IEEE Standard for Software Reviews

IEEE Std 1028-2008
15 August 2008
Revision of IEEE Std 1028-1997

Content

1. Purpose
2. Application Intent
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4. Conformance
5. Organization
6. Types of Reviews
7. Differences between types of reviews
Systematic Software Reviews

• The standard provides minimum acceptable requirements for systematic reviews:
  – Team participation
  – Documented results of the review
  – Documented procedures for conducting the review

• The standard is not intended to discourage or prohibit the use of non-systematic reviews

Purpose and Scope

• The standard defines how to carry out a review
• Five types of reviews are described
  1. Management Reviews
  2. Technical Reviews
  3. Inspections
  4. Walk-through
  5. Audits

• Defines procedures for the execution of each review type
• The standard does not define
  – The need to conduct specific reviews
  – Procedures for determining the necessity for a review
    • Defined in other standards, e.g. IEEE, ISO standard
  – Disposition of the results
**Application Intent**

1. Standard applies throughout the scope of any software life-cycle model
2. Maximum benefit by planning them early in the project life cycle
3. Can be used where software is the total system or when it is part of a larger system
4. Software reviews should exist in concert with hardware and system reviews
5. May include both personnel internal to the project and customer or acquirer and subcontractor(s)

**Conformance**

- Conformance is claimed when all mandatory actions (i.e. shall) are carried out as defined in the standard
  - Shall: express a requirement
  - Should: express a recommendation
  - May: express alternative or optional methods

- Claim for conformance should indicate the review type used
  - e.g. conforming to IEEE Std 1028-2008 for Inspections
Organization of the Standard

1. Introduction
   – Describes the objectives and overview of type of reviews

2. Responsibilities

3. Input needed to perform a review

4. Entry Criteria
   – Criteria to be met before review can begin
     • e.g. authorization, initiating event

5. Procedures:
   • e.g. planning, overview, preparation, examination, evaluation, recording, rework, follow-up

6. Exit criteria

7. Output

Application of the Standard

• Software
  1. Acquisition, i.e. an organization that acquires a system
  2. Supply, i.e. an organization that provides a system to the acquirer
  3. Development, i.e. an organization that defines, develops
  4. Operation
  5. Maintenance

• Software Products (37 are listed in the standard)
  – e.g. reports, procedures, contracts, plans, manuals, code, complaints, report data, inspection records.

• Reviews can be conducted by many means
  – e.g. telephone or video conference, group communication
Definitions

- **Anomaly**
  - Any condition that **deviates** from expectations based on **specifications**, standards, etc.

- **Review**
  - A process or meeting where a software **product is presented** for comments or approval

- **Management Review**
  - Under the **leadership** of management
  - A **systematic evaluation** of a **software process**
    - e.g. development process, acquisition process
  - Performed by or on behalf of management to:
    1. Monitor **progress**
    2. Determine **status** of plans and schedules
    3. **Confirm** requirements and their system allocation
    4. **Evaluate** effectiveness of management approaches

Technical Review

- Under the **leadership** of the **lead engineer**
- A **systematic evaluation** of a **software product**
- By a team of **qualified** personnel to **provide management** with evidence to confirm:
  1. The **suitability** of the product for its **intended use**
  2. The product **adheres** to regulations, plans, specifications and standards
  3. **Changes** are properly **implemented** and affect only those system areas identified by the change specification
- May provide **recommendations** of alternatives or **examination** of alternatives to management
Technical Review

• Responsibilities
  – Roles that shall be established
    • Decision maker, Review leader, Recorder, Technical staff.
  – Roles that may be established
    • Management staff, other team members, customer or user rep.

• Input
  – Statement of objectives, software product, plan, anomalies, review procedures

• Entry criteria
  – Authorization
    • Need shall be defined by project planning documents
    • At the request of management, SQA, system engineering according to local procedures.
      – Tech review may be used to evaluate impacts of hardware anomalies or deficiencies on software
  – Preconditions
    • Statement of objectives for the review
    • Review inputs are available

Technical Reviews

• Procedure
  1. Management preparation (plan, resources, funding, training, etc.)
  2. Planning the review (by review leader)
  3. Overview of review procedure (when requested by review leader)
  4. Overview of the software product (when requested by review leader)
  5. Preparation (prior to examination meeting)
    – Examine the product, anomalies sent to leader, to author for disposition
    – Leader gather preparation time and reschedule if appropriate.
  6. Examination (meeting)
    1. Decide on agenda
    2. Evaluate product
    3. Determine if:
      • Product is complete, conforms, properly implemented, suitable for use
      • Changes to the software product are properly implemented and affect only the specified areas;
      • The software product is suitable for its intended use:
      • Hardware anomalies or specification discrepancies exist
    4. Identify anomalies
    5. Generate list of action items
    6. Document the meeting (leader may recommend additional review)
    7. Rework/Follow-up
      – Leader shall verify that action items are closed
Technical Reviews

- **Exit criteria**
  - Review is competed when activities are accomplished and output exists

- **Output**
  - **Documented evidence** that identifies:
    - Project reviewed
    - Team members
    - Product reviewed
    - Inputs to review
    - Review objectives
    - List of resolved and unresolved software anomalies
    - List of resolved and unresolved hardware anomalies
    - List of managerial issues
    - Action items status (open, closed), ownership, target date
    - Any recommendations
    - Whether product reviewed meets regulations, standards, etc.

Walk-through

- A **static analysis** technique of a software product
- Where participants
  1. ask questions and make comments
  2. Find **anomalies**
  3. **Improve** the product
  4. Consider **alternative** implementations
  5. Evaluate **conformance** to standards or specifications

- Defined **Roles**
  - Leader, recorder, author, team member
  - **Management** position ‘over’ participants **shall not** participate
  - May be held to **educate** an audience about a software product
**Inspection**

1. A **visual examination** of a software product to **detect and identify anomalies** including errors and deviations from standards and specifications.
2. Peer examined, led by impartial and trained **facilitators**
3. Determination of **remedial** or investigative action for an anomaly is **mandatory**
4. **Solutions are not** determined during inspection meeting
5. **Management** position ‘over’ participants **shall not** participate.
6. Collection and analysis of **data** is strongly recommended

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**Focus of Types of Reviews**

[Diagram showing the overlap of Technical Review, Walk-through, Understanding, Decision Making, Defect Removal, and Inspection]

Source: Gilb & Graham, Inspection Course notes, Sept 1995.
Audits

• Purpose
  – To provide an independent evaluation of conformance of software products and processes to applicable regulations, standards, guidelines, plans, and procedures.

• Examples of software products subject to audit include:
  – Software configuration management plans, Software design descriptions, Installation procedures, Source code, Unit development folders, Software test documentation, Walk-through reports,…

• Examination
  – Examination shall consist of evidence collection and analysis with respect to the audit criteria, a closing meeting between the auditors and audited organization, and preparing an audit report.

• Evidence collection
  – The auditors shall collect evidence of conformance and non-conformance by interviewing audited organization staff, examining documents, and witnessing processes.

Audits

• Examples of non-conformance
  – Applicable regulations, standards, guidelines, plans, and procedures not used at all
  – Applicable regulations, standards, guidelines, plans, and procedures not used correctly

• Observations
  – An observation should be classified as major if the non-conformity will likely have a significant effect on product quality, project cost, or project schedule.
  – All observations shall be verified by discussing them with the audited organization before the closing audit meeting.
Audits

- **Content of Audit Report**
  1. **Purpose and scope** of the audit
  2. **Audited organization**, including location, liaison staff, and management
  3. Identification of the software **products** audited
  4. Applicable regulations, standards, guidelines, plans, and procedures used for evaluation
  5. Evaluation **criteria**
  6. Summary of auditor’s organization
  7. Summary of examination activities
  8. Summary of the planned examination activities not performed
  9. **Observation list, classified as major or minor**
  10. A summary and interpretation of the audit findings including the key items of non-conformance
  11. The type and timing of audit **follow-up activities**

- When stipulated by the audit plan, **recommendations** shall be provided

**Review Differences**

<table>
<thead>
<tr>
<th>Objective</th>
<th>Management Review</th>
<th>Technical Review</th>
<th>Inspection</th>
<th>Walk-through</th>
<th>Audit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensure Progress</td>
<td>Evaluate Conformances*</td>
<td>Find Anomalies</td>
<td>Find Anomalies Examine/Improve</td>
<td>Evaluate Compliance**</td>
<td></td>
</tr>
<tr>
<td>Number of Members</td>
<td>Unlimited</td>
<td>3-6</td>
<td>2-7</td>
<td>1-5</td>
<td></td>
</tr>
<tr>
<td>Material Size</td>
<td>Moderate to High</td>
<td>Relatively Low</td>
<td>Moderate to High</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leadership</td>
<td>Manager</td>
<td>Lead Eng.</td>
<td>Trained Facilitator</td>
<td>Facilitator or Author</td>
<td>Lead Auditor</td>
</tr>
<tr>
<td>Management Present ?</td>
<td>Yes</td>
<td>Optional</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Volume of material Checklist ?</td>
<td>Moderate to High</td>
<td>Moderate to High</td>
<td>Low</td>
<td>Low</td>
<td>Moderate to High</td>
</tr>
<tr>
<td>Checklist ?</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Output list</td>
<td>Management report</td>
<td>Technical report</td>
<td>Defect list</td>
<td>Report</td>
<td>Defect (Audit report)</td>
</tr>
</tbody>
</table>

* To specifications ** to standards
### Review Differences

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Management review</th>
<th>Technical review</th>
<th>Inspections</th>
<th>Walk-through</th>
<th>Audit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presenter</td>
<td>Project representative</td>
<td>Development Team representative</td>
<td>A reader</td>
<td>Author</td>
<td>Auditors collect and examine information provided by audited organization</td>
</tr>
<tr>
<td>Data collection</td>
<td>As required by applicable policies, standards, or plans</td>
<td>Not a formal project requirement. May be done locally.</td>
<td>Strongly recommended</td>
<td>Recommended</td>
<td>Not a formal project requirement. May be done locally.</td>
</tr>
<tr>
<td>Output</td>
<td>Management review Documentation</td>
<td>Technical review documentation</td>
<td>Anomaly list, anomaly summary, inspection documentation</td>
<td>Anomaly list, action items, decision, follow up proposal</td>
<td>Formal audit report observation, feeding deficiencies</td>
</tr>
<tr>
<td>Formal facilitator training</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes (formal auditing training)</td>
</tr>
<tr>
<td>Defined participants roles</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Use of defect checklists</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Management participates</td>
<td>Yes</td>
<td>Optional</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Customer or user representative participates</td>
<td>Optional</td>
<td>Optional</td>
<td>Optional</td>
<td>Optional</td>
<td>Optional</td>
</tr>
</tbody>
</table>

11/24/2009