

# **Software and systems Engineering Processes — Requirements and Evaluation**

## **Part 2-1**

### **Technical processes**

# **DKS 2896-2-1:2019**

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## **Part 2-1**

### **Technical processes**

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## Foreword

This Standard was prepared by the KEBS Technical Committee 94 on Software Engineering, IT Service Management, IT Governance and Artificial Intelligence, under the guidance of the Standards Projects Committee, and it is in accordance with the procedures of the Kenya Bureau of Standards.

The complexity of software systems has increased to an unprecedented level. This has led to new opportunities, but also to increased challenges for the organizations that create and utilize systems. These challenges exist throughout the life cycle of a system and at all levels of architectural detail.

This Kenya Standard provides a common process framework for describing the life cycle of systems created by humans, adopting a Systems Engineering approach. Systems Engineering is an interdisciplinary approach and means to enable the realization of successful systems.

It focuses on defining stakeholder needs and required functionality early in the development cycle, documenting requirements, then proceeding with design synthesis and system validation while considering the complete problem. It integrates all the disciplines and specialty groups into a team effort forming a structured development process that proceeds from concept to production to operation.

It considers both the business and the technical needs of all stakeholders with the goal of providing a quality product that meets the needs of users and other applicable stakeholders. This life cycle spans the conception of ideas through to the retirement of a system. It provides the processes for acquiring and supplying systems.

It helps to improve communication and cooperation among the parties that create, utilize and manage modern systems in order that they can work in an integrated, coherent fashion. In addition, this framework provides for the assessment and improvement of the life cycle processes.

This document can be used in one or more of the following modes:

- a) **By an organization** — to help establish an environment of desired processes. These processes can be supported by an infrastructure of methods, procedures, techniques, tools and trained personnel. The organization may then employ this environment to perform and manage its projects and progress software systems through their life cycle stages. In this mode, this document is used to assess conformance of a declared, established environment to its provisions.
- b) **By a project** — to help select, structure and employ the elements of an established environment to provide products and services. In this mode, this document is used in the assessment of conformance of the project to the declared and established environment.
- c) **By an acquirer and a supplier** — to help develop an agreement concerning processes and activities. Via the agreement, the processes and activities in this document are selected, negotiated, agreed to and performed. In this mode, this document is used for guidance in developing the agreement.
- d) **By process assessors** — to serve as a process reference model for use in the performance of process assessments that may be used to support organizational process improvement

The processes in this Standard form a comprehensive set from which organizations can construct system life cycle models appropriate to products and services.

During the preparation of this standard, reference was made to the following documents:

- i) ISO/IEC/IEEE 12207:2017
- ii) ISO/IEC/IEC 15288:2015
- iii) ISO/IEC 25000 Series of standards

Acknowledgement is hereby made for the assistance derived from these sources.

# Software Engineering Processes — Requirements and Evaluation — Part 2-1 — Technical processes

## 1 Scope and application

### 1.1 Scope

This document establishes a common framework for software technical processes, with well-defined terminology, that can be referenced by the software industry. It contains, activities, and tasks that are applicable during the development, operation, maintenance or disposal of software systems, products, and services.

These life cycle processes are accomplished through the involvement of stakeholders, with the ultimate goal of achieving customer satisfaction.

This document applies to the development, operation, maintenance, and disposal (whether performed internally or externally to an organization) of software systems, products and services, and the software portion of any system. Software includes the software portion of firmware. Those aspects of system definition needed to provide the context for software products and services are included.

### 1.2 Application

This document describes the processes that comprise the life cycle of man-made software systems. It therefore applies to one-of-a-kind software systems, software systems for wide commercial or public distribution, and customized, adaptable software systems. It also applies to a complete stand-alone software system and to software systems that are embedded and integrated into larger, more complex and complete systems. The purpose of this document is to provide a defined set of technical processes to facilitate communication among acquirers, suppliers and other stakeholders in the life cycle of a software system.

This document is written for acquirers, suppliers, developers, integrators, operators, maintainers, managers, quality assurance managers, and users of software systems, products, and services. It can be used by a single organization in a self-imposed mode or in a multi-party situation. Parties can be from the same organization or from different organizations and the situation can range from an informal agreement to a formal contract.

## 2 Conformance

A claim of full conformance declares the set of processes for which conformance is claimed. Full conformance to tasks is achieved by demonstrating that all of the requirements of the activities and tasks of the declared set of processes have been achieved.

**NOTE** A claim of full conformance to tasks can be appropriate in contractual situations where an acquirer or a regulator requires detailed understanding of the suppliers' processes.

## 3 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

KS 2896-1 :2019, *Software and Systems Engineering Processes — Requirements and Evaluation, Part 1 — Agreement processes — Acquisition and supply processes*

KS 2896-2-2 :2019, *Software and Systems Engineering Processes — Requirements and Evaluation, Part 2-2, — Technical evaluation*

KS 2896 -3-1: 2019, *Software and Systems Engineering Processes — Software product Quality — Part 3-1: Requirements*

KS 2896-3-2: 2019, *Software and Systems Engineering Processes — Software product Quality — Part 3-2: Product evaluation process*

## 4 Terms and definitions

For the purpose of this standard, the definitions given in Part 1 of this series of standards and those in Annex A shall apply.

## **5 Requirements for Technical Management Processes**

### **5.1 Project Planning process**

**5.1.1** The purpose of the Project Planning process is to produce and coordinate effective and workable plans.

**5.1.2** This process determines the scope of the project management and technical activities, identifies process outputs, tasks and deliverables, establishes schedules for task conduct, including achievement criteria, and required resources to accomplish tasks. This is an ongoing process that continues throughout a project, with regular revisions to plans.

<b>SL No.</b>	<b>Sub Process</b>	<b>Activities</b>	<b>Requirement</b>	<b>Reference/ Normative reference</b>
1.	<b>Define the project</b>	<ul style="list-style-type: none"> <li>Objectives and plans have been defined.</li> </ul>	Project Plan (e.g., Project Technical Management Plan, Systems or Software Engineering Management Plan, Software Development Plan, Transition Plan)	<ul style="list-style-type: none"> <li>KS ISO/IEC TS 24748-1</li> <li>The Practice Management Standard for Work Breakdown Structures of the Project Management Institute (PMI)</li> <li>KS ISO/IEC/IEEE 24748-5</li> <li>ISO/IEC/IEEE 16326</li> </ul>
2.	<b>Plan project and technical management.</b>	<ul style="list-style-type: none"> <li>Roles, responsibilities, accountabilities, and authorities are defined.</li> <li>Resources and services necessary to achieve the objectives are formally requested and committed.</li> </ul>	Work Breakdown Structure Resource Request	
3.	<b>Activate the project.</b>	<ul style="list-style-type: none"> <li>Plans for the execution of the project have been activated.</li> </ul>	Project Schedule, Infrastructure and Project Services Requirements	

### **5.2 Project assessment and control process**

**5.2.1** The purpose of the Project Assessment and Control process is to assess if the plans are aligned and feasible; determine the status of the project, technical and process performance; and direct execution to help ensure that the performance is according to plans and schedules, within projected budgets, to satisfy technical objectives.

**5.2.2** This process evaluates, periodically and at major events, the progress and achievements against requirements, plans and overall business objectives. Information is provided for management action when significant variances are detected. This process also includes redirecting the project activities and tasks, as appropriate, to correct identified deviations and variations from other technical management or technical processes. Redirection may include re-planning as appropriate

<b>SL No.</b>	<b>Sub Process</b>	<b>Activities</b>	<b>Requirement</b>	<b>Reference</b>
1.	<b>Plan for project assessment and control.</b>	<ul style="list-style-type: none"> <li>A project assessment and control strategy has been defined</li> <li>The strategy identifies planned assessment methods and timeframes, and necessary management and technical reviews.</li> </ul>	<ul style="list-style-type: none"> <li>project assessment and control strategy.</li> </ul>	<ul style="list-style-type: none"> <li>applicable organization policies and procedures</li> </ul>

SL No.	Sub Process	Activities	Requirement	Reference
2.	<b>Assess the project</b>	<ul style="list-style-type: none"> <li>Performance measures or assessment results are available.</li> <li>Adequacy of roles, responsibilities, accountabilities, and authorities have been assessed.</li> <li>Adequacy of resources is assessed.</li> <li>Technical progress reviews have been performed.</li> <li>Deviations in project performance from plans have been investigated and analysed.</li> </ul>	<ul style="list-style-type: none"> <li>Measurement Analysis Results and Recommendations</li> <li>Project Assessment Report</li> <li>Review Minutes</li> <li>Resource Request</li> </ul>	
3.	<b>Control the project.</b>	<ul style="list-style-type: none"> <li>Affected stakeholders have been informed of project status.</li> <li>Corrective action is defined and directed, when project achievement is not meeting targets.</li> <li>Project re-planning has been initiated, as necessary.</li> <li>Project action to progress (or not) from one scheduled milestone or event to the next is authorized.</li> <li>Project objectives have been achieved.</li> </ul>	<ul style="list-style-type: none"> <li>Authorization to Proceed to Next Milestone</li> </ul>	
NOTE The Project Assessment and Control process is used to reach agreement on milestone completion				

### 5.3 Decision management process

The purpose of the Decision Management process is to provide a structured, analytical framework for objectively identifying, characterizing and evaluating a set of alternatives for a decision at any point in the life cycle and select the most beneficial course of action.

SL No.	Sub Process	Activities	Requirement	Reference
1.	<b>Prepare for decisions.</b>	<ul style="list-style-type: none"> <li>Decisions requiring alternative analysis have been identified.</li> </ul>	<ul style="list-style-type: none"> <li>Decision Request</li> </ul>	<ul style="list-style-type: none"> <li>applicable organization policies and procedures</li> </ul>
2.	<b>Analyse the decision information</b>	<ul style="list-style-type: none"> <li>Alternative courses of action have been identified and evaluated.</li> </ul>	<ul style="list-style-type: none"> <li>A decision management strategy.</li> </ul>	
3.	<b>Make and manage decisions</b>	<ul style="list-style-type: none"> <li>The resolution, decision rationale and assumptions have been identified.</li> <li>A preferred course of action has been selected.</li> </ul>	<ul style="list-style-type: none"> <li>Decision Records record</li> </ul>	

### 5.4 Risk Management Process

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**5.4.1** The purpose of the Risk Management process is to identify, analyse, treat and monitor the risks continually.

**5.4.2** The Risk Management process is a continual process for systematically addressing risk throughout the life cycle of a system product or service. It can be applied to risks related to the acquisition, development, maintenance or operation of a system.

SL No.	Sub Process	Activities	Requirement	Reference
1.	<b>Plan risk management</b>	<ul style="list-style-type: none"><li>▪ A risk management strategy has been defined.</li></ul>	<ul style="list-style-type: none"><li>▪ Risk Management Plan</li></ul>	<ul style="list-style-type: none"><li>▪ KS ISO/IEC/IEEE 16085</li><li>▪ KS ISO 31000:2009</li><li>▪ KS ISO Guide 73:2009</li><li>▪ KS ISO 9001:2015 Clause 6.1.</li></ul>
2.	<b>Manage the risk profile.</b>	<ul style="list-style-type: none"><li>▪ Risks have been identified.</li></ul>	<ul style="list-style-type: none"><li>▪ Risk Profile record</li></ul>	
3.	<b>Analyze risks</b>	<ul style="list-style-type: none"><li>▪ Risks have been analysed.</li><li>▪ Risk treatment options are identified, prioritized, and selected.</li></ul>	<ul style="list-style-type: none"><li>▪ Risk Action request</li></ul>	
4.	<b>Treat risks</b>	<ul style="list-style-type: none"><li>▪ Appropriate treatment has been implemented.</li></ul>		
5.	<b>Monitor risks</b>	<ul style="list-style-type: none"><li>▪ Risks have been evaluated to assess changes in status and progress in treatment.</li></ul>		

## 5.5 Configuration Management process

The purpose of Configuration Management is to manage and control system elements and configurations over the life cycle. Configuration Management (CM) also manages consistency between a product and its associated configuration definition.

Software configuration management (SCM) applies to both the software system and its interfaces. The purpose of interface management is to agree with interface partners on the exchange of data through communications among software systems and services.

SL No.	Sub Process	Activities	Requirement	Reference
1.	<b>Plan configuration management.</b>	<ul style="list-style-type: none"><li>▪ Items requiring configuration management are identified and managed.</li></ul>	<ul style="list-style-type: none"><li>▪ A Defined configuration management plan/strategy</li></ul>	<ul style="list-style-type: none"><li>▪ KS ISO/IEC/IEEE 19770</li><li>▪ KS ISO 10007</li><li>▪ The SWEBOK, Guide to the Software Engineering Body of Knowledge</li></ul>
2.	<b>Perform configuration identification</b>	<ul style="list-style-type: none"><li>▪ Configuration baselines have been established.</li></ul>	<ul style="list-style-type: none"><li>▪ Configuration Management Procedures</li><li>▪ Configuration Management Records</li><li>▪ Configuration Baseline</li></ul>	
3.	<b>Perform configuration change management</b>	<ul style="list-style-type: none"><li>▪ Changes to items under configuration management have been controlled.</li></ul>	<ul style="list-style-type: none"><li>▪ Change/Variance Request</li></ul>	
4.	<b>Perform release control.</b>	<ul style="list-style-type: none"><li>▪ System releases and deliveries have been controlled and approved.</li></ul>	<ul style="list-style-type: none"><li>▪ System/Software Release Report</li></ul>	



SL No.	Sub Process	Activities	Requirement	Reference
5.	<b>Perform configuration status accounting.</b>	<ul style="list-style-type: none"><li>▪ Configuration status information is available.</li></ul>	<ul style="list-style-type: none"><li>▪ Configuration Status Report</li></ul>	
6.	<b>Perform configuration evaluation.</b>	<ul style="list-style-type: none"><li>▪ Required configuration audits have been completed.</li></ul>	<ul style="list-style-type: none"><li>▪ Configuration Evaluation Report</li></ul>	
NOTE The SCM strategy is commonly documented in a plan, e.g., a configuration management plan, or sometimes in a project's SEMP, SDP, or Project Management Plan (PMP).				

## 5.6 Information Management process

**5.6.1** The purpose of the Information Management process is to generate, obtain, confirm, transform, retain, retrieve, disseminate and dispose of information, to designated stakeholders.

**5.6.2** Information management plans, executes, and controls the provision of information to designated stakeholders that is unambiguous, complete, verifiable, consistent, modifiable, traceable, and presentable. Information includes technical, project, organizational, agreement, and user information. Information is often derived from data records of the organization, system, process, or project.

SL No.	Sub Process	Activities	Requirement	Reference
1.	<b>Prepare for information management.</b>	<ul style="list-style-type: none"><li>Information to be managed has been identified.</li></ul>	<ul style="list-style-type: none"><li>strategy for information management.</li></ul>	<ul style="list-style-type: none"><li>ISO/IEC/IEEE 15289</li><li>ISO/IEC/IEEE 26531</li></ul>
		<ul style="list-style-type: none"><li>Information representations have been defined.</li></ul>	<ul style="list-style-type: none"><li>Information Item Archive</li></ul>	
2.	<b>Perform information management</b>	<ul style="list-style-type: none"><li>Information has been obtained, developed, transformed, stored, validated, presented, and disposed of.</li></ul>	<ul style="list-style-type: none"><li>Information Management Procedures</li></ul>	
		<ul style="list-style-type: none"><li>The status of information has been identified.</li></ul>		
		<ul style="list-style-type: none"><li>Information has been made available to designated stakeholders.</li></ul>	<ul style="list-style-type: none"><li>Information Management Report</li></ul>	
NOTE 1 Managed information has these quality characteristics: unambiguous, complete, verifiable, consistent, modifiable, traceable, and presentable.				

## 5.7 Measurement process

The purpose of the Measurement process is to collect, analyse, and report objective data and information to support effective management and demonstrate the quality of the products, services, and processes.

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SL No.	Sub Process	Activities	Requirement	Reference
	Prepare for measurement	<ul style="list-style-type: none"><li>Information needs are identified.</li></ul>	Measurement strategy	<ul style="list-style-type: none"><li>KS ISO/IEC 15939</li><li>KS ISO 9001:2015</li></ul>
		<ul style="list-style-type: none"><li>An appropriate set of measures, based on the information needs, is identified or developed.</li></ul>	Measurement Records	
	Perform measurement	<ul style="list-style-type: none"><li>Required data is collected, verified, and stored.</li></ul>	Measurement Procedures	
		<ul style="list-style-type: none"><li>The data is analyzed and the results interpreted.</li></ul>	Measurement Information Needs Report	
		<ul style="list-style-type: none"><li>Information items provide objective information that supports decisions</li></ul>	Measurement Report	
NOTE Measures have these quality characteristics: verifiable, meaningful, actionable, timely, and cost-effective.				

### 5.8 Quality Assurance process

**5.8.1** The purpose of the Quality Assurance process is to help ensure the effective application of the organization's Quality Management process to the project.

**5.8.2** Quality Assurance focuses on providing confidence that quality requirement will be fulfilled. Proactive analysis of the project life cycle processes and outputs is performed to assure that the product being produced will be of the desired quality and that organization and project policies and procedures are followed.

SL No.	Sub Process	Activities	Requirement	Reference
	Prepare for quality assurance <sup>1</sup>	▪ Project quality assurance procedures are defined and implemented.	Quality Assurance strategy	▪ IEEE Std 730-2014 ▪ ISO/IEC 25010 ▪ ISO/IEC 25030 ▪ ISO/IEC TS ▪ 24748-1:2016, Annex C
		▪ Criteria and methods for quality assurance evaluations have been defined.		
	Perform product or service evaluations <sup>2</sup>	▪ Evaluations of the project's products, services, and processes have been performed, consistent with quality management policies, procedures, and requirements.	Quality Assurance Procedures	
	Perform process evaluations			
	Manage QA records and reports	▪ Results of evaluations have been provided to relevant stakeholders.	Quality Assurance Evaluation Report	

	<b>Treat incidents and problems</b>	<ul style="list-style-type: none"><li>Incidents have been resolved.</li></ul>	Incident Record	
		<ul style="list-style-type: none"><li>Prioritized problems have been treated</li></ul>	Problem Records	
<p>NOTE 1 to Table In software projects, activities and tasks that have significant impact on product quality include obtaining agreement on new and changed requirements, performance of peer reviews and unit testing, analysis of problem reports and feedback from users; validating completion of corrective actions assigned at project milestone reviews, and root cause analysis of defects.</p> <p>NOTE 2 to Table This task includes verifying if criteria for product or service acceptance are reflected in verification and validation activities. Derived system/software quality requirements are usually associated with quality characteristics during requirements definition processes. ISO/IEC 25010 and ISO/IEC 25030 provide additional information on system/software quality characteristics.</p> <p>NOTE 3 Consider items such as a collaborative software development environment, process measures that suppliers are required to provide, or a risk process that suppliers are required to use. This includes surveillance reviews of process implementation through the supply chain.</p>				

## 6 Requirements for Technical Processes

The Technical processes are used to define the requirements for a software system, to transform the requirements into an effective product, to permit consistent reproduction of the product where necessary, to use the product to provide the required services, to sustain the provision of those services, and to dispose of the product when it is retired from service.

### 6.1 Business or Mission Analysis process

The purpose of the Business or Mission Analysis process is to define the business or mission problem or opportunity, characterize the solution space, and determine potential solution class(es) that could address a problem or take advantage of an opportunity.

SL No.	Sub Process	Activities	Requirement	Reference
	Prepare for Business or Mission Analysis	<ul style="list-style-type: none"><li>Define the business or mission analysis strategy.</li></ul>	<ul style="list-style-type: none"><li>Mission analysis strategy.</li></ul>	<ul style="list-style-type: none"><li>KS ISO/IEC/IEEE 42010.</li><li></li></ul>
	Define the problem or opportunity space	<ul style="list-style-type: none"><li>The problem or opportunity space has been defined</li></ul>	<ul style="list-style-type: none"><li>Preliminary Life Cycle Concept</li></ul>	
	Characterize the solution space	<ul style="list-style-type: none"><li>The solution space has been characterized</li></ul>		
		<ul style="list-style-type: none"><li>Preliminary operational concepts and other concepts in the life cycle stages have been defined</li></ul>		
	Evaluate alternative solution classes	<ul style="list-style-type: none"><li>Candidate alternative solution classes have been identified and analyzed</li></ul>	<ul style="list-style-type: none"><li>Solution Alternative Classes Assessment Report</li></ul>	
		<ul style="list-style-type: none"><li>The preferred candidate alternative solution class(es) have been selected</li></ul>		
	Manage the business or mission analysis	<ul style="list-style-type: none"><li>Any enabling systems or services needed for business or mission analysis have been made available.</li></ul>		
		<ul style="list-style-type: none"><li>Traceability of business or mission problems and opportunities and the preferred alternative solution classes has been established.</li></ul>		
NOTE 1 to table This process has application through the life of the software system solution and can be revisited if there are changes in the environment, needs, or other drivers..				

## 6.2 Stakeholder Needs and Requirements Definition process

**6.2.1** The purpose of the Stakeholder Needs and Requirements Definition process is to define the stakeholder requirements for a system that can provide the capabilities needed by users and other stakeholders in a defined environment.

**6.2.2** It identifies stakeholders, or stakeholder classes, involved with the system throughout its life cycle, and their needs. It analyzes and transforms these needs into a common set of stakeholder requirements that express the intended interaction the system will have with its operational environment and that are the reference against which each resulting operational capability is validated. The stakeholder requirements are defined considering the context of the system-of-interest with the interoperating systems and enabling systems.

SL No.	Sub Process	Activities	Requirement	Reference
1.	<b>Prepare for Stakeholder Needs and Requirements Definition.<sup>1</sup></b>	<ul style="list-style-type: none"> <li>Stakeholders of the system have been identified.</li> </ul>	<ul style="list-style-type: none"> <li>stakeholder needs and requirements definition strategy.</li> </ul>	<ul style="list-style-type: none"> <li>Annex A</li> <li>The SWEBOK, Guide to the Software Engineering Body of Knowledge</li> <li>KS ISO/IEC/IEEE 29148:2011</li> <li>KS ISO/IEC/IEEE 15026</li> <li>KS ISO/IEC 25030</li> </ul>
2.	<b>Define stakeholder needs<sup>2</sup></b>	<ul style="list-style-type: none"> <li>Required characteristics and context of use of capabilities and concepts in the life cycle stages, including operational concepts, have been defined.</li> </ul>	<ul style="list-style-type: none"> <li></li> </ul>	
		<ul style="list-style-type: none"> <li>Constraints on a system have been identified.</li> </ul>	<ul style="list-style-type: none"> <li></li> </ul>	
		<ul style="list-style-type: none"> <li>Stakeholder needs have been defined.</li> </ul>	<ul style="list-style-type: none"> <li>Stakeholder Needs Assessment</li> </ul>	
3.	<b>Develop the operational concept and other life cycle concepts<sup>3</sup></b>	<ul style="list-style-type: none"> <li></li> </ul>	<ul style="list-style-type: none"> <li>Operational Concept</li> </ul>	
4.	<b>Transform stakeholder needs into stakeholder requirements.</b>	<ul style="list-style-type: none"> <li>Stakeholder needs have been prioritized and transformed into clearly defined stakeholder requirements.</li> </ul>	<ul style="list-style-type: none"> <li>Stakeholder Requirements</li> </ul>	
		<ul style="list-style-type: none"> <li>Critical performance measures have been defined</li> </ul>	<ul style="list-style-type: none"> <li>Critical Performance Measures</li> </ul>	
		<ul style="list-style-type: none"> <li>Stakeholder agreement that their needs and expectations have been reflected adequately in their requirements has been achieved.</li> </ul>	<ul style="list-style-type: none"> <li>Stakeholder Requirements Report</li> </ul>	
		<ul style="list-style-type: none"> <li>Any enabling systems or services needed for stakeholder needs and requirements are available.</li> </ul>	<ul style="list-style-type: none"> <li>Stakeholder Requirements Specification</li> </ul>	
		<ul style="list-style-type: none"> <li>Traceability of stakeholder requirements to stakeholders and their needs is established</li> </ul>		

NOTE 1 This includes individuals and classes of stakeholders who are users, operators, supporters, developers, producers, trainers, maintainers, disposers, acquirer and supplier organizations, parties responsible for external interfacing entities, regulatory bodies, and others who have a legitimate interest in the system. Where direct communication is not practicable (e.g., for consumer products and services), representatives or designated proxy stakeholders are selected.

Note 2 Needs concentrate on system purpose and behavior, and are described in the context of the operational environment and conditions. It is useful to trace needs to their sources and rationale

Note 3 Other life cycle concepts can include acquisition concepts, deployment concepts, support concepts, security concepts, and retirement concepts.

## 6.3 System/Software Requirements Definition process

### 6.3.1 Purpose

The purpose of the System/Software Requirements Definition process is to transform the stakeholder, user oriented view of desired capabilities into a technical view of a solution that meets the operational needs of the user.

6.3.2 This process creates a set of measurable system requirements that specify, from the supplier's perspective, what characteristics, attributes, and functional and performance requirements the system is to possess, in order to satisfy stakeholder requirements. As far as constraints permit, the requirements should not imply any specific implementation.

SL No.	Sub Process	Activities	Requirement	Reference
1.	<b>Prepare for System/Software Requirements Definition<sup>1</sup></b>	<ul style="list-style-type: none"> <li>The system or element description, including interfaces, functions and boundaries, for a system solution is defined</li> </ul>	<ul style="list-style-type: none"> <li>System or Element Description</li> </ul>	<ul style="list-style-type: none"> <li>Annex B</li> <li>KS ISO/IEC/IEEE 15026-4</li> <li>KS ISO/IEC 27036</li> </ul>
2.	<b>Define system/software requirements<sup>2</sup></b>	<ul style="list-style-type: none"> <li>.System/software requirements (functional, performance, process, non-functional, and interface) and design constraints are defined</li> </ul>	<ul style="list-style-type: none"> <li>System/Software Requirements</li> </ul>	<ul style="list-style-type: none"> <li>KS ISO 25030</li> <li>KS ISO/IEC 15939</li> <li>KS ISO/IEC/IEEE 29148</li> </ul>
3.	<b>Analyze system/software requirements<sup>3</sup></b>	<ul style="list-style-type: none"> <li>Critical performance measures are defined.</li> <li>The system/software requirements are analyzed</li> <li>Any enabling systems or services needed for system/software requirements definition are available</li> </ul>	<ul style="list-style-type: none"> <li>System/software requirements Specification</li> </ul>	<ul style="list-style-type: none"> <li>INCOSE TP-2003-020-01</li> <li>SWEBOK, Guide to the Software Engineering Body of Knowledge</li> <li>KS ISO/FDIS 9241-220,</li> <li>ISO/IEC 25000 series</li> </ul>
4.	<b>Manage system/software requirements.</b>	<ul style="list-style-type: none"> <li>Traceability of system/software requirements to stakeholder requirements is developed.</li> </ul>	Requirements Change Request	

NOTE<sup>1</sup> This includes the approach to be used to identify and define, and manage the system/software requirements with the selected life cycle model, e.g., evolutionary, incremental or iterative.

NOTE<sup>2</sup> Define each function that the software system or element is required to perform, identify required states or modes of operation of the software system, identify requirements that relate to risks, criticality of the software system, or critical quality characteristics and define system/software requirements and requirements attributes.

NOTE<sup>3</sup> This includes defining technical and quality measures and critical performance parameters associated with each effectiveness measure identified in the software system element requirements.

NOTE<sup>4</sup> Maintaining system/software requirements includes defining, recording, and controlling the baseline, typically under formal configuration management, along with managing changes resulting from the application of other life cycle processes such as architecture or design. Obtain explicit agreement on the system/software requirements, maintain traceability of the system/software requirements, and provide key artifacts and information items that have been selected for baselines.

## 6.4 Architecture Definition process

6.4.1 The purpose of the Architecture Definition process is to generate system architecture alternatives, to select one or more alternative(s) that frame stakeholder concerns and meet system requirements, and to express this in a set of consistent views.

SL No.	Sub Process	Activities	Requirement	Reference
1.	<b>Prepare for architecture definition.</b>	<ul style="list-style-type: none"> <li>Identified stakeholder concerns are addressed by the architecture.</li> </ul>	<ul style="list-style-type: none"> <li>Architecture Viewpoints</li> </ul>	<ul style="list-style-type: none"> <li>KS ISO/IEC TR 24748-3</li> <li>KS ISO/IEC/IEEE 42010</li> <li>KS ISO/IEC 26550:2013</li> </ul>
2.	<b>Develop architecture viewpoints</b>	<ul style="list-style-type: none"> <li>Architecture viewpoints are developed.</li> </ul>		
3.	<b>Develop models and views of candidate architectures</b>	<ul style="list-style-type: none"> <li>Context, boundaries, and external interfaces of the system are defined.</li> </ul>	<ul style="list-style-type: none"> <li>Architecture Views and Models (Architecture Description)</li> </ul>	
		<ul style="list-style-type: none"> <li>Architecture views and models of the system are developed.</li> </ul>		
4.	<b>Relate the architecture to design</b>	<ul style="list-style-type: none"> <li>Concepts, properties, characteristics, behaviors, functions, or constraints that are significant to architecture decisions of the system are allocated to architectural entities.</li> </ul>		
		<ul style="list-style-type: none"> <li>System elements and their interfaces are identified.</li> </ul>		
5.	<b>Assess architecture candidates</b>	<ul style="list-style-type: none"> <li>Architecture candidates are assessed.</li> </ul>		

		<ul style="list-style-type: none"> <li>An architectural basis for processes throughout the life cycle is achieved.</li> </ul>		
6.	<b>Assess architecture candidates.</b>	<ul style="list-style-type: none"> <li>Alignment of the architecture with requirements and design characteristics is achieved.</li> </ul>		
		<ul style="list-style-type: none"> <li>Any enabling systems or services needed for architecture definition are available.</li> </ul>		
7.	<b>Manage the selected architecture</b>	<ul style="list-style-type: none"> <li>Traceability of architecture elements to stakeholder and system/software requirements is developed.</li> </ul>		
NOTE Measures have these quality characteristics: verifiable, meaningful, actionable, timely, and cost-effective.				

## 6.5 Design Definition process

### 6.5.1 Purpose

The purpose of the Design Definition process is to provide sufficient detailed data and information about the system and its elements to enable the implementation consistent with architectural entities as defined in models and views of the system architecture.

SL No.	Requirements	Activities	Requirement	Reference
1.	<b>Prepare for software system design definition<sup>1</sup></b>	<ul style="list-style-type: none"> <li>Design characteristics of each system element are defined.</li> </ul>	<ul style="list-style-type: none"> <li>definition strategy,</li> </ul>	<ul style="list-style-type: none"> <li>The SWEBOK, Guide to the Software Engineering Body of Knowledge,</li> <li>KS ISO 9241-210</li> </ul>
		<ul style="list-style-type: none"> <li>System/software requirements have been allocated to system elements.</li> </ul>		
2.	<b>Establish designs related to each software system element</b>	<ul style="list-style-type: none"> <li>Design enablers necessary for design definition have been selected or defined.</li> </ul>	<ul style="list-style-type: none"> <li>Design Artifact</li> </ul>	
		<ul style="list-style-type: none"> <li>Interfaces between system elements composing the system have been defined or refined.</li> </ul>	<ul style="list-style-type: none"> <li>Interface Specification</li> </ul>	
3.	<b>Assess alternatives for obtaining software system elements.</b>	<ul style="list-style-type: none"> <li>Design alternatives for system elements have been assessed.</li> </ul>		



		<ul style="list-style-type: none"> <li>Design artifacts have been developed.</li> </ul>	<ul style="list-style-type: none"> <li>Design Artifacts Report</li> </ul>	
		<ul style="list-style-type: none"> <li>Any enabling systems or services needed for design definition are available.</li> </ul>		
4.	<b>Manage the design</b>	<ul style="list-style-type: none"> <li>Traceability of the design characteristics to the architectural entities of the system architecture has been established.</li> </ul>		
NOTE <sup>1</sup> The software design strategy can include initial or incremental decomposition into system elements; creation of various views of automated procedures, data structures and control systems; selection of design patterns, or progressively more detailed definition of objects and their relationships.				

## 6.6 System Analysis process

### 6.6.1 Purpose

The purpose of the System Analysis process is to provide a rigorous basis of data and information for technical understanding to aid decision-making across the life cycle

**6.6.2** The System Analysis process applies to the development of inputs needed for any technical assessment. It can provide confidence in the utility and integrity of system requirements, architecture, and design. System analysis covers a wide range of differing analytic functions, levels of complexity, and levels of rigor. It includes mathematical analysis, modelling, simulation, experimentation, and other techniques to analyze technical performance, system behavior, feasibility, affordability, critical quality characteristics, technical risks, life cycle costs, and to perform sensitivity analysis of the potential range of values for parameters across all life cycle stages.

SL No.	Sub Process	Activities	Requirement	Reference
1.	<b>Define the system analysis strategy and prepare for system analysis</b>	<ul style="list-style-type: none"> <li>System analyzes needed are identified.</li> <li>Any enabling systems or services needed for system analysis are available.</li> </ul>	system analysis strategy	<ul style="list-style-type: none"> <li>applicable organization policies and procedures with respect to the System Analysis process.</li> </ul>
2.	<b>Perform system analysis</b>	<ul style="list-style-type: none"> <li>System analysis assumptions and results are validated.</li> <li>System analysis results are provided for decisions.</li> </ul>	System Analysis Report	
3.	<b>Manage the system analysis</b>	<ul style="list-style-type: none"> <li>Traceability of the system analysis results is established.</li> </ul>		
NOTE The System Analysis process can be employed for the				

## 6.7 Implementation process

## DKS 2896-3-2:2019

### 6.7.1 Purpose

The purpose of the Implementation process is to realize a specified system element.

**6.7.2** This process transforms requirements, architecture, and design, including interfaces, into actions that create a system element according to the practices of the selected implementation technology, using appropriate technical specialties or disciplines. This process results in a system element that satisfies specified system requirements (including allocated and derived requirements), architecture, and design.

SL No.	Sub Process	Activities	Requirement	Reference
1.	<b>Prepare for implementation</b>	<ul style="list-style-type: none"><li>▪ Implementation constraints that influence the requirements, architecture, or design are identified.</li></ul>	<ul style="list-style-type: none"><li>▪ implementation strategy<sup>1</sup></li></ul>	<ul style="list-style-type: none"><li>▪ applicable organization policies and procedures with respect to the Implementation process.</li><li>▪ The SWEBOK, Guide to the Software Engineering Body of Knowledge</li><li>▪ KS ISO/IEC 20000 series</li></ul>
2.	<b>Perform implementation<sup>2</sup></b>	<ul style="list-style-type: none"><li>▪ A system element is realized.</li></ul>	<ul style="list-style-type: none"><li>▪ Software System Element</li></ul>	
3.		<ul style="list-style-type: none"><li>▪ A system element is packaged or stored.</li></ul>		
4.		<ul style="list-style-type: none"><li>▪ Any enabling systems or services needed for implementation are available.</li></ul>	<ul style="list-style-type: none"><li>▪ Implementation Procedures</li></ul>	
5.	<b>Manage results of implementation<sup>3</sup></b>	<ul style="list-style-type: none"><li>▪ Traceability is established.</li></ul>	<ul style="list-style-type: none"><li>▪ Implementation Records (unit test results)</li></ul>	
<p>NOTE<sup>1</sup> the strategy includes development policies and standards, including standards that govern applicable safety, security, privacy and environmental practices; programming or coding standards; unit test policies; and language-specific standards for implementing security features;</p> <p>NOTE<sup>2</sup> Throughout the Implementation process the Verification process is used to objectively confirm the system elements conform to requirements. The Validation process is used to objectively confirm the element is suitable to be used in its intended operational environment according to stakeholder requirements.</p> <p>NOTE<sup>3</sup> To support traceability throughout the life cycle during operations and maintenance, sources of software licenses and other system assets in the supply chain are recorded. The information management and configuration management processes are used to maintain license and maintenance support terms for a software application and its required infrastructure (host system).</p>				

## 6.8 Integration process

### 6.8.1 Purpose

The purpose of the Integration process is to synthesize a set of system elements into a realized system (product or service) that satisfies system/software requirements, architecture, and design. This process assembles the implemented system elements. Interfaces are identified and activated to enable interoperation of the system elements as intended. This process integrates the enabling systems with the system-of-interest to facilitate interoperation.

**6.8.2** Software system integration iteratively combines implemented software system elements to form complete or partial system configurations in order to build a product or service. Software integration is typically performed daily or continuously during development and maintenance stages, using automated tools. Continuous integration involves frequent inclusion or replacement and archiving of items in software libraries under CM control.

SL No.	Sub Process	Activities	Requirement	Reference
	<b>Prepare for integration</b>	<ul style="list-style-type: none"><li>Integration constraints that influence system</li></ul>	<ul style="list-style-type: none"><li>Integration strategy</li></ul>	<ul style="list-style-type: none"><li>ISO/IEC 19770</li></ul>

SL No.	Sub Process	Activities	Requirement	Reference
1.		requirements, architecture, or design, including interfaces, are identified.		<ul style="list-style-type: none"> <li>ISO/IEC/IEEE 15026</li> <li>ISO/IEC 27000 series</li> </ul>
		<ul style="list-style-type: none"> <li>Any enabling systems or services needed for integration are available.</li> </ul>		
		<ul style="list-style-type: none"> <li>Approach and checkpoints for the correct operation of the assembled interfaces and system functions are defined.</li> </ul>	<ul style="list-style-type: none"> <li>Interface Control Description (software library)</li> </ul>	
2.	<b>Perform integration</b>	<ul style="list-style-type: none"> <li>A system composed of implemented system elements is integrated.</li> </ul>	<ul style="list-style-type: none"> <li>Integrated Software System Elements</li> </ul>	
		<ul style="list-style-type: none"> <li>The interfaces between the implemented system elements that compose the system are checked.</li> </ul>	<ul style="list-style-type: none"> <li>Integration and Test Procedures</li> </ul>	
3.	<b>Manage results of integration</b>	<ul style="list-style-type: none"> <li>Integration results and anomalies are identified.</li> </ul>	<ul style="list-style-type: none"> <li>Integration Records</li> </ul>	
		<ul style="list-style-type: none"> <li>Traceability of the integrated system elements is established</li> </ul>		

## 6.9 Verification process

### 6.9.1 Purpose

The purpose of the Verification process is to provide objective evidence that a system or system element fulfils its specified requirements and characteristics.

**6.9.2** The Verification process identifies the anomalies (errors, defects, or faults) in any information item (e.g., system/software requirements or architecture description), implemented system elements, or life cycle processes using appropriate methods, techniques, standards or rules. This process provides the necessary information to determine resolution of identified anomalies.

SL No.	Sub Process	Activities	Requirement	Reference
1.	<b>Prepare for verification</b>	<ul style="list-style-type: none"> <li>Constraints of verification that influence the requirements, architecture, or design are identified.</li> </ul>	<ul style="list-style-type: none"> <li>verification strategy</li> </ul>	<ul style="list-style-type: none"> <li>KSISO/IEC/IEEE 29119</li> <li>IEEE Std 1012-2012</li> <li>SWEBOK, Guide to the Software Engineering Body of Knowledge</li> </ul>
		<ul style="list-style-type: none"> <li>Any enabling systems or services needed for verification are available.</li> </ul>	<ul style="list-style-type: none"> <li>Verification Procedures</li> </ul>	
2.	<b>Perform verification</b>	<ul style="list-style-type: none"> <li>The system or system element is verified.</li> </ul>	<ul style="list-style-type: none"> <li>Verified System</li> </ul>	
		<ul style="list-style-type: none"> <li>Data providing information for corrective actions is reported.</li> </ul>	<ul style="list-style-type: none"> <li>Verification Records</li> </ul>	
		<ul style="list-style-type: none"> <li>Objective evidence that the realized system fulfills the</li> </ul>	<ul style="list-style-type: none"> <li>Verification Report</li> </ul>	

SL No.	Sub Process	Activities	Requirement	Reference
		requirements, architecture and design is provided		
3.	Manage results of verification	▪ Verification results and anomalies are identified.		
		▪ Traceability of the verified system elements is established.		
NOTE <sup>1</sup> For software systems, the Verification process is typically instantiated for the following purposes: a) To confirm that a software work product or service properly reflects the specified requirements (often called software verification); b) To confirm that the integrated software product meets its defined requirements (often called software qualification testing); and c) To confirm that the implementation of each system/software requirement is tested for compliance				

## 6.10 Transition process

### 6.10.1 Purpose

The purpose of the Transition process is to establish a capability for a system to provide services specified by stakeholder requirements in the operational environment.

**6.10.2** This process moves the system in an orderly, planned manner into the operational status, such that the system is functional, operable and compatible with other operational systems. It installs a verified system, together with relevant enabling systems, e.g., planning system, support system, operator training system, user training system, as defined in agreements. This process is used at each level in the system structure and in each stage to complete the criteria established for exiting the stage. It includes preparing applicable storage, handling, and shipping enabling systems

SL No.	Sub Process	Activities	Requirement	Reference
1.	<b>Prepare for the software system transition</b>	▪ Transition constraints that influence system/software requirements, architecture, or design have been identified.	▪ Transition Strategy <sup>1</sup>	▪ applicable organization policies and procedures
		▪ Any enabling systems or services needed for transition are available.		
2.	<b>Perform the transition</b>	▪ The site has been prepared.	▪ Prepared Site for Operations	
		▪ The system, as installed in its operational location, is capable of delivering its specified functions.	▪ Transitioned System/Software	
		▪ The installed system has been activated and ready for operation.		
		▪ Operators, users and other stakeholders necessary to the system utilization and support have been trained.		
3.	<b>Manage results of transition</b>	▪ Transition results and anomalies have been identified.	▪ Transition Records	
		▪ Traceability of the transitioned elements has been established		

NOTE<sup>1</sup> The strategy includes roles and responsibilities, approval authority, use of readiness reviews and training

## 6.11 Validation process

### 6.11.1 Purpose

The purpose of the Validation process is to provide objective evidence that the system, when in use, fulfils its business or mission objectives and stakeholder requirements, achieving its intended use in its intended operational environment.

**6.11.2** The objective of validating a system or system element is to acquire confidence in its ability to achieve its intended mission, or use, under specific operational conditions. Validation is ratified by stakeholders. This process provides the necessary information so that identified anomalies can be resolved by the appropriate technical process where the anomaly was created.

**6.11.3** For software systems, the following are purposes of the Validation process:

**6.11.4** To confirm that the requirements for a specific intended use of the software work product are fulfilled (**often** called software validation); and

- a) To achieve confidence (especially with an acquirer or customer) that the delivered product meets stakeholder requirements and is fit for use (often called software acceptance testing).

NOTE 1 The validation process determines that the "right product is built". The verification process determines that the "product is built right".

SL No.	Sub Process	Activities	Requirement	Reference
1.	<b>Prepare for validation</b>	<ul style="list-style-type: none"> <li>Validation criteria for stakeholder requirements are defined.</li> </ul>	<ul style="list-style-type: none"> <li>validation strategy</li> </ul>	<ul style="list-style-type: none"> <li>IEEE Std 1012-2012</li> <li>SWEBOK, Guide to the Software Engineering Body of Knowledge</li> </ul>
2.		<ul style="list-style-type: none"> <li>The availability of services required by stakeholders is confirmed.</li> </ul>		
3.		<ul style="list-style-type: none"> <li>Constraints of validation that influence the requirements, architecture, or design are identified.</li> </ul>		
4.	<b>Perform validation</b>	<ul style="list-style-type: none"> <li>The system or system element is validated.</li> </ul>	<ul style="list-style-type: none"> <li>Validated System</li> </ul>	
5.		<ul style="list-style-type: none"> <li>Any enabling systems or services needed for validation are available.</li> </ul>	<ul style="list-style-type: none"> <li>Validation Procedures</li> </ul>	
6.	<b>Manage results of validation.</b>	<ul style="list-style-type: none"> <li>Validation results and anomalies are identified.</li> </ul>	<ul style="list-style-type: none"> <li>Validation Records</li> </ul>	
7.		<ul style="list-style-type: none"> <li>Objective evidence that the realized system or system element satisfies stakeholder needs is provided.</li> </ul>	<ul style="list-style-type: none"> <li>Validation Report</li> </ul>	
8.		<ul style="list-style-type: none"> <li>Traceability of the validated system elements is established.</li> </ul>		

NOTE<sup>1</sup> The validation strategy can be documented in a plan, e.g., an acceptance plan, or a project's SDP or SEMP.

NOTE<sup>2</sup> Validation procedures identify stakeholder requirements to be validated, the associated software system artifact (e.g., the actual system, or a model, a mock-up, a prototype, code, a set of instructions or other information item), and the expected results (success criteria), such as completed and timely performance of a function. The procedures identify the purpose of the validation with success criteria (expected results), the validation technique to be applied, the necessary enabling systems (facilities, equipment), and the environmental conditions to perform each validation procedure (resources, qualified personnel, participating stakeholders, and specialized procedural set-up or work instructions). Validation strategy includes how the validation procedure results will be recorded, analyzed, stored, and reported.

## 6.12 Operation process

## DKS 2896-3-2:2019

### 6.12.1 Purpose

The purpose of the Operation process is to use the system to deliver its services.

This process establishes requirements for and assigns personnel to operate the system, and monitors the services and operator-system performance. In order to sustain services, it identifies and analyzes operational anomalies in relation to agreements, stakeholder requirements and organizational constraints

NOTE1 ISO/IEC 20000-1:2011 is a service management system standard that specifies requirements for the design, transition, delivery and improvement of managed operational services, and supports the Operation process to achieve its purpose.

SL No.	Sub Process	Activities	Requirement	Reference
1.	<b>Prepare for operation</b>	<ul style="list-style-type: none"><li>Operation constraints that influence system/software requirements, architecture, or design are identified.</li></ul>	<ul style="list-style-type: none"><li>operation strategy</li><li>Continuity plan</li></ul>	<ul style="list-style-type: none"><li>KS ISO/IEC 16350</li></ul>
		<ul style="list-style-type: none"><li>Any enabling systems, services, and material needed for operation are available.</li></ul>	<ul style="list-style-type: none"><li>Operational procedures (User documentation)</li></ul>	
		<ul style="list-style-type: none"><li>Trained, qualified operators are available.</li></ul>		
		<ul style="list-style-type: none"><li>System product services that meet stakeholder requirements are delivered.</li></ul>	<ul style="list-style-type: none"><li>Operation Records</li></ul>	
2.	<b>Manage results of operation</b>	<ul style="list-style-type: none"><li>System product performance during operation is monitored.</li></ul>	<ul style="list-style-type: none"><li>Problem Report</li></ul>	
3.	<b>Support the customer</b>	<ul style="list-style-type: none"><li>Support to the customer is provided.</li></ul>	<ul style="list-style-type: none"><li>Customer Support Request</li><li>Customer Support Records</li></ul>	

### 6.13 Maintenance process

#### 6.13.1 Purpose

The purpose of the Maintenance process is to sustain the capability of the system to provide a service.

**6.13.2** This process monitors the system's capability to deliver services, records incidents for analysis, takes corrective, adaptive, perfective and preventive actions and confirms restored capability. For software systems, the Maintenance process makes corrections, changes, and improvements to deployed software systems and elements.

SL No.	Requirements	Activities	Requirement	Reference
1.	<b>Prepare for maintenance</b>	<ul style="list-style-type: none"><li>Maintenance constraints that influence system requirements, architecture, or design have been identified.</li></ul>	<ul style="list-style-type: none"><li>Maintenance strategy</li></ul>	<ul style="list-style-type: none"><li>ISO/IEC/IEEE 14764:2006</li><li>ISO/IEC 16350</li></ul>
		<ul style="list-style-type: none"><li>Any enabling systems or services needed for maintenance have been made available.</li></ul>	<ul style="list-style-type: none"><li>Maintenance Procedures (Logistics Procedures)</li></ul>	
	<b>Perform maintenance</b>	<ul style="list-style-type: none"><li>Replacement, repaired, or revised system elements have been made available.</li></ul>	<ul style="list-style-type: none"><li>Replacement System Element</li></ul>	

	<b>Perform logistics support</b>	<ul style="list-style-type: none"> <li>The need for changes to address corrective, perfective, or adaptive maintenance has been reported.</li> </ul>	<ul style="list-style-type: none"> <li>Maintenance (Logistics) Records</li> <li>Maintenance Requests record</li> </ul>	
2.	<b>Manage results of maintenance and logistics</b>	<ul style="list-style-type: none"> <li>Failure and lifetime data, including associated costs, has been determined.</li> </ul>	<ul style="list-style-type: none"> <li>Maintenance (Logistics) Report</li> </ul>	
NOTE Measures have these quality characteristics: verifiable, meaningful, actionable, timely, and cost-effective.				

## 6.14 Disposal process

### 6.14.1 Purpose

The purpose of the Disposal process is to end the existence of a system element or system for a specified intended use, appropriately handle replaced or retired elements, and to properly attend to identified critical disposal needs (e.g., per an agreement, per organizational policy, or for environmental, legal, safety, security aspects).

**6.14.2** Disposal of software systems encompasses the termination of services and disposal of software elements, stored data, media and firmware, information items, and associated hardware elements that will not be reused or transitioned to another system. The Disposal process is intended to be applicable in any stage of a software systems life cycle.

**6.14.3** For software, the Disposal process applies throughout the life cycle to source code or executable copies of the software, personally identifiable or controlled data used in the software system, and associated information items, retained under centralized configuration control or distributed for use, e.g., disposing of prototypes in early life cycle stages, and decommissioning elements replaced from modifications during utilization/deployment and support stages. When the system-of-interest is being modified for technology or capability upgrades, only the impacted elements are deactivated and removed

SL No.	Sub Process	Activities	Requirement	Reference
1.	<b>Prepare for disposal.</b>	<ul style="list-style-type: none"> <li>Disposal constraints are provided as inputs to requirements, architecture, design, and implementation.</li> </ul>	<ul style="list-style-type: none"> <li>Disposal strategy</li> </ul>	<ul style="list-style-type: none"> <li>KS ISO/IEC/IEEE 14764:2006</li> <li>KS ISO/IEC 16350</li> </ul>
		<ul style="list-style-type: none"> <li>Any enabling systems or services needed for disposal are available.</li> </ul>	<ul style="list-style-type: none"> <li>Maintenance Procedures (Logistics Procedures)</li> </ul>	
	<b>Perform disposal</b>	<ul style="list-style-type: none"> <li>The system elements or waste products are destroyed, stored, reclaimed or recycled in accordance with requirements, e.g., safety and security requirements.</li> </ul>	<ul style="list-style-type: none"> <li>Replacement System Element</li> </ul>	
	<b>Finalize the disposal</b>	<ul style="list-style-type: none"> <li>The environment is returned to its original or an agreed state.</li> </ul>	<ul style="list-style-type: none"> <li>Maintenance (Logistics) Records</li> <li>Maintenance Requests record</li> </ul>	

**Annex A  
(normative)**

**Terms, definitions, Acronyms and abbreviations**

For the purpose of this standard, the definitions given in Part 1 of this series of standards and those below shall apply.

**A.1**

**acquirer**

stakeholder that acquires or procures a product or service from a supplier

Note 1 to entry: Other terms commonly used for an acquirer are buyer, customer, owner, purchaser or internal/organizational sponsor.

**A.2**

**acquisition**

process of obtaining a system, product or service

**A.3**

**activity**

set of cohesive tasks of a process

**A.4**

**agile development**

software development approach based on iterative development, frequent inspection and adaptation, and incremental deliveries, in which requirements and solutions evolve through collaboration in cross-functional teams and through continual stakeholder feedback

[SOURCE: ISO/IEC/IEEE 26515: 2011]

**A.5**

**agreement**

mutual acknowledgement of terms and conditions under which a working relationship is conducted

EXAMPLE Contract, memorandum of agreement.

**A.6**

**architecture**

<system> fundamental concepts or properties of a system in its environment embodied in its elements, relationships, and in the principles of its design and evolution



[SOURCE: ISO/IEC/IEEE 42010:2011]

## **A.7**

### **architecture framework**

conventions, principles and practices for the description of architectures established within a specific domain of application and/or community of stakeholders

EXAMPLE 1 Generalised Enterprise Reference Architecture and Methodologies (GERAM) [ISO 15704] is an architecture framework.

EXAMPLE 2 Reference Model of Open Distributed Processing (RM-ODP) [ISO/IEC 10746] is an architecture framework.

[SOURCE: ISO/IEC/IEEE 42010:2011]

## **A.8**

### **architecture view**

work product expressing the architecture of a system from the perspective of specific system concerns

[SOURCE: ISO/IEC/IEEE 42010:2011]

## **A.9**

### **architecture viewpoint**

work product establishing the conventions for the construction, interpretation and use of architecture views to frame specific system concerns

[SOURCE: ISO/IEC/IEEE 42010:2011]

## **A.10**

### **audit**

independent examination of a work product or set of work products to assess compliance with specifications, standards, contractual agreements, or other criteria

## **A.11**

### **baseline**

formally approved version of a configuration item, regardless of media, formally designated and fixed at a specific time during the configuration item's life cycle

[SOURCE: IEEE Std 828-2012]

## **A.12**

### **business process**

partially ordered set of enterprise activities that can be executed to achieve some desired end-result in pursuit of a given objective of an organization

## **A.13**

### **concept of operations**

verbal and/or graphic statement, in broad outline, of an organization's assumptions or intent in regard to an operation or series of operations

Note 1 to entry: The concept of operations frequently is embodied in long-range strategic plans and annual operational plans. In the latter case, the concept of operations in the plan covers a series of connected operations to be carried out simultaneously or in succession. The concept is designed to give an overall picture of the organization operations. See also operational concept (3.1.28).

Note 2 to entry: It provides the basis for bounding the operating space, system capabilities, interfaces and operating environment.

[SOURCE: ANSI/AIAA G-043A-2012e]

## A.14

### concern

<system> interest in a system relevant to one or more of its stakeholders

Note 1 to entry: A concern pertains to any influence on a system in its environment, including developmental, technological, business, operational, organizational, political, economic, legal, regulatory, ecological and social influences.

[SOURCE: ISO/IEC/IEEE 42010:2011]

## A.15

### configuration item

item or aggregation of hardware, software, or both, that is designated for configuration management and treated as a single entity in the configuration management process

EXAMPLE Software, firmware, data, hardware, humans, processes (e.g., processes for providing service to users), procedures (e.g., operator instructions and user manuals), facilities, services, materials, and naturally occurring entities

## A.16

### customer

organization or person that receives a product or service

EXAMPLE Consumer, client, user, acquirer, buyer, or purchaser.

Note 1 to entry: A customer can be internal or external to the organization.

## A.17

### design, verb

<process> to define the architecture, system elements, interfaces, and other characteristics of a system or system element

[SOURCE: ISO/IEC/IEEE 24765:2010, modified, changed 'components' to 'system element']

## A.18

### design, noun

result of the process in A.17

Note 1 to entry: Information, including specification of system elements and their relationships, that is sufficiently complete to support a compliant implementation of the architecture

Note 2 to entry: Design provides the detailed implementation-level physical structure, behavior, temporal relationships, and other attributes of system elements.

## A.19

### design characteristic

design attributes or distinguishing features that pertain to a measurable description of a product or service

## A.20

### enabling system

system that supports a system-of-interest during its life cycle stages but does not necessarily contribute directly to its function during operation

EXAMPLE A configuration management system used to control software elements during software development.

Note 1 to entry: Each enabling system has a life cycle of its own. This document is applicable to each enabling system when, in its own right, it is treated as a system-of-interest.

## A.21

**environment**

<system> context determining the setting and circumstances of all influences upon a system

[SOURCE: ISO/IEC/IEEE 42010:2011]

**A.22**

**facility**

physical means or equipment for facilitating the performance of an action, e.g., buildings, instruments, tools

**A.23**

**incident**

anomalous or unexpected event, set of events, condition, or situation at any time during the life cycle of a project, product, service, or system

**A.24**

**information item**

separately identifiable body of information that is produced, stored, and delivered for human use

[SOURCE: ISO/IEC/IEEE 15289:2015]

**A.25**

**infrastructure**

hardware and software environment to support computer system and software design, development, and modification

**A.26**

**life cycle**

evolution of a system, product, service, project or other human-made entity from conception through retirement

**A.27**

**life cycle model**

framework of processes and activities concerned with the life cycle, which can be organized into stages, acting as a common reference for communication and understanding

**A.28**

**operational concept**

verbal and graphic statement of an organization's assumptions or intent in regard to an operation or series of operations of a system or a related set of systems

Note 1 to entry: The operational concept is designed to give an overall picture of the operations using one or more specific systems, or set of related systems, in the organization's operational environment from the users' and operators' perspective. See also concept of operations (3.1.13).

**A.29**

**operator**

individual or organization that performs the operations of a system

Note 1 to entry: The role of operator and the role of user can be vested, simultaneously or sequentially, in the same individual or organization.

Note 2 to entry: An individual operator combined with knowledge, skills and procedures can be considered as an element of the system.

Note 3 to entry: An operator can perform operations on a system that is operated, or within a system that is operated, depending on whether or not operating instructions are placed within the system boundary.

**A.30**

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## **organization**

group of people and facilities with an arrangement of responsibilities, authorities and relationships

EXAMPLE company, corporation, firm, enterprise, institution, charity, sole trader, association, or parts or combination thereof.

Note 1 to entry: An identified part of an organization (even as small as a single individual) or an identified group of organizations can be regarded as an organization if it has responsibilities, authorities and relationships. A body of persons organized for some specific purpose, such as a club, union, corporation, or society, is an organization.

## **A.31**

### **party**

organization entering into an agreement

Note 1 to entry: In this document, the agreeing parties are called the acquirer and the supplier.

## **A.32**

### **problem**

difficulty, uncertainty, or otherwise realized and undesirable event, set of events, condition, or situation that requires investigation and corrective action

## **A.33**

### **process**

set of interrelated or interacting activities that transforms inputs into outputs

## **A.34**

### **process outcome**

observable result of the successful achievement of the process purpose

## **A.35**

### **process purpose**

high-level objective of performing the process and the likely outcomes of effective implementation of the process

Note 1 to entry: The purpose of implementing the process is to provide benefits to the stakeholders.

## **A.36**

### **product**

result of a process

Note 1 to entry: There are four agreed generic product categories: hardware (e.g., engine mechanical part); software (e.g., computer program procedures, and possibly associated documentation and data); services (e.g., transport); and processed materials (e.g., lubricant). Hardware and processed materials are generally tangible products, while software or services are generally intangible.

## **A.37**

### **project**

endeavour with defined start and finish criteria undertaken to create a product or service in accordance with specified resources and requirements

Note 1 to entry: A project is sometimes viewed as a unique process comprising coordinated and controlled activities and composed of activities from the Technical Management processes and Technical processes defined in this document.

## **A.38**

### **<project> portfolio**

collection of projects that addresses the strategic objectives of the organization

**A.39**

**qualification**

process of demonstrating whether an entity is capable of fulfilling specified requirements

**A.40**

**quality assurance**

part of quality management focused on providing confidence that quality requirements will be fulfilled

[SOURCE: ISO 9000:2015]

**A.41**

**quality characteristic**

inherent characteristic of a product, process or system related to a requirement

Note 1 to entry: Critical quality characteristics commonly include those related to health, safety, security assurance, reliability, availability and supportability.

**A.42**

**quality management**

coordinated activities to direct and control an organization with regard to quality

**A.43**

**release**

particular version of a configuration item that is made available for a specific purpose

EXAMPLE Test release.

**A.44**

**requirement**

statement that translates or expresses a need and its associated constraints and conditions

[SOURCE: ISO/IEC/IEEE 29148:2011, modified, NOTE has been removed.]

**A.45**

**resource**

asset that is utilized or consumed during the execution of a process

Note 1 to entry: Resources include those that are reusable, renewable or consumable.

EXAMPLE diverse entities such as funding, personnel, facilities, capital equipment, tools, and utilities such as power, water, fuel and communication infrastructures.

**A.46**

**retirement**

withdrawal of active support by the operation and maintenance organization, partial or total replacement by a new system, or installation of an upgraded system

**A.47**

**risk**

effect of uncertainty on objectives

Note 1 to entry: An effect is a deviation from the expected — positive or negative. A positive effect is also known as an opportunity.

Note 2 to entry: Objectives can have different aspects (such as financial, health and safety, and environmental goals) and can apply at different levels (such as strategic, organization-wide, project, product and process).

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Note 3 to entry: Risk is often characterized by reference to potential events and consequences, or a combination of these.

Note 4 to entry: Risk is often expressed in terms of a combination of the consequences of an event (including changes in circumstances) and the associated likelihood of occurrence.

Note 5 to entry: Uncertainty is the state, even partial, of deficiency of information related to understanding or knowledge of an event, its consequence, or likelihood.

[SOURCE: ISO Guide 73:2009, definition 1.1]

## A.48

### **safety**

expectation that a system does not, under defined conditions, lead to a state in which human life, health, property, or the environment is endangered

## A.49

### **security**

protection against intentional subversion or forced failure; a composite of four attributes – confidentiality, integrity, availability, and accountability – plus aspects of a fifth, usability, all of which have the related issue of their assurance

[SOURCE: NATO AEP-67]

## A.50

### **service**

performance of activities, work, or duties

Note 1 to entry: A service is self-contained, coherent, discrete, and can be composed of other services.

Note 2 to entry: A service is generally an intangible product.

## A.51

### **software element**

system element that is software

## A.52

### **software engineering**

application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software; that is, the application of engineering to software

## A.53

### **software item**

source code, object code, control code, control data, or a collection of these items

Note 1 to entry: A software item can be viewed as a system element of this document and of ISO/IEC 15288:2015. Software items are typically configuration items.

## A.54

### **software product**

set of computer programs, procedures, and possibly associated documentation and data

Note 1 to entry: A software product is a software system viewed as the output (product) resulting from a process.

## A.55

### **software system**

system for which software is of primary importance to the stakeholders

Note 1 to entry: In the most general case, a software system is comprised of hardware, software, people, and manual procedures.

Note 2 to entry: In a software system, software is the leading driver in meeting system requirements.

**A.56**

**software system element**

member of a set of elements that constitute a software system

Note 1 to entry: A software system element can include one or more software units, software elements, hardware units, hardware elements, services, and other system elements and systems.

Note 2 to entry: A software system element can be viewed as a system element.

**A.57**

**software unit**

atomic-level software component of the software architecture that can be subjected to standalone testing

Note 1 to entry: Some software units are separately compilable pieces of code.

[SOURCE: ISO 26262-1:2011, modified, Note 1 to entry added.]

**A.58**

**stage**

period within the life cycle of an entity that relates to the state of its description or realization

Note 1 to entry: As used in this document, stages relate to major progress and achievement milestones of the entity through its life cycle.

Note 2 to entry: Stages often overlap.

**A.59**

**stakeholder**

individual or organization having a right, share, claim, or interest in a system or in its possession of characteristics that meet their needs and expectations

EXAMPLE End users, end user organizations, supporters, developers, producers, trainers, maintainers, disposers, acquirers, supplier organizations and regulatory bodies.

Note 1 to entry: Some stakeholders can have interests that oppose each other or oppose the system.

**A.60**

**supplier**

organization or an individual that enters into an agreement with the acquirer for the supply of a product or service

Note 1 to entry: Other terms commonly used for supplier are contractor, producer, seller, or vendor.

Note 2 to entry: The acquirer and the supplier sometimes are part of the same organization.

**A.61**

**system**

combination of interacting elements organized to achieve one or more stated purposes

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 or database management system. Alternatively, the word "system" is substituted simply by a context dependent synonym, e.g., aircraft or database, though this potentially obscures a system principles perspective.

Note 3 to entry: A system can include the associated equipment, facilities, material, software, firmware, technical documentation, services and personnel required for operations and support to the degree necessary for use in its intended environment.

Note 4 to entry: See for comparison: enabling system, system-of-interest, system of systems.

**A.62**

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## **system element**

member of a set of elements that constitute a system

EXAMPLE Hardware, software, data, humans, processes (e.g., processes for providing service to users), procedures (e.g., operator instructions), facilities, materials, and naturally occurring entities or any combination.

Note 1 to entry: A system element is a discrete part of a system that can be implemented to fulfill specified requirements.

## **A.63**

## **system-of-interest**

## **SOI**

system whose life cycle is under consideration

## **A.64**

## **system of systems**

## **SoS**

set of systems that integrate or interoperate to provide a unique capability that none of the constituent systems can accomplish on its own

Note 1 to entry: Each constituent system is a useful system by itself, having its own management, goals, and resources, but coordinates within the SoS to provide the unique capability of the SoS.

## **A.65**

## **systems engineering**

interdisciplinary approach governing the total technical and managerial effort required to transform a set of stakeholder needs, expectations, and constraints into a solution and to support that solution throughout its life.

## **A.66**

## **task**

required, recommended, or permissible action, intended to contribute to the achievement of one or more outcomes of a process

## **A.67**

## **technical management**

application of technical and administrative resources to plan, organize and control engineering functions

## **A.68**

## **trade-off**

decision-making actions that select from various requirements and alternative solutions on the basis of net benefit to the stakeholders

## **A.69**

## **traceability**

degree to which a relationship can be established among two or more logical entities, especially entities having a predecessor successor or master-subordinate relationship to one another, such as requirements, system elements, verifications, or tasks

EXAMPLE Software features and test cases are typically traced to software requirements.

## **A.70**

## **user**

individual or group that interacts with a system or benefits from a system during its utilization

Note 1 to entry: The role of user and the role of operator are sometimes vested, simultaneously or sequentially, in the same individual or organization.



[SOURCE: ISO/IEC 25010:2011, modified, Note 1 to entry added.]

## **A.71**

### **validation**

confirmation, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled

Note 1 to entry: A system is able to accomplish its intended use, goals and objectives (i.e., meet stakeholder requirements) in the intended operational environment. The right system was built.

Note 2 to entry: In a life cycle context, validation involves the set of activities for gaining confidence that a system is able to accomplish its intended use, goals and objectives in an environment like the operational environment.

## **A.72**

### **verification**

confirmation, through the provision of objective evidence, that specified requirements have been fulfilled

Note 1 to entry: Verification is a set of activities that compares a system or system element against the required characteristics. This includes, but is not limited to specified requirements, design, descriptions, and the system itself. The system was built right.

[SOURCE: ISO 9000:2015, modified, Note 1 to entry added.]

## **A.73 Abbreviated terms**

<b>CCB</b>	Configuration Control Board
<b>CM</b>	Configuration Management
<b>COTS</b>	Commercial-Off-The-Shelf
<b>FCA</b>	Functional Configuration Audit
<b>FOSS</b>	Free and Open Source Software
<b>GUI</b>	Graphical User Interface
<b>NDI</b>	Non-Developmental Items
<b>QA</b>	Quality Assurance
<b>PCA</b>	Physical Configuration Audit
<b>PESTEL</b>	Political, Economic, Social, Technological, Environmental, and Legal
<b>PMI</b>	Project Management Institute
<b>PMP</b>	Project Management Plan
<b>PRM</b>	Process Reference Model
<b>SCM</b>	Software Configuration Management
<b>SDP</b>	Software Development Plan
<b>SEMP</b>	Systems Engineering Management Plan
<b>SOI</b>	System-of-Interest
<b>SoS</b>	System of Systems
<b>SWOT</b>	Strengths, Weaknesses, Opportunities, Threats
<b>WBS</b>	Work Breakdown Structure