

CMM and ISO

The ISO 9000 standards developed by the International Standards Organization are both concerned with quality and process management. The specific ISO standard of concern to software organizations is ISO 9001.

Questions frequently asked are:

- At what CMM level is an ISO compliant organization?
- Can a Level 2 or (3) organization be considered ISO compliant?
- Should SPI be based on CMM or ISO?

ISO Series - 1

The ISO series of standards is a set of documents dealing with quality systems that can be used for external quality assurance purposes. They specify quality system requirements for use where a contract between two parties requires the demonstration of the supplier's capability to design and supply a product. The two parties could be an external client and a supplier, or they could both be internal.

ISO Series - 2

ISO 9000 is a guideline that clarifies the distinctions and interrelationships between quality concepts and provides guidelines for the selection and use of a series of international standards on quality systems that can be used for internal quality management purposes (ISO 9004) and for external quality purposes (ISO 9001, 9002, and 9003).

ISO Series - 3

The quality concepts addressed by these standards are:

- An organization should achieve and sustain the quality of the product or service produced to continually meet the purchaser's stated or implied needs
- An organization should provide confidence to its own management that the intended quality is achieved
- An organization should provide confidence to the purchaser that the intended quality is being achieved in the delivered product or service provided

Software and ISO 9001

ISO 9001, “Quality systems-Model for quality assurance in design, development, production, installation, and servicing,” is the ISO standard that applies to software development and maintenance. There is a guideline, ISO 9000-3, for applying ISO 9001 to software processes. A British guide [TickIT] for 9001 provides additional guidelines on using ISO 9000-3 and 9001 in the software area.

Mapping ISO 9001 to the CMM - 1

Here, twenty clauses of ISO 9001 are mapped to practices of CMM

1. Clause 4.1 - Management responsibility

Addressed primarily by SQA and partly by SPP and SPTO (Level 2)

2. Clause 4.2 - Quality system

Addressed primarily by SQA and SPP (Level 2)

Mapping ISO 9001 to the CMM - 2

Clause 4.3 - Contract review

Addressed primarily by RM and SPP (Level 2)

Clause 4.4 - Design control

Addressed primarily by SPE, SPP, SPTO, and PR
(Levels 2 and 3)

Clause 4.5 - Documentation and data control

Addressed primarily by SCM (Level 2)

Mapping ISO 9001 to the CMM - 3

Clause 4.6 - Purchasing

Addressed by SSM (Level 2)

Clause 4.7 - Control of customer-supplied product

Addressed weakly by ISM (Level 3). CMM change request written

Clause 4.8 - Product identification and traceability

Addressed primarily by SCM and by SPE (Levels 2 and 3)

Mapping ISO 9001 to the CMM - 4

Clause 4.9 - Process control

Addressed by SPP, SPE, and SQA (Levels 2 and 3)

Clause 4.10 - Inspection and testing

Addresses by SPE and in PR (Level 3)

Clause 4.11 - Control of Inspection, Measuring, and
Test Equipment

Addressed by SPE (Level 3)

Mapping ISO 9001 to the CMM - 5

Clause 4.12 - Inspection and test status

Addressed by SPE and SCM (Levels 2 and 3)

Clause 4.13 - Control of nonconforming product

Addressed by SPE and SCM (Levels 2 and 3)

Clause 4.14 - Corrective and preventive actions

Addressed by SCM and SQA (Level 2)

Mapping ISO 9001 to the CMM - 6

Clause 4.15 - Handling storage, packaging, and preservation delivery

Addressed partly by SCM, but actual delivery and installation not covered in present CMM (CMM change request written) (Level 2)

Clause 4.16 - Control of quality records

Addressed by SPE, SCM, and PR (Levels 2 and 3)

Mapping ISO 9001 to the CMM - 7

Clause 4.17 - Internal quality audits
Addressed by SQA (Level 2)

Clause 4.18 - Training
Addressed by TP (Level 3)

Clause 4.19 - Servicing
Not really addressed by CMM since maintenance is not a separate issue in CMM. Will be addressed in next version of CMM

Mapping ISO 9001 to the CMM - 8

Clause 4.20 - Statistical techniques

Practices described throughout CMM. Perhaps specifically addressed by OPD, QPM, and SQM (Levels 3 and 4)

Contrasting ISO 9001 and CMM - 1

Some issues in ISO 9001 are not covered in CMM, and vice versa. The levels of detail differ. Chapter 4 in ISO 9001 is 5 pages long, sections 5, 6, and 7 in ISO 9000-3 comprise 11 pages; CMM is over 500 pages long.

The ISO 9001 clauses with no strong relationship to CMM KPAs are control of customer-supplied products and handling, packaging, preservation and delivery

Contrasting ISO 9001 and CMM - 2

The clause in ISO 9001 that addresses servicing in CMM in a completely distributed fashion is significant. There is significant debate about the exact relationships to CMM for corrective and preventive action and statistical techniques.

The biggest difference is the emphasis in CMM on continuous process improvement. ISO only addresses minimum criteria for an acceptable quality system.

Contrasting ISO 9001 and CMM - 3

CMM focuses strictly on software, while ISO 9001 has includes hardware, software, processed materials, and services.

For both CMM and ISO 9001, the bottom line is “Say what you do; do what you say.”

Contrasting ISO 9001 and CMM - 4

Every Level 2 KPA is strongly related to ISO 9001

Every KPA is at least weakly related to ISO 9001

A CMM Level-1 organization can be ISO 9001 certified; that organization would have significant Level-2 process strengths and noticeable Level-3 strengths.

Contrasting ISO 9001 and CMM - 5

Given a reasonable implementation of the software process, a ISO 9001 certified organization should be at least close to CMM Level-2.

Can a CMM Level-3 organization be considered ISO 9001 compliant? Even a Level-3 organization would need to ensure that delivery and installation are addressed, but even a Level-2 organization would have comparatively little difficulty in obtaining ISO 9001 certification.

How ISO 9001 Fits into the Software World (F. Coallier, *IEEE Software*, January 1994)

ISO 9001 has a strong emphasis on traditional manufacturing quality control. It assumes products are purchased in a formal, contractual environment with detailed specifications that are correct. Such an environment is not the case for consumer or mass-market products, however, and it is naive to assume such conditions for complex products like those that incorporate software.

CMM/ISO 9001 - 1

Software products are inherently complex and challenging to scope, develop, implement, verify, validate, and maintain. This requires a total-quality approach focused on customer satisfaction and continuous improvement. In ISO 9001, continuous improvement is almost totally absent. It merely addresses the control of a nonconforming product and recommends corrective and preventive action.

CMM/ISO 9001 - 2

For an organization that develops and manufactures embedded software products, an ISO 9001 certification tells very little about its software development capability. Certification means only that some basic practices are in place.

CMM is a more comprehensive model to measure software development capability. It covers more processes and has a five-level rating system that emphasizes continuous improvement.

CMM/ISO 9001 - 3

With ISO 9001, once you are certified, your challenge is only to maintain certification.

CMM can be used as a self-assessment. ISO 9001 certification requires auditors, which places emphasis on opinions of outsiders whose abilities may be unknown or marginal. ISO certification is usually prompted because certification is needed to get contracts. CMM review is usually done to improve and involves a more detailed study than does an ISO review.

CMM/ISO 9001 - 4

ISO 9001 can still be worthwhile if:

- The auditors are good
- If the organization is CMM Level 1 or 2 because ISO 9001 covers the basics and can help the organization grow.