**SEI**

SEI stands for ‘Software Engineering Institute’.

SEI at Carnegie-Mellon University was started by the U.S. Defense Department to help in improving software development processes.

**CMM**

CMM stands for ‘Capability Maturity Model’. It was developed by the SEI. It’s a model of 5 levels of organizational ‘Maturity’ that determines the effectiveness in delivering quality software.

It is geared to large organizations such as large U.S. Defense Department contractors. However, many of the QA processes involved are appropriate to any organization, and if reasonably applied, they can be helpful.

Organizations can receive CMM ratings by undergoing assessments by qualified auditors.

**Level 1**– Characterized by chaos, periodic panics, and heroic efforts required by individuals to complete projects successfully. If few of any processes are in place, then successes may not be repeatable.

**Level 2** – Software project tracking, requirements management, realistic planning & configuration management processes are in place, and successful practices can be repeated.

**Level 3** – Standard software development and maintenance processes are integrated throughout an organization, a Software Engineering Process Group is in place to oversee software processes, and training programs are used to ensure understanding and compliance.

**Level 4** – Metrics are used to track productivity, processes, and products. Project performance is predictable, and quality is consistently high.

**Level 5** – The focus is on continuous process improvement. The impact of new processes and technologies can be predicted and effectively implemented when required.

**ISO**

ISO stands for ‘International Organization for Standards’.

The ISO 9001, 9002, and 9003 standards concern quality systems that are assessed by outside auditors, and they apply to many kinds of production and manufacturing organizations, and not just software.

The most comprehensive is 9001, and this is the most often used one by software development organizations. It covers documentation, design, development, production, testing, installation, servicing, and other processes.

ISO 9000-3 (not the same as 9003) is a guideline for applying ISO 9001 to software development organizations. The U.S. version of the ISO 9000 series standards is exactly the same as the international version and is called the ANSI/ASQ Q9000 series.

The U.S. version can be purchased directly from the ASQ (American Society for Quality) or the ANSI organizations. To be ISO 9001 certified, a third-party auditor assesses an organization, and certification is typically good for about 3 years, after which a complete reassessment is required.

Note that ISO 9000 certification does not show quality products necessarily, but it indicates only that documented processes are followed.

**IEEE**

IEEE stands for ‘Institute of Electrical and Electronics Engineers’.

Among the other things, creates standards such as ‘IEEE Standard for Software Test Documentation’ (IEEE/ANSI Standard 829), ‘IEEE Standard of Software Unit Testing (IEEE/ANSI Standard 1008), ‘IEEE Standard for Software Quality Assurance Plans’ (IEEE/ANSI Standard 730), and others.

**ANSI**

ANSI stands for ‘American National Standards Institute’.

ANSI is the primary industrial standards body in the U.S. that publishes some software-related standards in conjunction with the IEEE and ASQ (American Society for Quality).

|  |  |
| --- | --- |
| ISO 9000 is a set of international standards on quality management and quality assurance developed to help companies effectively document the quality system elements needed to an efficient quality system. | SEI (Software Engineering Institute), Capability Maturity Model (CMM) specifies an increasing series of levels of a software development organization. |
| Focus is customer supplier relationship, attempting to reduce customer’s risk in choosing a supplier. | Focus on the software supplier to improve its interval processes to achieve a higher quality product for the benefit of the customer. |
| It is created for hard goods manufacturing industries. | It is created for software industry. |
| ISO9000 is recognized and accepted in most of the countries. | SEICMM is used in USA, less widely elsewhere. |
| It specifies concepts, principles and safeguards that should be in place. | CMM provides detailed and specific definition of what is required for given levels. |
| This establishes one acceptance level. | It assesses on 5 levels. |
| Its certification is valid for three years. | It has no limit on certification. |
| It focuses on inwardly processes. | It focus outwardly. |
| It has no level. | It has 5 levels:   **(a).** Initial  **(b).** Repeatable  **(c).** Defined  **(d).** Managed  **(e).** Optimized |
| It is basically an audit. | It is basically an appraisal. |
| It is open to multi sector. | It is open to IT/ITES. |
| Follow set of standards to make success repeatable. | It emphasizes a process of continuous improvement. |

Processes

ISO/IEC/IEEE 12207:2017 divides software life cycle processes into four main process groups: agreement, organizational project-enabling, technical management, and technical processes. Under each of those four process groups are a variety of sub-categories, including the primary activities of acquisition and supply (agreement); configuration (technical management); and operation, maintenance, and disposal (technical).

**Agreement processes**

Here ISO/IEC/IEEE 12207:2017 includes the acquisition and supply processes, which are activities related to establishing an agreement between a supplier and acquirer. Acquisition covers all the activities involved in initiating a project. The acquisition phase can be divided into different activities and deliverables that are completed chronologically. During the supply phase a project management plan is developed. This plan contains information about the project such as different milestones that need to be reached.

**Organizational project-enabling processes**

Detailed here are life cycle model management, infrastructure management, [portfolio management](https://en.wikipedia.org/wiki/IT_portfolio_management), [human resource management](https://en.wikipedia.org/wiki/Human_resource_management), quality management, and [knowledge management](https://en.wikipedia.org/wiki/Knowledge_management) processes. These processes help a business or organization enable, control, and support the system life cycle and related projects. Life cycle model management helps ensure acquisition and supply efforts are supported, while infrastructure and portfolio management supports business and project-specific initiatives during the entire system life cycle. The rest ensure the necessary resources and quality controls are in place to support the business' project and system endeavors. If an organization does not have an appropriate set of organizational processes, a project executed by the organization may apply those processes directly to the project instead.[[1]](https://en.wikipedia.org/wiki/ISO/IEC_12207#cite_note-ISO12207-2017-1)

**Technical management processes**

ISO/IEC/IEEE 12207:2017 places eight different processes here:

[Project planning]

* Project assessment and control
* [Decision management](https://en.wikipedia.org/wiki/Decision_management)
* [Risk management](https://en.wikipedia.org/wiki/Risk_management)
* [Configuration management](https://en.wikipedia.org/wiki/Configuration_management)
* [Information management](https://en.wikipedia.org/wiki/Information_management)
* [Measurement](https://en.wikipedia.org/wiki/Measurement)
* Quality assurance

These processes deal with planning, assessment, and control of software and other projects during the life cycle, ensuring quality along the way.

**Technical processes**

The technical processes of ISO/IEC/IEEE 12207:2017 encompass 14 different processes, some of which came from the old software-specific processes that were phased out from the 2008 version.

The full list includes:

* [Business or mission analysis](https://en.wikipedia.org/wiki/Business_analysis)
* [Stakeholder](https://en.wikipedia.org/wiki/Stakeholder_(corporate)) needs and requirements definition
* Systems/Software requirements definition
* [Architecture](https://en.wikipedia.org/wiki/Information_technology_architecture) definition
* Design definition
* [System analysis](https://en.wikipedia.org/wiki/Systems_analysis)
* [Implementation](https://en.wikipedia.org/wiki/Implementation)
* [Integration](https://en.wikipedia.org/wiki/System_integration)
* [Verification](https://en.wikipedia.org/wiki/Verification_and_validation)
* [Transition](https://en.wikipedia.org/wiki/Transition_(computer_science))
* [Validation](https://en.wikipedia.org/wiki/Verification_and_validation)
* Operation
* [Maintenance](https://en.wikipedia.org/wiki/Software_maintenance)
* [Disposal](https://en.wikipedia.org/wiki/End-of-life_(product))