STDB

Introducing Standard IEEE/EIA 12207 For Software Lifecycle Processes

Objectives

- Understand the nature and structure of standard IEEE/EIA 12207
- Learn how the elements of this standard relate to each other
- Build a basis of terminology and understanding for a more in-depth understanding of this standard

Synopsis

This module is an introduction to IEEE/EIA 12207. It lays a foundation of terminology and understanding that will be helpful in learning how to apply this standard to your own projects.

The Purpose of IEEE/EIA 12207

- Establishes a common framework for software life cycle processes using well-defined terminology that can be referenced by the software industry.
- Contains processes, activities, and tasks that are to be applied during the acquisition of a software or software-based system.
- Also covers software service, development, operation, and maintenance of software products.

The Purpose of IEEE/EIA 12207

IEEE/EIA 12207 describes a common framework for software life cycle processes using well-defined terminology that can be referenced by the software industry. This standard contains processes, activities, and tasks that are to be applied during the acquisition of a software or software-based system.

IEEE?EIA also covers software service, development, operation, and maintenance of software products.

<div style="border:1px solid;">

The Purpose of IEEE/EIA 12207

- IEEE/EIA 12207.0 may be used to:
  - Acquire, supply, develop, operate, and maintain software.
  - Support the above functions in the form of quality assurance, configuration management, joint reviews,audits, verification, validation, problem resolution, and documentation.
  - Manage and improve the organization's processes and personnel.
  - Establish software management and engineering environments based upon the life cycle processes as adapted and tailored to serve business needs.
  - Foster improved understanding between customers and vendors and among the parties involved in the life cycle of a software product.
  - Facilitate world trade in software.

RICECONSULTING

</div>

The Purpose of IEEE/EIA 12207

IEEE/EIA 12207.0 has a large scope of application, including describing processes to:

- **Acquire, supply, develop, operate, and maintain software.**

    IEEE/EIA addresses the complete project lifecycle.

- **Support the above functions in the form of quality assurance, configuration management, joint reviews, audits, verification, validation, problem resolution, and documentation.**

    Not only does IEEE/EIA 12207 address the entire project lifecycle, it also describes all of the tasks needed to control and manage the lifecycle.

- **Manage and improve the organization's processes and personnel.**

    Process improvement and personnel tasks, such as staffing are also addressed in this standard.

- **Establish software management and engineering environments based upon the life cycle processes as adapted and tailored to serve business needs.**

    This standard does not prescribe a process, but gives you a framework for finding and adapting your own processes.

- **Foster improved understanding between customers and vendors and among the parties involved in the life cycle of a software product.**

    This standard provides a common level of understanding as what should be done on a project.

- **Facilitate world trade in software.**

    The goal is that the more standardized the processes, the more compatible and acceptable products will be in the global marketplace.

> **IEEE/EIA 12207 provides a process that can be employed for defining, controlling, and improving software life cycle processes.**

Major Structure of IEEE/EIA 12207

There are three major parts of IEEE/EIA 12207:

- **12207.0 Standard for Software Life Cycle Processes**

  This section contains ISO/IEC12207 in its original form and six additional annexes (E through J). This is the main body of the standard.

- **12207.1 (Draft), Guide for Life Cycle Data**

  This section provides additional guidance on recording the data that is created by the software processes. This part is very helpful in understanding which data are created in the lifecycle processes and how the data should be managed.

- 12207.2 (Draft), Guide for software life cycle processes - Implementation considerations

  This section provides guidance on applying IEEE/EIA 12207, as derived from U.S. practices.

Major Structure of IEEE/EIA 12207

IEEE/EIA 12207 has the following major sections:

1. Scope

This describes the scope of the standard.

2. Normative references

These are references that through references in this text, constitute provisions of this standard.

3. Definitions

These are terms used or referred to in this standard.

4. Application of the standard

"This clause presents the software life cycle processes that can be employed to acquire, supply, develop, operate, and maintain software products."

"The objective is to provide a road map for the users of this International Standard so that they can orient themselves in it and apply it judiciously." IEEE/EIA 12207.0-1996, 4.0.

5. Primary life cycle processes

This standard defines the primary lifecycle processes described in the standard.

6. Supporting processes

This standard defines the supporting lifecycle processes described in the standard.

7. Organizational life cycle processes

This standard defines the organizational lifecycle processes described in the standard.

8. Annexes
These ten annexes discuss topics that are related to lifecycle processes.

Annex Topics

In the annexes you will find information on:

- **Tailoring process**

  This describes the major steps to be performed in tailoring the standard.

- **Guidance on tailoring**

  This describes the initial level of tailoring needed to adapt the process for a given business or mission application.

- **Guidance on processes and organizations**

  This annex describes the processes, organizations, and their relationships under key viewpoints.

- **Bibliography**

  This annex lists a secondary source.

- **Basic concepts of IEEE/EIA Standard 12207**

  This annex explains the concepts upon which ISO/IEC 12207 was originally developed. The information in this annex is intended as an aid in understanding this standard.

- **Compliance**

  This annex describes what constitutes compliance to the standard.

- **Life cycle processes objectives**

  This annex describes the basic objectives to be considered in meeting the intent of each life cycle process defined in this standard.

- **Life cycle data objectives**

  This annex describes the basic principles to be considered in preparing data during the execution of the software life cycle processes of IEEE/EIA 12207.

- **Relationships**

  This annex describes the roles of IEEE Std 1074, ISO/IEC 12207, IEEE Std 1498, and ISO 9001.

- **Errata**

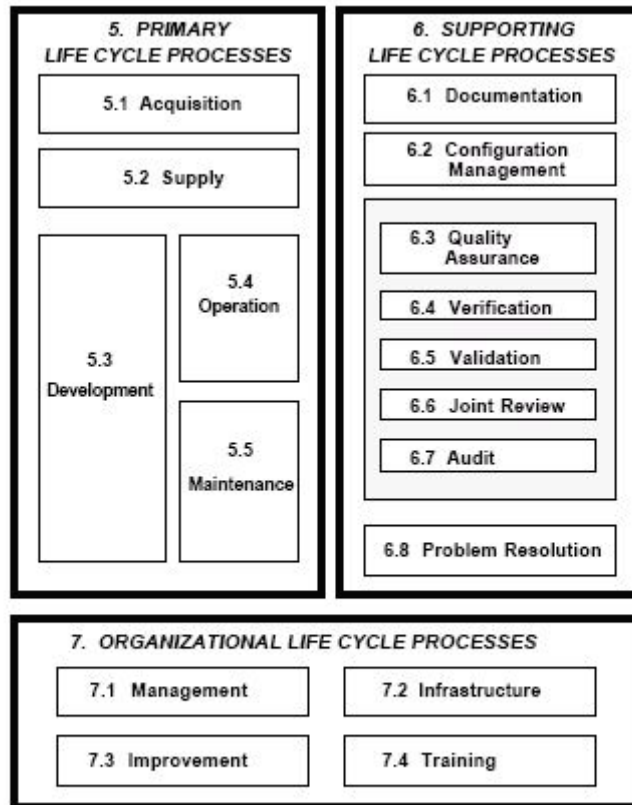 This annex describes ambiguities in the standard that were not discovered before publication.

Figure 1. Structure of this International Standard
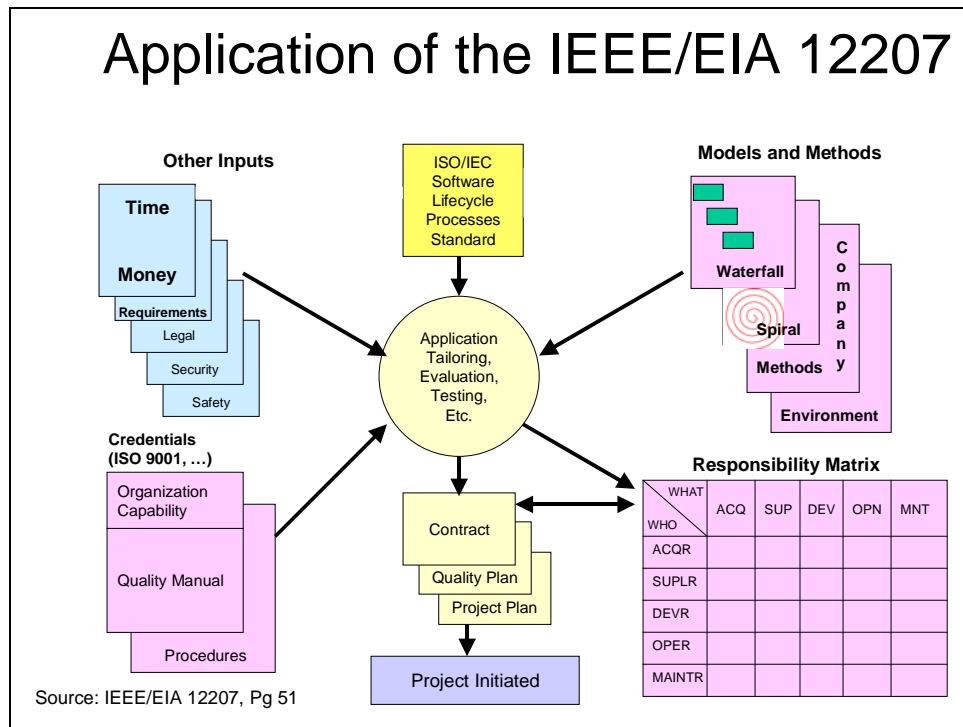
Source: IEEE/EIA 12207.0-1996, Pg 7

Structure of IEEE/EIA 12207

In the above slide we see the structure of IEEE/EIA 12207. This standard has five primary processes, eight supporting processes, and four organizational processes. Each life cycle process is divided into a set of activities; each activity is further divided into a set of tasks.

These processes are grouped into three major sections of processes:

- **Primary Life Cycle Processes**

- **Supporting Life Cycle Processes**

- **Organizational Life Cycle Processes**

We will look at all of these processes in more detail in later modules.

Application of the IEEE/EIA 12207

In this diagram from IEEE/EIA 12207.0-1996, we see how things work together to create life cycle processes and other deliverables.

Notice that the standard itself is just one of the inputs. Also needed are models and methods that are determined by organizational needs and constraints. Other inputs include resources (time and money), requirements, and constraints such as those for legality, safety and security. Also considered are organizational quality management procedures.

These items are all considered together for the process of application tailoring, evaluation, testing and other analysis activities. The deliverables are project planning documents needed to start the project.

Annex B of IEEE/EIA 12207.0-1996, which we will examine in module STDE, gives very practical guidance on tailoring and applying this standard to your organization and projects.

"No two projects are the same. Variations in organizational policies and procedures, acquisition methods and strategies, project size and complexity, system requirements and development methods, among other things, influence how a system is acquired, developed, operated, or maintained. This International Standard is written for a general project to accommodate such variations as much as possible. Therefore, in the interest of cost reduction and quality improvement, this International Standard should be tailored for an individual project. All parties involved in the project should be involved in tailoring."
IEEE/EIA 12207.0-1996

Limitations of IEEE/EIA 12207

It's important to understand the limitations of this standard. Some notable quotes from EEE/EIA 12207.0-1996 Annex E that reinforce where the standard stops and your work begins are:

- "This standard is not a substitute for systematic, disciplined management and engineering of software systems." (IEEE/EIA 12207.0-1996 Annex E Clause E.18)
- "This standard merely provides a framework where the processes, activities, and tasks related to software can be reasonably identified, planned and acted upon" (IEEE/EIA 12207.0-1996 Annex E Clause E.18)

Limitations of IEEE/EIA 12207

- "This standard contains only a set of well-defined building blocks (processes)."
- "The user of this standard should select, tailor, and assemble those processes and their activities and tasks that are cost-effective for the organization and the project." (IEEE/EIA 12207 Annex E Clause E.18)

You can learn more about creating life cycle processes in Chapter 7, pages 197 – 202.

In Other Words...

You will need to apply this standard to your own projects. IEEE/EIA 12207 does not describe the process to be used on a project. That is up to you to determine. You will need to define or adopt the processes for your organization or project.

What This Means

Software and systems projects require not only a good process, but also, discipline and the ability to manage the project. The process is the roadmap and the standard makes sure all the important things are on the map.

To Apply the Standard, You Must Know Your Current Situation and Your Objectives

Two very cogent quotes at this point are:

"If you don't know where you are, a map won't help."
Watts Humphrey

But don't forget…

"If you don't know where you're going, any place will do."
Lewis Carroll

This Means You Need...

- Project objectives (to show where you are going)
- A project plan (to show how to get there)
- Discipline to stick to the plan
- Understanding of your current situation (where you are right now)
- Flexibility to make changes when needed
- A standard to help you make sure to consider the needed tasks on the project

Prerequisites

To effectively apply 12207, you will need several other things:

- **Knowledge of organizational policies**

  This will help shape what is useful and acceptable in the context of your own organization.

- **Knowledge of the project environment**

  This will help you understand what is feasible given your project objectives and constraints. This will drive many of your tailoring decisions.

- **Understanding of the standard and how to use it**

  To apply the standard, you have to know what is in it, as well as guidelines for application.

- **Trained people**

  People must understand the purpose of the standard and how to apply it. This seldom happens without training. This implies an intentional effort to convey information to people and also a receptive attitude for people who are learning the information.

Applying the IEEE/EIA 12207 to Organizations

- IEEE/EIA 12207 is designed to serve a variety of organizations.
- Each organization must apply the standard in their own context.
- A process may be performed by one organization or more than one organization.

Applying the IEEE/EIA 12207 to Organizations

IEEE/EIA 12207 is designed to serve a variety of organizations – military, scientific, industrial, commercial, etc.

Each organization has its own points of uniqueness, so an organization must apply the standard in its own context.

Keep in mind that a process may be performed by one organization or more than one organization. This means that the same process may be deployed to multiple organizations to perform. This implies that the process should be applicable to all concerned organizations.

Applying the IEEE/EIA 12207 to Projects

- IEEE/EIA 12207 is written for large and complex projects.
- For smaller and simpler projects, the standard can be tailored.
- On the same project, the standard may be applied more than once.

Applying the IEEE/EIA 12207 to Projects

IEEE/EIA 12207 is written for large and complex projects, but can be tailored for smaller and simpler projects. On the same project, the standard may be applied more than once. An example would be a large project that has multiple lifecycle processes used by different parts of the organization.
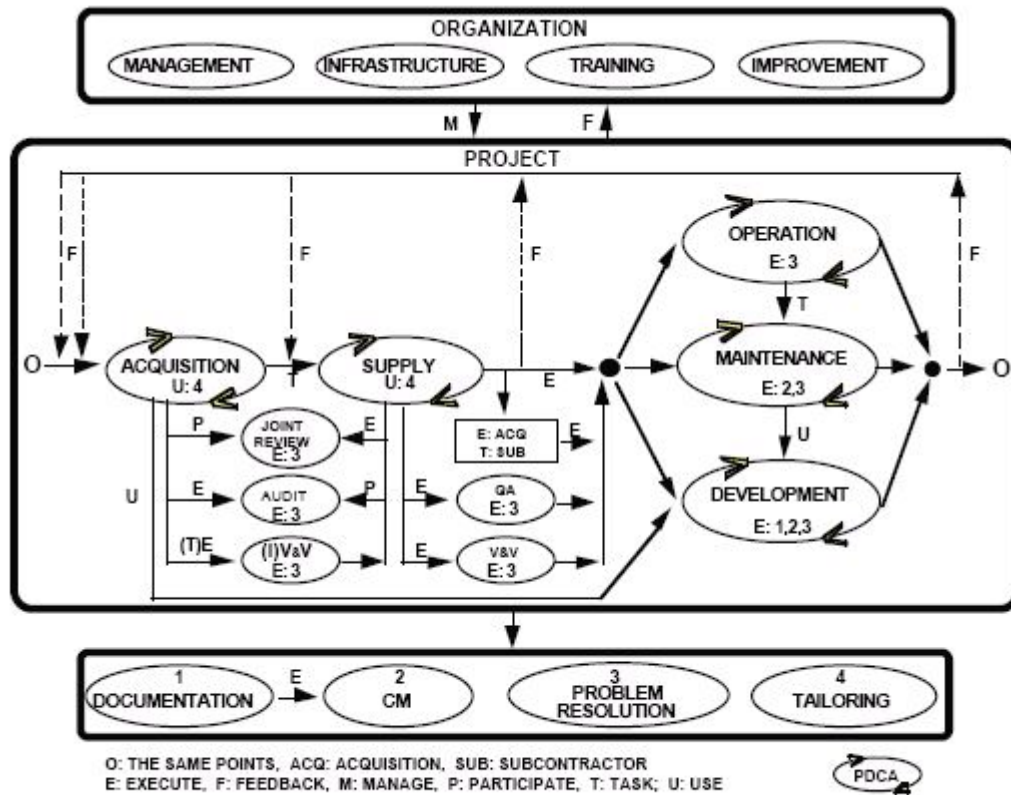
Figure E.2 The processes and their interactions

Source: IEEE/EIA 12207.0-1996 Annex E, Pg. 62

IEEE/EIA 12207 Processes and Their Interactions

This is another depiction of the processes described in IEEE/EIA 12207, Annex E. However, there is no explanation about this diagram in the standard itself. We will, however, point out some observations.

In this diagram you can see the types of interactions (feedback, management, etc.). Note that:

1. The organizational processes manage the project and receive feedback from the project.
2. The five major project activities: acquisition, supply, operation, maintenance and development are performed in a plan-do-check-act cycle, as indicated by the cycle arrows.
3. There are activities, such as joint reviews, audits, IV&V and QA to evaluate the processes and work products.
4. Each major project activity has feedback to project management.
5. Each activity has a reference to the clause in IEEE 12207 that describes it.
6. The support activities (documentation, CM, problem resolution and tailoring apply to all the project activities and tasks.