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Systems and software engineering — Life cycle management —

Part 10: Guidelines for systems engineering agility

Ingénierie des systèmes et du logiciel — Gestion du cycle de vie —

Partie 10: Lignes directrices relatives à l'agilité de l'ingénierie des systèmes

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Foreword

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A list of all parts in the ISO/IEC/IEEE 24748 series can be found on the ISO and IEC websites.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

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Introduction

Systems engineering agility is a strategy-based method for designing, building, sustaining, and evolving purpose-fulfilling creations when knowledge is uncertain and operational environments are dynamic. Strategies are abstractions for what needs to be accomplished and why, without constraints or directions on how to achieve them. Thus, systems engineering agility is a what, not a how; a strategic intent, not a tactical method. That is, agility provides strategic direction rather than prescribing detailed methods. There are many different methods that can be adopted, adapted, or crafted to suit project contexts and organizational cultures, but all share the same goals and strategies.

This document specifies strategic aspects supporting systems engineering agility. It includes guidelines for the application of the strategic aspects as well as relevant examples. Individually and collectively, the aspects can improve capability to deal with uncertain knowledge and dynamic environments. These strategic aspects can complement life cycle models such as those described in ISO/IEC/IEEE 24748-1 and ISO/IEC/IEEE 15288, enhancing responsiveness without prescribing specific process sequences.

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Systems and software engineering — Life cycle management —

Part 10: Guidelines for systems engineering agility

1 Scope

This document:

— specifies strategic aspects supporting systems engineering agility;

— provides guidelines for their selection and application.

This document is applicable to:

— those who use or plan to use ISO/IEC/IEEE 15288 on projects dealing with human-made systems and services related to those systems and products;

— those who are responsible for the technical management of projects concerned with the engineering of systems;

— those responsible for executing ISO/IEC/IEEE 15288 system life cycle processes at a project level;

— organizations and individuals who are seeking to improve their capability to deal with uncertain knowledge and dynamic environments.

2 Normative references

There are no normative references in this document.

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO, IEC, and IEEE maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

— IEEE Standards Dictionary Online: available at https://ieeexplore.ieee.org/xpls/dictionary.jsp

NOTE For additional terms and definitions in the field of systems and software engineering, see ISO/IEC/IEEE 24765, which is published periodically as a "snapshot" of the SEVOCAB (Systems and software Engineering Vocabulary) database and which is publicly accessible at http://www.computer.org/sevocab.

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3.1.1
agile
approach to development, delivery and maintenance of products and services by enabling rapid response to feedback

[SOURCE: ISO/IEC 33202:2024, 3.2, modified — Note 1 to entry has been removed.]

3.1.2
DevOps
development and operations
set of principles and practices which enable better communication and collaboration between relevant stakeholders for the purpose of specifying, developing, and operating software and *systems* (3.1.6), products and services, and continuous improvements in all aspects of the life cycle

Note 1 to entry: Extensions include DevSecOps which addresses concerns related to security throughout development and operations, and DevStar or Dev*Ops an evolving set of principles and practices that consider multiple factors (e.g. security, safety, automation) for building better systems faster to achieve business outcomes.

[SOURCE: ISO/IEC/IEEE 32675:2022, 3.1, modified — Note 1 to entry has been added.]

3.1.3
increment
tested, deliverable version of a product that provides new or modified capabilities

[SOURCE: ISO/IEC 33202:2024, 3.17, modified — "software" has been removed.]

3.1.4
iteration
repeating the application of the same process or set of processes on the same level of the *system* (3.1.6) structure

[SOURCE: ISO/IEC/IEEE 15288:2023, 3.28]

3.1.5
modular
composed of discrete parts

[SOURCE: ISO/IEC/IEEE 24765:2017, 3.2504]

3.1.6
system
arrangement of parts or elements that together exhibit a stated behaviour or meaning that the individual constituents do not

Note 1 to entry: A system is sometimes considered as a product or as the services it provides.

Note 2 to entry: In practice, the interpretation of its meaning is frequently clarified by the use of an associative noun, e.g. aircraft system. Alternatively, the word "system" is substituted simply by a context-dependent synonym, e.g. aircraft, though this potentially obscures a system principles perspective.

Note 3 to entry: A complete system includes all of the associated equipment, facilities, material, computer programs, firmware, technical documentation, services and personnel required for operations and support to the degree necessary for self-sufficient use in its intended environment.

[SOURCE: ISO/IEC/IEEE 15288:2023, 3.46]

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3.1.7
systems engineering
SE
transdisciplinary and integrative approach to enable the successful realization, use, and retirement of engineered *systems* (3.1.6) using systems principles and concepts and scientific, technological and management methods

[SOURCE: ISO/IEC/IEEE 15288:2023, 3.50, modified — The abbreviated term "SE" has been added.]

3.1.8
systems engineering agility
strategy-based method for designing, building, sustaining, and evolving purpose-fulfilling creations when knowledge is uncertain and operational environments are dynamic.

Note 1 to entry: Strategies are abstractions for what needs to be accomplished and why, without constraints or directions on how to achieve them.

3.1.9
technical debt
deferred cost of work not performed at an earlier point in the product life cycle

3.2 Abbreviated terms

CIE	continuous integration environment
DARPA	Defense Advanced Research Project Agency
INCOSE	International Council on Systems Engineering
IPT	integrated product team
MRAP	mine-resistant ambush protected (vehicle)
NATO	North Atlantic Treaty Organization
PLM	product life cycle management
SoI	system of interest

4 Concepts

4.1 General

Systems engineering (SE) agility is a strategy-based method for designing, building, sustaining, and evolving purpose-fulfilling creations when knowledge is uncertain and operational environments are dynamic.

NOTE An example case story can be found in Annex A.

4.2 Context

The concept of successive repetitions of the process of interlaced testing and design of the system ultimately becoming the system was introduced at the 1968 NATO conference on Software Engineering[21]. In 1991, the US Department of Defense[21] funded a project to investigate what could drive competition in manufacturing enterprises after Lean manufacturing (a term related to the Toyota Production System[19]) had stabilized. That project introduced the concept of agility to describe how organizations can deal with the rapid pace of change in markets and technologies. The words agile and agility were intended in that and related subsequent work, as in this document, to simply mean what is meant when they are applied in everyday conversation to characterize anything – quick and nimble interaction and response – agility being the noun form and agile being the adjectival form.

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