Leveraging Your ISO-based Compliance with CMMI-based Improvement

Michael West
Natural Systems Process Improvement
Principal
Organization Overview

About NSPI:

- Founded 9/11/2001
- CMMI Institute-Partner, Certified Lead Appraisers
- AS9100C Internal Auditor
- Process system design and development for CMMI, ISO/AS/TL Standards, DO-178, ITIL, PMBoK, SOX
- Delivering value-adding performance improvement results to clients in all sectors of economy
- Value-based CI³: Courage, Initiative, Intelligence, Integrity
- Author of two process improvement books, multiple articles, and delivered dozens of conference presentations, tutorials, and keynotes
Many organizations achieved and maintained ISO/AS compliance for many years before adopting the CMMI. When they adopted the CMMI, here’s what went wrong:

- The organization didn’t take time to learn what the CMMI really is and what it’s used for, and just considered it another “quality standard.”
- Uninformed leadership pushed CMMI adoption to Operations, QA, or Mission Assurance, failing to realize that it is a model for engineering and product development.
- Operations and QA tried to patch or add onto their existing QMS to accommodate engineering processes, usually failing, or even worse …
- Management wanted to believe that their QMS already accommodated the CMMI.
- CMMI appraisals were perceived to be the same as ISO/AS audits.
The Plan

Transform myths, misbeliefs, assumptions, and inaccurate interpretations into fact-based information.

Research, publish, publicize, and educate the uninformed so that they can understand the difference between standards and the CMMI, and realistically leverage the synergy between their ISO investment and CMMI investment.
The Results

Know the differences between AS9100C (ISO 9001:2010) and the CMMI in terms of:

- Purpose, structure, and intended use
- Content focus and product realization life cycle applicability
- Implementation
- Appraisals and audits

Know the leverage points
The Results

Scope and Scale

CMMI-DEV
688 pages
22 process areas
421 practices

AS9100C
33 pages
5 process areas
72 clauses
## The Results

### Purpose, Structure, and Intended Use

<table>
<thead>
<tr>
<th>CMMI-DEV</th>
<th>AS 9100C / ISO 9001:2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guidelines for improving software and systems engineering</td>
<td>Standards (requirements) primarily for production and manufacturing</td>
</tr>
<tr>
<td>Informative, but not prescriptive</td>
<td>Prescriptive, but not informative</td>
</tr>
<tr>
<td>Provides practice interpretation and implementation guidance</td>
<td>Does not provide interpretation and implementation guidance</td>
</tr>
<tr>
<td>Project and organizational performance excellence is the implicit goal of continual improvement via the CMMI.</td>
<td>The implicit goal of continual improvement in an AS9100 organization is maintaining compliance with the Standard.</td>
</tr>
</tbody>
</table>
The Results

Content Focus and Product Realization Life Cycle Applicability

Life Cycle

- CMMI-DEV: Product Design and Development
  - TS
  - VER
  - PI
  - VAL

PM and Support

- CMMI-DEV: PMC, MA, IPM, RSKM, GP 2.8s, GP 2.10s
- CMMI-DEV: CM, GP 2.6s
- CMMI-DEV: PPQA, GP 2.9s

AS9100: Production

Transition to Production Gap

- 7.1.1, 7.1.2, 8.2
- 4.2.3, 4.2.4, 7.1.3
- 8.5.2, 8.5.3
## The Results

### Content Focus and Product Realization Life Cycle Applicability

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<tr>
<th>CMMI-DEV</th>
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<tr>
<td>Focus on product engineering from requirements to transition to production</td>
<td>Primary focus is on production and manufacturing</td>
</tr>
<tr>
<td>Unit of work is based on project or program</td>
<td>Based on operations; does not incorporate units of work</td>
</tr>
<tr>
<td>Accommodates multiple life cycle models</td>
<td>Presumes waterfall life cycle model</td>
</tr>
<tr>
<td>6 process areas defining 45 practices in engineering disciplines</td>
<td>Allocates 5 paragraphs to product design and development, and does not have to be documented procedure</td>
</tr>
<tr>
<td>5 process areas define 54 practices in project management</td>
<td>Provides minimal standards for project management and risk management</td>
</tr>
<tr>
<td>5 process areas define 38 practices in process related to process development, process management, and continuous process improvement</td>
<td>Very little focus on QMS development and management; only 6 standards-based procedures are required to be documented</td>
</tr>
</tbody>
</table>
### The Results

#### Content Focus and Product Realization Life Cycle Applicability

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<tr>
<td>Via a Glossary, definitions are provided for 226 terms and phrases</td>
<td>Glossary provides definition for 4 terms, but does not define “manual” or “procedure”</td>
</tr>
<tr>
<td>ML 4 and ML 5 provide 4 process areas for quantitative process and performance improvement</td>
<td>Does not define approaches, practices or methods for quantitative process or performance improvement</td>
</tr>
<tr>
<td>Provides institutionalization goals and practices and information for establishing a managed process and a defined process</td>
<td>In general, the concept of institutionalization is not addressed; there are some leverage points</td>
</tr>
<tr>
<td>Provides components for process tailoring</td>
<td>Does not provide information for tailoring QMS performance</td>
</tr>
<tr>
<td>Provides process areas and practices for establishing and maintaining a process definition and management capability</td>
<td>Does not address establishing an organizational function to maintain the QMS</td>
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## Content Focus and Product Realization Life Cycle Applicability

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| Provides PAs and practices for four product realization support areas:  
  - Configuration Management  
  - Decision Analysis and Resolution  
  - Measurement and Analysis  
  - Process and Product QA | Provides standards for two support areas:  
  - Configuration Management  
  - Measurement and Analysis |
The Results

**Typical Implementation**

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<tr>
<td>Process focus group formed to develop and deploy organization's standard processes and process assets</td>
<td>QMS group formed to write the Quality Manual + procedures</td>
</tr>
<tr>
<td>Process group conducts process modeling workshops to first define the as-performed, and then determine CMMI gaps</td>
<td>QMS group writes a Quality Manual and procedures that mimic the Standard almost verbatim, and then expect the operations and production personnel to perform those procedures, often irrespective of what people actually do</td>
</tr>
<tr>
<td>Based on project or program characteristics, process tailoring criteria and guidelines are developed and used to tailor process implementation.</td>
<td>Because the QMS is viewed as inviolate “requirements,” programs and projects are usually prohibited from tailoring their implementation of the QMS.</td>
</tr>
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# The Results

## Typical Implementation

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<tr>
<td>Via institutionalization practices GP 2.2 and GP 2.8 in all PAs, process performance is planned and monitored.</td>
<td>AS9100C does not provide for the institutionalization of Standards-based process performance, and there is no requirement to plan and monitor process performance.</td>
</tr>
</tbody>
</table>
| Focus of PPQA implementation is to gain insight into fidelity of performed process with defined process, to improve performed process. | Focus of QA is two-fold:  
• Be the QMS “police” to ensure people perform what is defined, and  
• Conduct product, component, and material physical inspections (QE) |
| Via OPF SP 1.3, OPF SP 3.4, IPM SP 1.7 and GP 3.2 in all PAs, the organization implements and institutionalizes feedback and learning processes and systems for continuous improvement. | “Continual Improvement” (8.5) in an AS9100C organization is based on corrective and preventive action, which are oriented toward addressing process and product defects. |
## Appraisals and Audits

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<td>SCAMPI MDD is 258 pages and defines three appraisal phases, within which it defines 13 appraisal processes, within which it defines 43 appraisal activities.</td>
<td>Guidelines for Auditing Management Systems is 44 pages and defines guidelines for conducting ISO-based audits – in three areas, within which it defines 19 audit activities.</td>
</tr>
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</table>
| The bases for strength and weakness findings are a comparison of the appraised organization’s implementation of processes in relation to the reference model – the CMMI. | The bases for a conformance or nonconformance are a comparison of the auditee’s:  
  • QMS against the Standard  
  • Examples of the auditee’s implementation of its QMS/quality manual  
  • Examples of the auditee’s products and work products against customer requirements |
### The Results

#### Appraisals and Audits

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<td>The aggregation of instantiation-level weaknesses may or may not result in a weakness finding.</td>
<td>One instantiation of a nonconformance yields a nonconformance finding (equivalent to a weakness).</td>
</tr>
<tr>
<td>Appraisal (SCAMPI Class A) results in process capability and or organizational maturity level ratings.</td>
<td>Audits result in conformance or nonconformance to the Standard.</td>
</tr>
<tr>
<td>In appraisal planning, scope and sampling is Model-based, and based on the organization using defined scoping and sampling factors. Appraisal sampling is also based on the organization’s basic units (i.e., projects, programs, releases, builds).</td>
<td>Audit scope is based on the Standard, and whether the audit is a surveillance audit or a full-system recertification audit. The concept of a product realization “project” is not inherent in the Standard, and audit sampling does not require there to be a “project.”</td>
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## The Results

### Appraisals and Audits

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| Five defined characterizations are used to determine the extent to which practices are satisfied:  
  - Fully implemented  
  - Largely implemented  
  - Partially implemented  
  - Not implemented  
  - Not yet implemented | There are two determinations about the implementation of a standard: conformant or non-conformant. |
| Mini-team or full team consensus (not “majority rule”) decisions are made on the extent to which the organization satisfies the intent of Model components. | Lead Auditor makes judgments about non-conformances and their categories. |
The Results

Appraisals and Audits

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<tr>
<td>CMMI goal, capability, and maturity level ratings are based on the extent to which weaknesses, in aggregate, affect the satisfaction of a CMMI goal.</td>
<td>There is no threshold or even guideline for minor versus major nonconformities that can be used by a lead auditor to determine revocation or suspension of an organization’s registration; such decisions are solely at the discretion of the lead auditor.</td>
</tr>
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The Results

ISO 9001:2010 and CMMI-DEV Leverage Points

Process focus, definition, and improvement:

- The CMMI-DEV provides substantially more guidance for establishing and institutionalizing a persistent organizational process focus. Combine the QMS group with the EPG/SEPG to coordinate an integrated process focus and capability.

- Recognize the product realization life cycle scope of the CMMI-DEV (design and development) and AS9100 (production and manufacturing). Build one process system for end-to-end, using both the Model and the Standard as appropriate.

- Clearly define the interfaces and hand-offs of the processes and systems used for reporting and managing corrective and preventive actions (AS9100), and those used for process change or improvement requests (CMMI-DEV).
ISO 9001:2010 and CMMI-DEV Leverage Points

Process and work product quality assurance:

- Integrate processes, systems, and checklists for conducting AS9100-based audits (internal and external) with CMMI-based engineering process and work product audits. For example, establish CAR categories: process, work product, material, component.

- Define and apply the same QA effectivity measures to both process and product quality assurance.

- Link or otherwise establish traceability between CARs and process change requests.
ISO 9001:2010 and CMMI-DEV Leverage Points

Institutionalization touch-points:

- Standard 5.3, Policy relates to CMMI-DEV Generic Practice GP 2.1
- Standard 5.4.2, Quality Management System Planning relates to CMMI-DEV Generic Practice GP 2.2.
- Standard 4.2 3, Control of Documents and 4.2.4, Control of Records is related to CMMI-DEV Generic Practice 2.6.
- Standard 5.6, Management Review, is related to CMMI-DEV Generic Practices 2.8 and 2.10. However, AS9100C oriented management review is a review of the QMS procedures whereas GP 2.8 and GP 2.10 in the CMMI provides management with visibility into process performance against the defined standard processes.
- Standard 6, Resource Management, relates to CMMI-DEV Generic Practice 2.3.
- Standard 6.2.2, Competence, Training, Awareness, relates to CMMI-DEV Process Area Organizational Training (OT) and Generic Practice 2.5.
The Results

ISO 9001:2010 and CMMI-DEV Leverage Points

AS9100C Clause 7 Product Realization expansion to CMMI-DEV coverage:

- Replace this 1.5 pages in the standard with your product development OSSP, based on the 688 pages of the CMMI-DEV.
- Replace AS9100 7.1.1 Project Management with processes based on PP, PMC, IPM, RSKM, and QPM and – better yet – PMBoK practices.
- Replace AS9100 7.1.3 Configuration Management with processes based on CM and GP 2.6s in all PAs; also cover standard EIA-649.
Lessons Learned

Do:

- If you’re responsible for model adoption or standards compliance, and you don’t know something, go learn.
- Question your colleagues’ and bosses’ statements (“What’s your source?”)
- Learn vicariously from others’ experiences; be open to ideas other than your own.
- Realize the universe of process improvement is ALWAYS bigger than your knowledge and experience.
Lessons Learned

Don’t:

- Assume that what you know about process or the CMMI or a Standard is all there is to know.
- Assume that what you’ve done in the past is the “best” way to do things.
- Believe that the CMMI and an ISO-based standard are equivalent.
- Think that just because someone calls himself an “expert” that he is.
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Executive Certification, Notre Dame  
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