

ISO 9000 Certification

ISO (International Standards Organization) is a group or consortium of 63 countries established to plan and fosters standardization. ISO declared its 9000 series of standards in 1987. It serves as a reference for the contract between independent parties. The ISO 9000 standard determines the guidelines for maintaining a quality system. The ISO standard mainly addresses operational methods and organizational methods such as responsibilities, reporting, etc. ISO 9000 defines a set of guidelines for the production process and is not directly concerned about the product itself.

Types of ISO 9000 Quality Standards

The ISO 9000 series of standards is based on the assumption that if a proper stage is followed for production, then good quality products are bound to follow automatically. The types of industries to which the various ISO standards apply are as follows.

1. **ISO 9001:** This standard applies to the organizations engaged in design, development, production, and servicing of goods. This is the standard that applies to most software development organizations.
2. **ISO 9002:** This standard applies to those organizations which do not design products but are only involved in the production. Examples of these category industries contain steel and car manufacturing industries that buy the product and plants designs from external sources and are engaged in only manufacturing those products. Therefore, ISO 9002 does not apply to software development organizations.
3. **ISO 9003:** This standard applies to organizations that are involved only in the installation and testing of the products. For example, Gas companies.

How to get ISO 9000 Certification?

An organization determines to obtain ISO 9000 certification applies to ISO registrar office for registration. The process consists of the following stages:

1. **Application:** Once an organization decided to go for ISO certification, it applies to the registrar for registration.

2. **Pre-Assessment:** During this stage, the registrar makes a rough assessment of the organization.
3. **Document review and Adequacy of Audit:** During this stage, the registrar reviews the document submitted by the organization and suggest an improvement.
4. **Compliance Audit:** During this stage, the registrar checks whether the organization has compiled the suggestion made by it during the review or not.
5. **Registration:** The Registrar awards the ISO certification after the successful completion of all the phases.
6. **Continued Inspection:** The registrar continued to monitor the organization time by time.

Software Engineering Institute Capability Maturity Model (SEICMM)

The Capability Maturity Model (CMM) is a procedure used to develop and refine an organization's software development process.

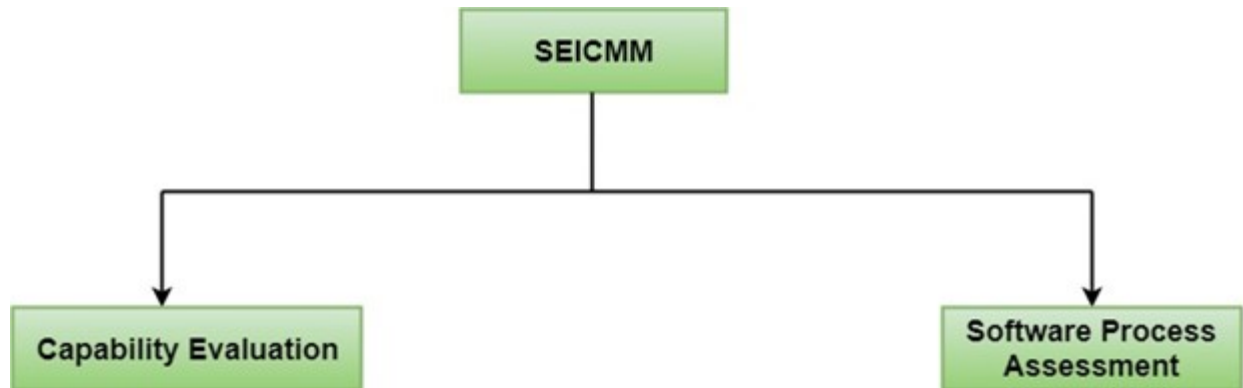
The model defines a five-level evolutionary stage of increasingly organized and consistently more mature processes.

CMM was developed and is promoted by the Software Engineering Institute (SEI), a research and development center promote by the U.S. Department of Defense (DOD).

Capability Maturity Model is used as a benchmark to measure the maturity of an organization's software process.

Methods of SEICMM

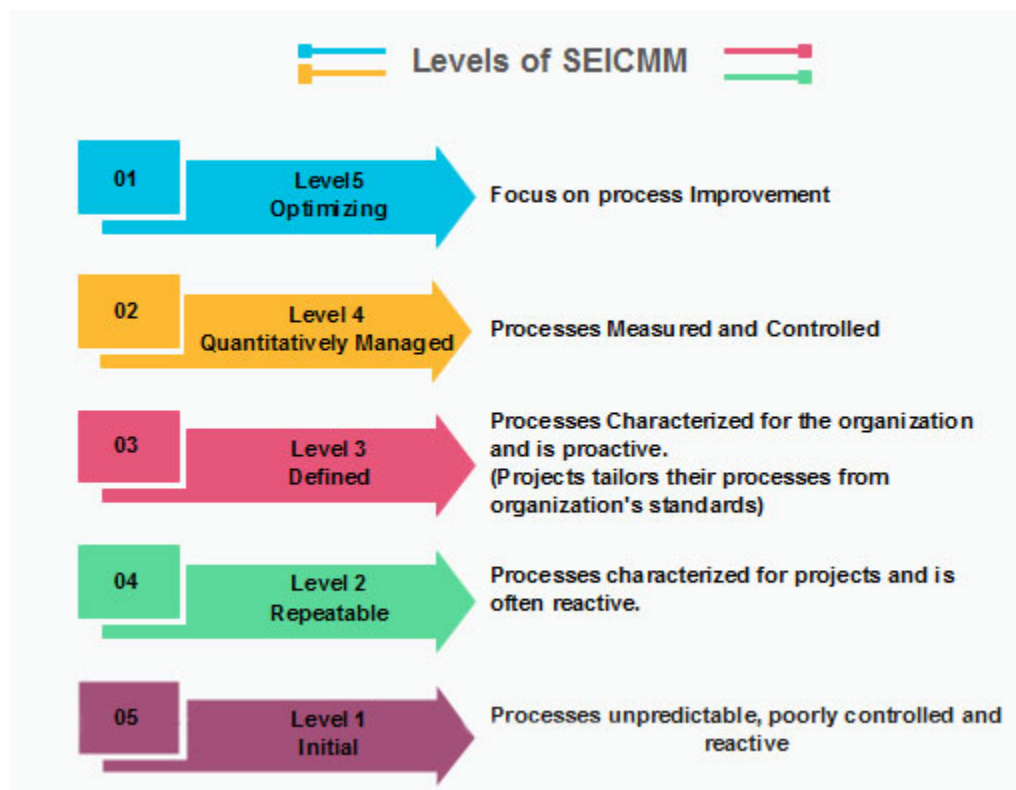
There are two methods of SEICMM:



Capability Evaluation: Capability evaluation provides a way to assess the software process capability of an organization. The results of capability evaluation indicate the likely contractor performance if the contractor is awarded a work. Therefore, the results of the software process capability assessment can be used to select a contractor.

Software Process Assessment: Software process assessment is used by an organization to improve its process capability. Thus, this type of evaluation is for purely internal use.

SEI CMM categorized software development industries into the following five maturity levels. The various levels of SEI CMM have been designed so that it is easy for an organization to build its quality system starting from scratch slowly.



Level 1: Initial

Ad hoc activities characterize a software development organization at this level. Very few or no processes are described and followed. Since software production processes are not limited, different engineers follow their process and as a result, development efforts become chaotic. Therefore, it is also called a chaotic level.

Level 2: Repeatable

At this level, the fundamental project management practices like tracking cost and schedule are established. Size and cost estimation methods, like function point analysis, COCOMO, etc. are used.

Level 3: Defined

At this level, the methods for both management and development activities are defined and documented. There is a common organization-wide understanding of operations, roles, and responsibilities. The ways through defined, the process and product qualities are not measured. ISO 9000 goals at achieving this level.

Level 4: Managed

At this level, the focus is on software metrics. Two kinds of metrics are composed.

Product metrics measure the features of the product being developed, such as its size, reliability, time complexity, understandability, etc.

Process metrics follow the effectiveness of the process being used, such as average defect correction time, productivity, the average number of defects found per hour inspection, the average number of failures detected during testing per LOC, etc. The software process and product quality are measured, and quantitative quality requirements for the product are met. Various tools like Pareto charts, fishbone diagrams, etc. are used to measure the product and process quality. The process metrics are used to analyze if a project performed satisfactorily. Thus, the outcome of process measurements is used to calculate project performance rather than improve the process.

Level 5: Optimizing

At this phase, process and product metrics are collected. Process and product measurement data are evaluated for continuous process improvement.

Key Process Areas (KPA) of a software organization

Except for SEI CMM level 1, each maturity level is featured by several Key Process Areas (KPAs) that contains the areas an organization should focus on improving its software process to the next level. The focus of each level and the corresponding key process areas are shown in the fig.

CMM Level	Focus	Key Process Areas
1. Initial	Competent People	NO KPA'S
2. Repeatable	Project Management	Software Project Planning software Configuration Management
3. Defined	Definition of Processes	Process definition Training Program Peer reviews
4. Managed	Product and Process quality	Quantitative Process Metrics Software Quality Management
5. Optimizing	Continuous Process improvement	Defect Prevention Process change management Technology change management

The focus of each SEI CMM level and the Corresponding Key process areas.

SEI CMM provides a series of key areas on which to focus to take an organization from one level of maturity to the next. Thus, it provides a method for gradual quality improvement over various stages. Each step has been carefully designed such that one step enhances the capability already built up.

People Capability Maturity Model (PCMM)

PCMM is a maturity structure that focuses on continuously improving the management and development of the human assets of an organization.

It defines an evolutionary improvement path from Adhoc, inconsistently performed practices, to a mature, disciplined, and continuously improving the development of the

knowledge, skills, and motivation of the workforce that enhances strategic business performance.

The People Capability Maturity Model (PCMM) is a framework that helps the organization successfully address their critical people issues. Based on the best current study in fields such as human resources, knowledge management, and organizational development, the PCMM guides organizations in improving their steps for managing and developing their workforces.

The People CMM defines an evolutionary improvement path from Adhoc, inconsistently performed workforce practices, to a mature infrastructure of practices for continuously elevating workforce capability.

The PCMM subsists of five maturity levels that lay successive foundations for continuously improving talent, developing effective methods, and successfully directing the people assets of the organization. Each maturity level is a well-defined evolutionary plateau that institutionalizes a level of capability for developing the talent within the organization

The five steps of the People CMM framework are:



Initial Level: Maturity Level 1

The Initial Level of maturity includes no process areas. Although workforce practices implement in Maturity Level, 1 organization tend to be inconsistent or ritualistic, virtually all of these organizations perform processes that are defined in the Maturity Level 2 process areas.

Managed Level: Maturity Level 2

To achieve the Managed Level, Maturity Level 2, managers start to perform necessary people management practices such as staffing, operating performance, and adjusting compensation as a repeatable management discipline. The organization establishes a culture focused at the unit level for ensuring that person can meet their work commitments. In achieving Maturity Level 2, the organization develops the capability to handle skills and performance at the unit level. The process areas at Maturity Level 2 are Staffing, Communication and Coordination, Work Environment, Performance Management, Training and Development, and Compensation.

Defined Level: Maturity Level 3

The fundamental objective of the defined level is to help an organization gain a competitive benefit from developing the different competencies that must be combined in its workforce to accomplish its business activities. These workforce competencies represent critical pillars supporting the strategic workforce competencies to current and future business objectives; the improved workforce practices for implemented at Maturity Level 3 become crucial enablers of business strategy.

Predictable Level: Maturity Level 4

At the Predictable Level, the organization handles and exploits the capability developed by its framework of workforce competencies. The organization is now able to handle its capacity and performance quantitatively. The organization can predict its capability for performing work because it can quantify the ability of its workforce and of the competency-based methods they use performing in their assignments.

Optimizing Level: Maturity Level 5

At the Optimizing Level, the integrated organization is focused on continual improvement. These improvements are made to the efficiency of individuals and workgroups, to the act of competency-based processes, and workforce practices and activities.