Relevant Standards

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There are a multitude of standards across a number of standards development organizations (SDOs) that are related to systems engineering and systems domains. This topic examines the types of standards and provides a summary of the relevant standards for systems engineering (SE).

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Standards Taxonomies and Types

of Standards

There are many types of standards that focus on different aspects of SE. Thus, it can be helpful to have a taxonomy that classifies the types of standards and the objective of each type. Table 1 provides the types of the current standards and a description of the types. Refer to the Modeling Standards for a list of relevant system modeling standards.

Table 1. Types of Systems Engineering Standards.
(SEBoK Original)

Standard Type	Description of Type
Concepts and Terminology	• Defines the terminology and describes the concepts of a specific domain.
Process	• Elaborates a specific process, giving normative requirements for the essential elements of the process. It may give guidance to the requirements.
Requirements	• Describes the requirements for something. • Most often used for actions, activities, or practices and not objects (see specifications).
Procedure (Practice, Activity)	• A specific procedure. Instructions or requirements on how to do something. • Sometimes a description of best practices. • Sometimes guidance and sometimes normative.
Guidance	• Usually an interpretation and guidance of a published standard.
Management System	• Requirements for management.
Specification	• Specifies the form, attributes, or properties of a subject artifact. • Usually an object and usually normative.
Reference Model	• A reference model or collection of specifications of which a reference model is composed.
Process Reference Model (PRM)	• A collection of processes necessary and sufficient to achieve a nominated business outcome.
Process Assessment Model (PAM)	• Requirements and guidance for assessing attributes of nominated processes or attributes of a nominated collection of processes.
Guide to Body of Knowledge (BOK)	• Collection and description of the current body of knowledge in a domain, or a guide to the body of knowledge.

Systems Engineering Related Standards

Summary of Systems Engineering Related Standards

Table 2 contains a summary of SE related standards. This table does not include all SE related standards, as there are many are focused on a specific domain, sector, or user group (e.g., it does not include standards from a specific government agenda). The table does include standards that are considered to be widely applicable to systems engineering and systems life cycle management system life cycle processes, such as ISO/IEC/IEEE 15288 (2015). Where available, there is a link to the official abstract for the standard.

Table 2. Summary of Systems Engineering Standards.
(SEBoK Original)

Document ID	Document Title	Organization
ISO/IEC/IEEE 15288	Systems and Software Engineering - System Life Cycle Processes	ISO/IEC/IEEE
ISO/IEC/IEEE 24765	Systems and Software Engineering - Systems and Software Engineering Vocabulary	ISO/IEC/IEEE
ISO/IEC/IEEE 42010	Systems and Software Engineering - Architecture Description	ISO/IEC/IEEE
ISO/IEC 26702 / IEEE 1220	Management of the Systems Engineering Process	ISO/IEC/IEEE
ISO/IEC/IEEE 29148	Systems and Software Engineering - Requirements Engineering	ISO/IEC/IEEE
ISO/IEC/IEEE 16085	Systems and Software Engineering - Risk Management	ISO/IEC/IEEE
ISO/IEC/IEEE 15939	Systems and Software Engineering - Measurement Process	ISO/IEC/IEEE
ISO/IEC/IEEE 16326	Systems and Software Engineering - Project Management	ISO/IEC/IEEE

prEN9277	Programme management - Guide for the management of Systems Engineering	CEN
EIA 632	Engineering of a System	TechAmerica
ISO 9001:2008	Quality Management Systems - Requirements	ISO TC 176
EIA-649-B	National Consensus Standard for Configuration Management	TechAmerica
ISO/IEC/IEEE TR 24748-1	Systems and Software Engineering - Guide to Life Cycle Management	ISO/IEC/IEEE
ISO/IEC/IEEE TR 24748-2	Systems and Software Engineering - Guide To The Application of ISO/IEC 15288:2008	ISO/IEC/IEEE
ISO/IEC/IEEE CD 24748-4	Systems and Software Engineering - Application and management of the systems engineering process	ISO/IEC/IEEE
ISO/IEC DTR 16337	Systems Engineering Handbook (INCOSE)	ISO/IEC/INCOSE
ISO/IEC/IEEE 15289:2011	Systems and Software Engineering - Content of Life-Cycle Information Products (Documentation)	ISO/IEC/IEEE
ISO/IEC/IEEE 15026-1:2010	Systems and Software Engineering - System and Software Assurance – Part 1: Concepts And Vocabulary	ISO/IEC/IEEE
ISO/IEC/IEEE 15026-2:2011	Systems and Software Engineering - System and Software Assurance – Part 2: Assurance Case	ISO/IEC/IEEE
ISO/IEC/IEEE 15026-3:2011	Systems and Software Engineering - System and Software Assurance – Part 3: Integrity Levels	ISO/IEC/IEEE
ISO/IEC/IEEE 15026-4:2012	Systems and Software Engineering - System And Software Assurance – Part 4: Assurance in the Life Cycle	ISO/IEC/IEEE JTC 1

ISO/IEC TR 90005:2008	Guidelines for the Application of ISO 9001 to Systems Life Cycle Processes	ISO/IEC JTC 1
ISO 10303-233:2012	Systems Engineering Data Interchange Standard	ISO TC 184
ECSS-E-ST-10C	Systems Engineering General Requirements	ECSS
ECSS-E-ST-10-02	Space Engineering - Verification {Note - standard is canceled}	ECSS
ECSS-E-ST-10-06	Space Engineering - Technical Requirements Specification	ECSS
ECSS-E-ST-10-24	Space Engineering - Interface Control	ECSS
ECSS-M-ST-10	Space Project Management - Project Planning and Implementation	ECSS
ECSS-M-ST-40	Space Project Management - Configuration and Information Management	ECSS
ECSS-M-00-03	Space Project Management - Risk Management	ECSS
ISO 31000:2009	Risk Management - Principles and Guidelines	ISO
ISO 31010:2009	Risk Management - Risk Assessment Techniques	ISO
ISO 19439:2006	Enterprise Integration - Framework for Enterprise Modeling	ISO
ISO 15704:2000	Requirements for Enterprise - Reference Architectures and Methodologies	ISO
EIA 748	Earned Value Management System	TechAmerica

Breadth and Level of Detail of Key Systems Engineering Related Standards

Figure 1 shows the level of detail and the coverage of the life cycle for some key standards or groups of standards.
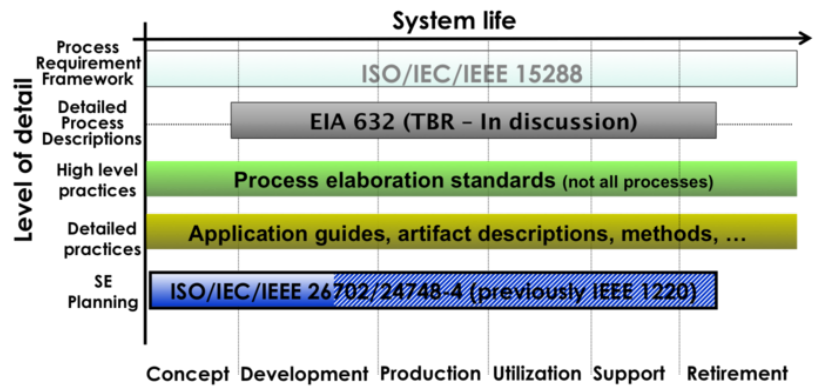
Figure 1. Breadth and Depth of Key SE Related Standards (Adapted from Roedler 2011). Reprinted with permission of Garry Roedler. All other rights are reserved by the copyright owner.

Practical Considerations

Key pitfalls and good practices related to systems engineering standards are described in the next two sections.

Pitfalls

Some of the key pitfalls encountered in the selection and use of SE standards are provided in Table 3.

Table 3. Pitfalls in Using Systems Engineering Standards. (SEBoK Original)

Pitfall Name	Pitfall Description
Turnkey Process Provision	• Expecting the standard to fully provide your SE processes without any elaboration or tailoring.
No Need for Knowledge	• Expecting that the standard can be used without any functional or domain knowledge since the standard is the product of collective industry knowledge.
No Process Integration	• Lack of integrating the standards requirements with the organization or project processes.

Good Practices

Some good practices as gathered from the references are provided in Table 4.

Table 4. Good Practices in Using Systems Engineering Standards. (SEBoK Original)

Good Practice Name	Good Practice Description

Tailor for Business Needs	• Tailor the standard within conformance requirements to best meet business needs.
Integration into Project	• Requirements of the standard should be integrated into the project via processes or product/service requirements.

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