**Software Configuration Management Audits**
**Part 4 – In-Process SCM Audits**

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In the first part of this article, we introduced the three different types of Software Configuration Management Audit:

- Functional Configuration Audit (FCA) (discussed in Part 2)

- Physical Configuration Audit (PCA) (discussed in Part 3)

- In-Process SCM Audits (discussed in this part of the article)

In this fourth part of the article, we will discuss In-process Software Configuration Management (SCM) audits are performed throughout the software life cycle to provide management with an ongoing independent evaluation of the:

- Adequacy of the organization's SCM policies, plans, processes and systems to meet the organization's objectives

- Ongoing compliance to those documented SCM policies, plans, processes and systems

- Ongoing conformance of the configuration items to their requirements and workmanship standards

- Effectiveness of the SCM plans, processes and systems, and their implementation (e.g., SCM training of personnel and SCM tool capabilities)

- Efficiency of resource utilization

- Identification of areas for continuous improvement to SCM plans, processes, systems and products.

In-process SCM audits are typically focused on either SCM processes or SCM baselines. Table 1 illustrates an example of a checklist for a process-focused in-process SCM audit and lists possible objective evidence-gathering techniques for each item. Table 2 illustrates an example of a checklist for a product baseline-focused in-process SCM audit and lists possible objective evidence-gathering techniques for each item.

While several suggested evidence-gathering techniques are listed for each checklist item, the level of rigor chosen for the audit will dictate which of these techniques (or other techniques) will actually be used.

Table 1 – Example Checklist and Evidence-Gathering Techniques Used During a Process-Focused In-Process Audit

| Checklist Item | Suggestions for Evidence-Gathering Techniques |
|---|---|
| 1. Are there defined SCM policies and/or standards associated with this process and are they adequate to meet the organization's defined objectives? | • Perform a document review of the SCM policies and/or standards associated with the process being audited against the organization's defined objectives<br>• Interviews with key personnel to evaluate their knowledge of the connection between SCM policies and/or standards and organizational objectives. |
| 2. Are there defined SCM project plans associated with this process and are they adequate to meet defined policies and/or standards? | • Perform a document review of a sample set of project SCM plans associated with the process being audited to evaluate adequacy against SCM policies and/or standards<br>• Interviews with key personnel to evaluate their knowledge of the connection between SCM plans and SCM policies and/or standards. |
| 3. Are the procedures and/or work instructions for the SCM processes adequate to implement defined policies, standards and/or plans? | • Perform a document review of the SCM procedures and work/instructions with the process being audited to evaluate adequacy against SCM policies, standards and/or plans. |
| 4. Does each person performing SCM tasks associated with the process have access to applicable procedures or work instructions? | • Interview a sample of personnel performing SCM tasks to evaluate their knowledge of the existence, availability, and content of the applicable procedures or work instructions. |
| 5. Are the procedures or work instructions up-to-date (latest revision)? | • Check revision numbers of the copies of procedures and work instructions in use by personnel and compare those against current baselined revisions, as interviews are conducted for checklist item 4. |
| 6. Were the entry criteria to the SCM process verified before that process began? | • Interview a sample of personnel performing tasks to determine what entry criteria were used and how they determined that those entry criteria were met before initiation the process and evaluate their answers against process requirements.<br>• Examine a sample set of the quality records (e.g., completed entry criteria checklists or meeting minutes) to ensure that entry criteria were met or the appropriate waivers/deviations exist. |
| 7. Does each person performing SCM tasks have the appropriate education, training, skills and/or experience? | • Interview a sample of personnel performing tasks to determine their knowledge/skill level or to ask about the training they received and evaluate their answers against process requirements.<br>• Examine a sample set of SCM training records to determine if the appropriate training has been provided<br>• Observe tasks being performed to ensure that they are being performed as specified. |

Table 1 – continued

| Checklist Item | Suggestions for Evidence-Gathering Techniques |
|---|---|
| 8. Does everyone performing SCM tasks comply with the policies, standards, plans, procedures, and work instructions? | • Interview a sample of personnel performing tasks to determine how they are performing activities and evaluate their answers against process requirements.<br>• Observe tasks being performed to ensure that they are being performed as specified.<br>• Examine a sample quality records (e.g., completed checklists, data records, minutes, reports) for compliance to process requirements. |
| 9. Are the correct environment, infrastructure, and tools being used to perform SCM task | • Interview a sample of personnel performing tasks to determine the environment, infrastructure, and tools being used and compare those against those documented in the SCM plans.<br>• Observe tasks being performed to ensure that the environment, infrastructure and tools are those against those documented in the SCM plans.. |
| 10. Are the environment, infrastructure, and tools utilized during the SCM task adequate to achieve conformity with the policies, standards, plans, procedures and work instructions | • Interview a sample of personnel performing tasks to determine adequacy of environment, infrastructure, and tools.<br>• Observe tasks being performed to ensure that the environment, infrastructure and tools are adequate. |
| 11. Were the exit criteria to the SCM process verified before that process was considered complete? | • Interview a sample of personnel performing tasks to determine what exit criteria were used and how they determined that those entry criteria were met before completing the process and evaluate their answers against process requirements.<br>• Examine a sample set of the quality records (e.g., completed exit criteria checklists or meeting minutes) to ensure that exit criteria were met or the appropriate waivers/deviations exist. |
| 12. Are nonconformities/defects appropriately reported and tracked to closure? | • Interview a sample of personnel performing tasks to determine how nonconformities/defects are reported and tracked to closure and evaluate their answers against process requirements.<br>• Examine a sample of quality records (e.g., nonconformance reports, corrective action reports, defect reports) and evaluate their contents against process requirements, ensuring they were tracked to closure. |
| 13. Are the appropriate records being kept? | • Examine of the existence of required quality records and their storage and retention. |

Table 2 – Example Checklist and Evidence-Gathering Techniques Used During a Product Baseline-Focused In-Process Audit

| Checklist Item | Suggestions for Evidence-Gathering Techniques |
|---|---|
| 1. Has each acquired configuration item met the appropriate acquisition criteria required for acquisition? | • Review acquisition quality records (e.g., completed acquisition criteria checklists, peer review minutes, test reports) for accuracy and completeness to ensure that acquisition criteria were met or the appropriate waivers/deviations exist. |
| 2. For each configuration item, are all the defects/anomalies reported during verification and validation activities for that item adequately resolved? | • Review a sample set of approved defects/anomaly report records for evidence of adequate resolution.<br>• Sample a set of associated verification and validation (V&V) records to ensure that any changes to the configuration items associated with the defects/anomaly resolutions were adequately re-reviewed and/or retested and regression tested, or the appropriate waivers/deviations exist. |
| 3. Has each configuration item been properly placed under configuration control? | • Examine a sample of items in the configuration management database to ensure that each item has been entered (typically this consists of ensuring that each item has been appropriately checked into a SCM tool or stored in a controlled SCM library). |
| 4. Do all of the configuration items meet their associated workmanship standards? | • Sample a set of source code modules and evaluate them against the coding standards.<br>• Sample a set of requirements and/or design models and evaluate them against the modeling standards.<br>• Sample a set of documents (or sections/pages of those documents) and evaluate them against documentation standards. |

**Conclusion**

Conducting SCM audits provides management with independent verification that the SCM processes are being complied with and that the software products are being built as required and at production, they are ready to be released.  SCM plans for each project/program should include plans for conducting these SCM audits, including schedules and resource allocations.

Standardized checklists, like the example checklists in this article, can be created for SCM audits.  The advantage of using standardized checklists include:

- Reduction of effort in recreating checklists for each audit

- Lessons learned from previous audits can be incorporated into the standardized checklists to help improve future audits

- Consistency and continuity of implementation from one audit to the next as well as complete coverage

Prior to each audit, these standardized checklists should be reviewed to ensure that they reflect any changes made in the SCM standards, policies, or plans since the last audit was conducted.  These generic checklists should also be supplemented and tailored to the exact circumstances of each individual audit.  For example, if the corrective actions against prior audit findings are being verified with the current audit, specific checklist items for those actions may be added to the checklist.  Another example might be the auditing of small projects where certain optional processes do not apply and the corresponding items should be removed from the checklist.

**References**

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