

Title: ISO/IEC 15288:2002, *Systems Engineering – System life cycle processes*  
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*Reviewer: Eva Freund*

For several years now the IEEE has been viewed as the guiding light for *software* engineering standards. And for the same period of time, those involved with system development have been clamoring for *system-* oriented standards – maybe even a set of system engineering standards comparable to the set of IEEE software engineering standards.

This year the IEEE Standards Association voted to issue this ISO/IEC 15288 standard as part of the IEEE system engineering series of standards. It will complement but not replace existing IEEE standards such as 12207-1995 which provides an overview of software engineering processes. IEEE agrees with the ISO/IEC joint task force that there exists a need for a common framework to improve communications and co-operation within the organization among those who create, utilize, and manage modern systems. The ISO/IEC 15288 provides this common framework.

This framework provides a common process covering the development lifecycle. From the initial conception of the idea, to acquiring and supplying the system, through its ultimate retirement, this standard provides a comprehensive set of processes from which any organization can apply to a system lifecycle model appropriate to its products and services. This standard describes processes that support the definition, control and improvement of new or existing processes of an organization or project. Any organization, depending on its purpose, can select and apply an appropriate subset of these processes to fulfill its purpose. For example:

- An organization can use this standard to help establish an environment of desired processes in order to manage its projects and systems through their lifecycle processes.
- A project can use this standard to help select, structure and employ the elements of an established environment to provide products and services.
- An acquirer and a supplier both can use this standard to help develop an agreement concerning processes and activities, and maintain congruity between both.

This standard identifies four essential lifecycle processes – **agreement, enterprise, project, and technical**. For each of these, the standard identifies sub-processes. The **agreement** process consists of the acquisition and supply processes.

The **enterprise** process consists of the environment management sub-process, the investment management sub-process, the system lifecycle management sub-process, the resource management sub-process and the quality management sub-process.

The **project** process consists of the sub-processes for project planning, project assessment, project control, decision-making, risk management, configuration management, and information management.

The **technical** process consists of the following sub-processes: stakeholder requirements, requirements analysis, architectural design, implementation, integration, verification, transition, validation, operation, maintenance, and disposal.

To assist you in using the standard each sub-process identifies the purpose of that sub-process, the activities to be implemented to achieve the purpose of the sub-process, and the outcomes that demonstrate the purpose of the sub-process has been met. For example, an organization looking to enhance its **quality management sub-process** will implement those activities that seek to achieve the outcomes listed below:

- Quality management policies and procedures are defined.
- Quality goals and objectives are defined.
- Accountability and authority for quality management are well defined.
- Status of customer satisfaction is monitored.
- Appropriate action is taken when quality goals are not achieved.

These outcomes will assure that the products, services and implementations of lifecycle processes meet enterprise quality goals and achieve customer satisfaction. This assurance is the purpose of the Quality Management sub-process.

This reviewer has found ISO/IEC 15288:2002 relatively user-friendly and has been using it to guide a large and complex program that uses an iterative development methodology. Thus the system as a whole will undergo a stakeholder requirements definition process, a requirements analysis process, and an architectural design process, and so forth through the operation process and finally the maintenance process. Each of the multiple iterations will undergo the same processes as appropriate and each release within the iteration will undergo the same processes, as appropriate. For example, the processes for iteration one/release one begins with a preliminary design, followed by a detailed design, and ends with the validation process because release one is not considered to be an operational release.

Looking at the process from another direction – the development of the system as a whole is actually the culmination of the development of multiple smaller *systems*. Each *sub-systems* is developed according to the processes and sub-processes. The *sub-systems* are integrated, verified, and transitioned according to the applicable processes and sub-processes. The final integration will be that of the system as a whole which will be verified, transitioned, placed into operation and maintained.

This recursive use of sub-processes is a key aspect of the application of ISO/IEC 15288. The outputs (information, artifacts, services) of sub-processes at any level become the inputs to the same sub-process used at a level above or a level below. Outputs across all levels of the system architecture can be resolved and consistency achieved.

ISO/IEC 15288 describes lifecycle processes that can be invoked, as needed, any time throughout the lifecycle without a prescribed ordering to their use, thus recognizing that an individual lifecycle is a complex system of processes that possess concurrent, iterative, recursive and time dependent characteristics.

ISO/IEC 15288 provides a level of detail not now provided by IEEE 12207-1995. In addition, it is supportive of SEI-CMM and SEI-CMMI. Thus it is applicable for program and project managers, quality managers, and verification and validation managers at all levels of the organization.