defects in documents / software element. This is a rigorous, formal peer (or expert) examination that does the following:

1. Verifies that the document / software element(s) satisfy its specification
2. Verify that the document/software element(s) conform to applicable standards
3. Identify deviation from standards and specifications
4. Does not examine alternatives or stylistics issues

The objective of the review is to find errors, not to fix them. The following table depicts the steps involved with their associated objectives:

|  |  |
| --- | --- |
| **Steps** | **Objectives** |
| 1. Planning / Overview
 | Communication/education |
| 1. Preparation
 | Education |
| 1. Inspection / Examination
 | Error detection |
| 1. Rework
 | Error correction |
| 1. Follow-Up
 | Ensure all error correction are applied correctly |

## **Participants**

All team members, including those with special roles, may act as inspectors. Special roles required for the inspection process are detailed below. Many roles can be combined, like any of the Inspectors can take the role of Recorder. The role of Reader can be taken by any of the inspector other than Author.

1. ***Moderator or Inspection Leader***

The moderator leads the inspection, schedules and controls the meetings, reports inspection results, and follows up on rework issues. Moderators should be trained to maintain harmony between associates with strong technical skills but weak social skills. Main responsibilities of Moderator / Inspection Leader are :

1. Ensure meeting of entry/exit criteria
2. Manage the Inspection Process
3. Accountable for effectiveness
4. Impartial
5. Good leadership skills
6. Good interpersonal/communication skills
7. Provide Training
8. Ensure preparedness
9. Control pace
10. Responsible for follow-up
11. Ideally not from project
12. ***Reader***

The reader describes the section of work products to the team members as they proceed through the inspection. The reader may paraphrase product functions and features. Main responsibilities of Reader are :

1. Understanding material
2. Paraphrase while reading
3. Set pace of inspection
4. ***Author***

The author either created or maintains the work product being inspected. The author can answer questions asked about the product during the inspection and also looks for defects. Main responsibilities of Author are :

1. Gather and distribute material
2. Provide overview/tutorial on product
3. Provide clarifications
4. Not be defensive
5. ***Inspector*s / Reviewers**

Inspector is the tester of the software item / document to be inspected. The role of the inspector is to identify and describe the defects in the software element / document. Inspectors must be knowledgeable enough to view the software element / document from different view points (for example requirements, design, code, and quality). Main responsibilities of Inspector are:

1. Understand the document / software element
2. Individually do the inspection
3. Be prepared for the inspection meeting
4. Focus on product, NOT producer
5. At least one inspector (other than author) must be an expert on the relevant standards
6. ***Recorder***

The recorder classifies and records defects and issues raised during the inspection. The moderator might perform this role for a small inspection team. Main responsibilities of Recorder are :

1. Record errors as and when detected
2. Classify errors (must know classification)
3. Wait for leader before recording
4. After each recording, read out the findings to inspection team for confirmation
5. Read out/present full list to inspection team at the end of the inspection

## **Activation**

Inspections are planned for, and documented in Project Plan. The software inspection process can be activated by the following:

1. Document/Software element(s) to be inspected is available
2. Project Plan schedule Compliance
3. Scheduled reinspection
4. Special request by Project Manager/ Head, QA/Senior Management

### Entry criteria

Before planning inspection, the following entry criteria must be met :

1. The software element(s)/document conform to Project or QMS Documentation standards in terms of content, and format.
2. All prior milestones are satisfied, as identified in the appropriate planning documents
3. All required supporting documents are available
4. All inspectors have been trained in inspection process and have gone through the standard/procedure for inspection
5. Inspection criteria (e.g. specific coding standards) is well defined and known to the members of the inspection team
6. For reinspection, all items noted on the defect list must be satisfied.

## **Inspection process**

### Planning / overview (kick-off)

During the planning step, the author assembles the inspection package materials for the moderator. The moderator is responsible for assuring that the materials meet the inspection entry criteria. The Project Manager is also responsible for assuring the selection of the inspection team and the assignment of their inspection meeting roles, for scheduling the inspection meetings, and for the distribution of the inspection materials .

If required, the overview of the document / software elements can be done through a Kick-off meeting which will be decided by the moderator based on requirements. In the kick-off meeting, the overview of the document/software element(s) to be inspected is conducted by the moderator, and the author makes the presentation. This overview is used to educate the other inspectors concerning the software element(s) and may be attended by other project personnel who could benefit from the presentation.

### Preparation

It is the individual responsibility of all inspectors to become thoroughly familiar with the document/software element, list the inspection criteria, the information provided in the overview, and the specifications.

### Inspection / Examination

The inspection meeting shall not be more than 2 hours and shall follow this schedule.

#### **Introduce meeting**

To open the meeting, the moderator introduces the participants, and describes their roles. The moderator states the purpose of the inspection and directs the inspectors to focus their efforts towards defect detection, not solution hunting. The moderator reminds the inspectors to direct their remarks to the recorder and to comment only on the product, not the author.

#### **Establish preparedness**

The moderator confirms for the individual preparation and reschedules the meeting if the inspectors are not adequately prepared.

#### **Review the inspection criteria**

The moderator reviews the inspection criteria with the team and ensures that the product has been thoroughly studied.

#### **Read document / software elements and record defects**

The reader presents the materials to the inspection team. The team examines the software element(s) keeping in view the objectives and creates the defect (error) list. This list among other items contains the description of the defect, defect severity, and the location.

#### **Review the defect list**

The integrity and the accuracy of the defect list is reviewed by the moderator at the end of the inspection meeting.

#### **Make exit decision**

At the end of the meeting the exit decision shall be clear and determine the appropriate rework needed. There may be three cases.

1. The software element / document is accepted as is or with only minor rework.
2. The moderator verifies rework before accepting it.
3. A reinspection is scheduled to verify rework after revision.

### Rework

During rework, the author revises the materials, addressing all items on the inspection defect list.

### Follow-Up

The follow up is done by Moderator by verifying rework done by the author. Moderator also ensures that all the defects have been closed. Few of the follow-up activities are:

1. Follow-up is done by the moderator
2. Moderator verifies that all defects are corrected
3. Moderator trace all defects to correction
4. Moderator asks for additional rework, if necessary
5. Approve the product, if all defects are closed

## **Exit criteria**

All the defects that are detected during inspection process must be resolved. Moderator should verify that each project shall develop its own criteria to meet the needs of its specific products and development environment.

## **Output**

The following output reports are produced in the inspection process.

1. The defect list, containing the defect location, description, and severity.
2. The Moderator inspection report containing the following.
3. The number of participants
4. Meeting duration
5. Software element(s) to be inspected.
6. The disposition of the document / software element.
7. Name of the associates who performed the specified roles

## **Auditability**

The inspected material, modified document, inspection reports, defect data are retained to provide auditability.

# *Structured Walkthrough*

## **Overview**

This is a structured review, where lots of activities are done formally and does require some preparedness. Typically used to confirm understanding test ideas, brainstorms etc. The walkthrough process primarily utilizes the experience of the walkthrough team in reviewing ideas or products. Walkthrough are most effective during the creative part of any development phase.

During the walkthrough meeting, the author makes an overview presentation of the document/software element(s) under review. This is followed by general discussion from the participants after which the presenter “walk through” the software element /document in detail. As the walkthrough progresses, errors, suggested changes, and improvements are noted and written. When the walkthrough is finished, the notes are consolidated into one report which is distributed to author for necessary correction.

## **Objective**

The objective of structured Walkthrough is to evaluate a software element/document and find defects, omissions and contradictions, to improve it and to consider alternative implementations.

Other important objectives of the structured Walkthrough process include exchange of techniques and variations, and education of the participants.

## **Participants**

1. **Presenter (normally the Producer or the Author)**

The author or producer is the person responsible for the document/software element(s) being examined, and presents the material.

1. **Coordinator or Moderator**

The walkthrough moderator is responsible for conducting a specific walkthrough, handling the administrative tasks pertaining to structured walkthrough, and ensuring that walkthrough is conducted in an orderly manner. The moderator is also responsible for preparing the Review Criteria to guide the team through the walkthrough.

1. **Secretary or Recorder**

The Recorder is responsible for writing all comments made during the walkthrough that pertain to error found, question of style, omissions, contradictions, suggestion for improvement, or alternative approaches.

1. **Reviewers**

Each member of the walkthrough team are themselves reviewers and are responsible for reviewing any input material prior to the walkthrough, and participate during the walkthrough to ensure that it meets its objectives.

## **Entry criteria**

The need for conducting Structured Walkthroughs shall be established in planning documents like Project Plan. In addition, at the request of functional management, author or management may call for the structured walkthrough. The structured walkthrough is conducted, when

1. The author of the document/software element(s) to be reviewed indicates his readiness, and is prepared to present the material. This exercise could be done in various phases/parts.
2. Associates selected for conducted structured Walkthrough have undergone training of conducting Walkthrough and are aware of the Walkthrough standard/procedures.

## **Structured walkthrough process**

The structure walkthrough process consists of the following steps:

### Planning

During the planning stage, the moderator does the following:

1. Identifies the walkthrough team
2. Schedule the meeting and selects the meeting place
3. Distribute all necessary input materials to the participants, allowing for adequate preparation time

### Examination

During the walkthrough meeting

1. The presenter makes an overview presentation of the software element(s)/document under examination.
2. The author walk through the specific document / software element(s) so that members of the walkthrough team may ask questions or raise issues regarding the document /software element(s)
3. The Recorder writes comments and decisions for inclusion in the walkthrough report.

### Follow-up

At the completion of the walkthrough, the walkthrough team may recommend a follow-up walkthrough. This follow-up would follow the standard for walkthroughs, and would at a minimum cover areas changed by the author. As the walkthrough progresses, errors, suggested changes, and improvements are noted and written. When consolidated into one report which is distributed to the participants. A copy of the report is placed in the project file for audibility.

### Exit criteria

The structured walkthrough process is complete when:

1. The entire document/software element(s) have been “walk through” in detail
2. All deficiencies, omissions, efficiency issues, suggestions for improvements have been noted
3. The walkthrough report has been issued

### Output

The output of the structured walkthrough process is a walkthrough report listing those deficiencies, omissions, efficiency issues, and suggestions for improvement that were recorded during the walkthrough.

The walkthrough report contains the following

1. Identification of the walkthrough team
2. Identification of the software element (s) / document being examined
3. Review criteria
4. List of noted deficiencies, omissions, contradictions, and suggestions for improvements
5. Any suggestion made by the walkthrough team on how to dispose of deficiencies and unresolved issues.

## **Audit ability**

The walkthrough report and other material are kept in project file to provide audit ability.

# *Review Criteria*

All the documents / software elements going for inspection/walkthrough should clearly specify the criteria against which, it will be reviewed. A sample list is given below:

| **Review Item** | **Review Criteria** |
| --- | --- |
| Requirement | Introduce Subject Matter ExpertOnsite For Requirement Gathering and analysisIntroduction of Requirement review checklist |
| Design | Traceability to Functional Specs/Contract/ Software Requirements SpecificationAdherence to Design StandardsImplementabilityPrecision & ClarityIntroduce Subject Matter Expert |
| Code | Conformance to Coding Standards (for e.g. VB, GUI Standards)Conformance to Program SpecsConformance to Change ControlsAdequacy of commentsCode EfficiencyIntroduce Subject Matter ExpertPeer review |
| Unit Test Plan | Coverage of all test casesTraceability to & coverage of Design DocumentSequencing of test casesConformance to test plan standard |
| Project Plan | Conformance to Proposal/ContractConformance to Project Plan standardsAppropriateness of development methodology & processScope of planRisk Planning |
| System Test Plan | Conformance to requirementsSequencing of test casesConformance to test plan standardCoverage of all test cases |
| Data Points | Review target Set through Whatif AnalysisReview Normality and IMR ChartReview Process CababilityReview CBA (Cost Benefit Analysis)Review ANNOVA for Defect in project |

# *Selection Of Review Techniques*

All the Project deliverables to customers as well as Project Plan, Requirements & Design Documents should be inspected, whereas all other types of documents/software elements should be walkthrough.

The sample list for conducting Reviews for various documents/software elements are given below.

|  |  |
| --- | --- |
| **Document** | **Review Type** |
| Project Plan | Inspection |
| SRS\* | Inspection |
| Design (HLD, LLD, DDS) \* | Inspection |
| Code | StructuredWalkthrough or Inspection |
| User Manual | Inspection / Structured Walkthrough |
| Test Cases | Structured Walkthrough / Inspection |
| Test Plan | Structured Walkthrough / Inspection |
| Test Reports | Structured Walkthrough / Inspection |

1. Complete document should be inspected, whereas intermittent document may be structured walkthrough

# *Guidelines for Effective Inspection and Structured Walkthrough*

The following shall represent a minimum set of guidelines for conducting effective inspection, structured walkthrough or phase-end-review.

1. Review the product, not the producer

The review leader should conduct the review meeting to ensure that the proper tone and attitude are maintained.

1. Use standards to avoid disagreement over style

The standards mentioned in this document should be adhered in order to maintain decorum in the review meeting. The arguments over the style of the product can be minimized by following these standards.

1. Set an agenda and maintain it

A review must be kept on track and on schedule. The review leader is chartered with the responsibility for maintaining the meeting schedule.

1. Keep the walkthrough short

Walkthrough are mentally fatiguing and reviewers cannot expect to maintain their concentration for more than an hour or two hours at the very most.

1. Limit debate and rebuttal

When an issue is raised by the reviewer, there may not be universal agreement on its impact. Rather than spending time debating the question, the issue should be recorded for further discussions off-line.

1. Enunciate problem areas, but don’t attempt to solve every problem noted

A review is not a problem-solving session. Problem-solving should be postponed until after the review meeting.

1. Take written notes

Written notes should be taken keeping in view proper wording and prioritization of the review information.

1. Limit the number of participants

Keep the number of people involved to the necessary minimum to allow the meeting to be more fruitful.

1. Insist upon advance preparation

All review team members must prepare in advance. Written comments should be solicited by the review leader.

1. Develop a checklist for each product to be reviewed

A checklist helps the review leader to structure the review meeting and helps each reviewer to focus on important issues.

1. Review complete pieces of a product

Don’t walk through “fragments” of a product. It should be complete specification, design, or the code for the entire program or system or a meaningful sub-system that can be reviewed in isolation from the rest of the system.

1. Allocate resources and time schedule

For reviews to be effective, they should be scheduled as tasks during the software engineering process. In addition, time should be scheduled for the inevitable modifications that will occur as a result of a review.