Software and Systems Engineering Processes — Requirements and Evaluation

Part 2 -2

Technical evaluation

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In order to keep abreast of progress in industry, Kenya Standards shall be regularly reviewed. Suggestions for improvements to published standards, addressed to the Managing Director, Kenya Bureau of Standards, are welcome.

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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/IEEEE 12207:2017

ii) ISO/IEC/IEC 15288:2015

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

Software Engineering Processes — Requirements and Evaluation — Part 2-2 — Technical evaluation

1 Scope and application

This standard outlines the tasks and activities within the technical processes of the system and software life cycle as specified in Part 2-1 of the standard and determines the evaluation criteria.

Although this Kenya Standard does not establish a management system, it is intended to be compatible with the quality management system provided by ISO 9001, the service management system provided by KS ISO/IEC 20000-1:2011 (IEEE Std 20000-1-2013), and the information security management system provided by KS ISO/IEC 27000.

2 Full conformance to tasks

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

KS 2896 -1 :2019, *Software and Systems Engineering Processes — Requirements and Evaluation, Part 2-1 — Agreement Processes — Acquisition and Supply processes.*

KS 2896 - 2-1 :2019, *Software and Systems Engineering Processes — Requirements and Evaluation, Part 2-1 — Technical processes.*

KS 2896 - 3-2: 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 purposes of this document, the terms and definitions in Part 2-1 of this standard, **KS 2896-2-1:2019** shall apply.

5 Technical Evaluation

5.1 Technical Management processes

Process tasks and activities	Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Exemption/ Justification	Reference Standard
Effective Rating	0	1	2	3		
5.1.1 Project planning process						
Identify the project objectives and constraints.						

Process tasks and activities	Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Exemption/ Justification	Reference Standard
Effective Rating	**0**	**1**	**2**	**3**		
Define the project scope as established in the agreement						
Define and maintain a life cycle model that is comprised of stages using the defined life cycle models of the organization.						
Establish a work breakdown structure based on the evolving system architecture.						
Define and maintain the processes that will be applied on the project.						
5.1.2 Project assessment and control process						
Define the project assessment and control strategy.						
Assess alignment of project objectives and plans with the project context.						
Assess management and technical plans against objectives to determine adequacy and feasibility.						
Assess project and technical status against appropriate plans to determine actual and projected cost, schedule, and performance variances.						
Assess the adequacy and availability of resources.						
Assess progress using measured achievement and milestone completion.						
Conduct required management and technical reviews, audits and inspections.						
Monitor critical processes and new technologies.						

Process tasks and activities	Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Exemption/ Justification	Reference Standard
Effective Rating	**0**	**1**	**2**	**3**		
Analyze measurement results and make recommendations.						
Record and provide status and findings from assessment tasks.						
Monitor process execution within the project.						
Initiate necessary actions needed to address identified issues.						
Initiate necessary project replanning.						
Initiate change actions when there is a contractual change to cost, time or quality due to the impact of an acquirer or supplier request.						
Authorize the project to proceed toward the next milestone or event, if justified.						
5.1.3 Decision management process						
Define a decision management strategy.						
Identify the circumstances and need for a decision.						
Involve relevant stakeholders in the decision-making in order to draw on experience and knowledge.						
Select and declare the decision management strategy for each decision.						
Determine desired outcomes and measurable selection criteria.						
Identify the trade space and alternatives.						
Evaluate each alternative, against the criteria.						

Process tasks and activities	Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Exemption/ Justification	Reference Standard
Effective Rating	**0**	**1**	**2**	**3**		
Determine preferred alternative for each decision						
Record the resolution, decision rationale, and assumptions						
Record, track, evaluate and report decisions.						
5.1.4 Risk management process						
Define the risk management strategy.						
Define and record the context of the Risk Management process.						
Define and record the risk thresholds and conditions under which a level of risk may be accepted.						
Establish and maintain a risk profile.						
Periodically provide the relevant risk profile to stakeholders based upon their needs.						
Identify risks in the categories described in the risk management context.						
Estimate the likelihood of occurrence and consequences of each identified risk.						
Evaluate each risk against its risk thresholds.						
For each risk that does not meet its risk threshold, define and record recommended treatment strategies and measures.						
Identify recommended alternatives for risk treatment.						
Implement risk treatment alternatives for which the stakeholders determine that actions should be taken to make a risk acceptable.						

Process tasks and activities	Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Exemption/ Justification	Reference Standard
Effective Rating	**0**	**1**	**2**	**3**		
When the stakeholders accept a risk that does not meet its threshold, consider it a high priority and monitor it continually to determine if any future risk treatment actions are necessary.						
Once a risk treatment is selected, coordinate management action.						
Continually monitor all risks and the risk management context for changes and evaluate the risks when their state has changed.						
Implement and monitor measures to evaluate the effectiveness of risk treatments.						
Continually monitor for the emergence of new risks and sources throughout the life cycle.						
5.1.5 Configuration management process						
Define a configuration management strategy.						
Define the archive and retrieval approach for configuration items, configuration management artifacts and data.						
Identify the system elements and information items that are configuration items						
Identify the hierarchy and structure of system information.						
Establish system, system element, and information item identifiers.						
Define baselines through the life cycle.						
Obtain acquirer and supplier agreement to establish a baseline						

Process tasks and activities	Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Exemption/ Justification	Reference Standard
Effective Rating	**0**	**1**	**2**	**3**		
Identify and record Requests for Change and Requests for Variance.						
Coordinate, evaluate, and disposition Requests for Change and Requests for Variance.						
Submit requests for review and approval.						
Track and manage approved changes to the baseline, Requests for Change, and Requests for Variance.						
Develop and maintain the configuration management status information, for system elements, baselines, and releases.						
Capture, store and report configuration management data.						
Identify the need for CM audits and schedule the events.						
Verify the product configuration meets the configuration requirements.						
Monitor the incorporation of approved configuration changes.						
Assess whether the system meets baseline functional and performance capabilities.						
Record the CM audit results and disposition action items.						
Approve system releases and deliveries						
Track and manage system releases and deliveries.						
5.1.6 Information management process						

Process tasks and activities	Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Exemption/ Justification	Reference Standard
Effective Rating	**0**	**1**	**2**	**3**		
Define the strategy for information management.						
Define the items of information that will be managed						
Define the content, formats and structure of information items.						
Define information maintenance actions.						
Obtain, develop, or transform the identified items of information.						
Maintain information items and their storage records, and record the status of information.						
Publish, distribute or provide access to information and information items to designated stakeholders.						
Archive designated information						
Dispose of unwanted, invalid or unvalidated information.						
5.1.7 Measurement process						
Define the measurement strategy.						
Describe the characteristics of the organization that are relevant to measurement						
Identify and prioritize the information needs.						
Select and specify measures that satisfy the information needs						
Define data collection, analysis, access, and reporting procedures.						
Define criteria for evaluating the information items and the Measurement process.						

Process tasks and activities	Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Exemption/ Justification	Reference Standard
Effective Rating	**0**	**1**	**2**	**3**		
Identify and plan for the necessary enabling systems or services to be used.						
Integrate procedures for data generation, collection, analysis and reporting into the relevant processes.						
Collect, store, and verify data.						
Analyze data and develop information items.						
Record results and inform the measurement users.						
5.1.8 Quality assurance process						
Define a Quality Assurance strategy						
Establish independence of quality assurance from other life cycle processes						
Evaluate products and services for conformance to established criteria, contracts, standards, and regulations.						
Perform verification and validation of the outputs of the life cycle processes to determine conformance to specified requirements.						
Evaluate project life cycle processes for conformance						
Evaluate tools and environments that support or automate the process for conformance						
Evaluate supplier processes for conformance to process requirements.						
Create records and reports related to quality assurance activities.						

Process tasks and activities	Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Exemption/ Justification	Reference Standard
Effective Rating	**0**	**1**	**2**	**3**		
Maintain, store, and distribute records and reports						
Identify incidents and problems associated with product, service, and process evaluations						
Incidents are recorded, analyzed and classified.						
Incidents are resolved or elevated to problems						
Problems are recorded, analyzed and classified						
Treatments for problems are prioritized and implementation is tracked						
Trends in incidents and problems are noted and analyzed						
Stakeholders are informed of the status of incidents and problems						
Incidents and problems are tracked to closure.						

5.2 Technical Processes

Technical Processes		Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Justification /Exclusion	Reference Standard
Process	Effective Rating	0	1	2	3		
5.2.1 Business or mission analysis process							
Review identified problems and opportunities in the organization strategy with respect to desired organization goals or objectives.							
Define the business or mission analysis strategy.							

Technical Processes		Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Justification /Exclusion	Reference Standard
Process	Effective Rating	0	1	2	3		
Identify and plan for the necessary enabling systems or services needed to support business or mission analysis							
Obtain or acquire access to the enabling systems or services to be used.							
Analyze the problems and opportunities in the context of relevant trade-space factors							
Define the mission, business, or operational problem or opportunity.							
Define preliminary operational concepts and other concepts in life cycle stages.							
Identify candidate alternative solution classes that span the potential solution space.							
Assess each alternative solution class.							
Select the preferred alternative solution class(es).							
Maintain traceability of business or mission analysis.							
Provide key information items that have been selected for baselines.							
5.2.2 Stakeholder needs and requirements definition process							
Identify the stakeholders who have an interest in the software system throughout its life cycle.							
Define the stakeholder needs and requirements definition strategy							
Identify and plan for the necessary enabling software systems or services needed to support stakeholder needs and requirements definition.							
Obtain or acquire access to the enabling software systems or services to be used.							

Technical Processes		Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Justification /Exclusion	Reference Standard
Process	Effective Rating	0	1	2	3		
Define context of use within the concept of operations and the preliminary life cycle concepts.							
Identify stakeholder needs.							
Prioritize and down-select needs.							
Define the stakeholder needs and rationale.							
Define a representative set of scenarios to identify all required capabilities that correspond to anticipated operational and other life cycle concepts.							
Identify the interaction between users and the software system.							
Identify the constraints on a software system solution.							
Identify the stakeholder requirements and functions that relate to critical quality characteristics, such as assurance, safety, security, environment, or health							
Define stakeholder requirements, consistent with life cycle concepts, scenarios, interactions, constraints, and critical quality characteristics.							
Analyze the complete set of stakeholder requirements.							
Define critical performance measures that enable the assessment of technical achievement.							
Feed back the analyzed requirements to applicable stakeholders to validate that their needs and expectations have been adequately captured and expressed.							
Resolve stakeholder requirements issues.							
Obtain explicit agreement on the stakeholder requirements.							
Maintain traceability of stakeholder needs and requirements.							

Technical Processes		Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Justification /Exclusion	Reference Standard
Process	Effective Rating	0	1	2	3		
Provide key information items that have been selected for baselines.							
5.2.3 System/software requirements definition process							
Define the functional boundary of the software system in terms of the behavior and properties to be provided.							
Define the software/system requirements definition strategy.							
Identify and plan for the necessary enabling systems or services needed to support system/software requirements definition.							
Obtain or acquire access to the enabling systems or services to be used.							
Define each function that the software system is required to perform.							
Define necessary implementation constraints.							
Identify system/software requirements that relate to risks, criticality of the system, or critical quality characteristics.							
Define software system requirements and rationale.							
Analyze the complete set of system/software requirements.							
Define critical performance measures that enable the assessment of technical achievement							
Feed back the analyzed requirements to applicable stakeholders for review.							
Identify and resolve issues, deficiencies, conflicts, and weaknesses within the complete set of requirements.							
Obtain explicit agreement on the system /software requirements.							
Maintain traceability of the system/software							

Technical Processes		Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Justification /Exclusion	Reference Standard
Process	Effective Rating	0	1	2	3		
requirements.							
Provide key information items that have been selected for baselines.							
5.2.4 Architecture definition process							
Review pertinent information and identify key drivers of the architecture.							
Identify stakeholder concerns							
Define the architecture definition roadmap, approach, and strategy.							
Define evaluation criteria based on stakeholder concerns and key requirements.							
Identify and plan for the necessary enabling systems or services needed to support the Architecture Definition process.							
Obtain or acquire access to the enabling systems or services to be used.							
Select, adapt, or develop viewpoints and model kinds based on stakeholder concerns.							
Establish or identify potential architecture framework(s) to be used in developing models and views.							
Capture rationale for selection of framework(s), viewpoints and model types.							
Select or develop supporting modeling techniques and tools.							
Define the system context and boundaries in terms of interfaces and interactions with external entities.							
Identify architectural entities and relationships between entities that address key stakeholder concerns and critical system requirements.							
Allocate concepts, properties, characteristics, behaviors, functions, or							

Technical Processes		Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Justification /Exclusion	Reference Standard
Process	Effective Rating	0	1	2	3		
constraints that are significant to architecture decisions of the system to architectural entities.							
Select, adapt, or develop models of the candidate architectures of the system.							
Compose views from the models in accordance with identified viewpoints to express how the architecture addresses stakeholder concerns and meets stakeholder and system requirements.							
Harmonize the architecture models and views with each other.							
Define the interfaces and interactions between the system elements and with external entities.							
Partition, align and allocate requirements to architectural entities and system elements.							
Map system elements and architectural entities to design characteristics.							
Define principles for the system design and evolution.							
Assess each candidate architecture against constraints and requirements.							
Assess each candidate architecture against stakeholder concerns using evaluation criteria.							
Select the preferred architecture(s) and capture key decisions and rationale.							
Establish the architecture baseline of the selected architecture.							
Formalize the architecture governance approach and specify governance-related roles and responsibilities, accountabilities, and authorities related to design, quality, security, and safety.							
Obtain explicit acceptance of the architecture by stakeholders.							

Technical Processes		Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Justification /Exclusion	Reference Standard
Process	Effective Rating	0	1	2	3		
Maintain concordance and completeness of the architectural entities and their architectural characteristics.							
Organize, assess and control evolution of the architecture models and views to help ensure that the architectural intent is met and the architectural vision and key concepts are correctly implemented.							
Maintain the architecture definition and evaluation strategy.							
Maintain traceability of the architecture.							
Provide key artifacts and information items that have been selected for baselines.							
5.2.5 Design Definition process							
Define the design definition strategy, consistent with the selected life cycle model and anticipated design artifacts.							
Select and prioritize design principles and design characteristics.							
Identify and plan for the necessary enabling systems or services needed to support design definition.							
Obtain or acquire access to the enabling systems or services to be used.							
Transform architectural and design characteristics into the design of software system elements.							
Define and prepare or obtain the necessary design enablers.							
Examine design alternatives and feasibility of implementation.							
Refine or define the interfaces among the software system elements and with external entities.							
Establish the design artifacts.							

Technical Processes		Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Justification /Exclusion	Reference Standard
Process	Effective Rating	0	1	2	3		
Determine technologies required for each element composing the software system.							
Identify candidate alternatives for the software system elements.							
Assess each candidate alternative against criteria developed from expected design characteristics and element requirements to determine suitability for the intended application.							
Choose the preferred alternatives among candidate design solutions for the software system elements.							
Capture the design and rationale.							
Establish traceability between the detailed design elements, the system/software requirements, and the architectural entities of the software system architecture.							
Determine the status of the software system and element design.							
Provide key artifacts and information items that have been selected for baselines.							
5.2.6 System Analysis process							
Identify the problem or question that requires analysis.							
Identify the stakeholders of the analysis.							
Define the scope, objectives, and level of fidelity of the analysis.							
Select the methods to support the analysis							
Identify and plan for the necessary enabling systems or services needed to support the analysis.							
Obtain or acquire access to the enabling systems or services to be used.							
Collect the data and inputs needed for the analysis.							

Technical Processes		Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Justification /Exclusion	Reference Standard
Process	Effective Rating	0	1	2	3		
Identify and validate contexts and assumptions.							
Apply the selected analysis methods to perform the required analysis.							
Review the analysis results for quality and validity.							
Establish conclusions and recommendations.							
Record the results of the system analysis,							
Maintain traceability of the analysis results.							
Provide key artifacts and information items that have been selected for baselines.							
5.2.7 Implementation process							
Define an implementation strategy with the following:							
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;							
For reused or adapted software, methods to determine the level, source, and suitability of the reused system elements and security of the supply chain;							
procedures and methods for software development (construction) and development of unit tests; and the use of peer reviews, unit tests, and walkthroughs during implementation;							
use of CM control during software construction;							
change management considerations for manual processes;							
implementation priorities to support data							

Technical Processes		Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Justification /Exclusion	Reference Standard
Process	Effective Rating	0	1	2	3		
and software migration and transition, along with retirement of legacy systems;							
creation of manual or automated test procedures to verify that a software unit meets its requirements before creation of the software unit (test-driven development); and							
comprehensive or specialized life cycle development and support environments for realizing and managing requirements, models and prototypes, deliverable system or software elements, and test specifications and test cases.							
Identify constraints from the implementation strategy and implementation technology on the system/software requirements, architecture characteristics, design characteristics, or implementation techniques.							
Identify and plan for the necessary and distinct software environments, including enabling systems or services needed to support development and testing.							
Obtain or acquire access to the software environments and other enabling systems or services.							
Realize or adapt software elements, according to the strategy, constraints, and defined implementation procedures.							
Realize or adapt hardware elements of software systems.							
Realize or adapt service elements of software systems.							
Evaluate software unit and affiliated data or other information according to the implementation strategy and criteria.							
Package and store the software system element.							
Record objective evidence that the software system element meets requirements.							

Technical Processes		Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Justification /Exclusion	Reference Standard
Process	Effective Rating	0	1	2	3		
Record implementation results and anomalies encountered.							
Maintain traceability of the implemented software system elements.							
Provide key artifacts and information items that have been selected for baselines.							
5.2.8 Integration process							
Define the integration strategy.							
Identify and define criteria for integration and points at which the correct operation and integrity of the interfaces and the selected software system functions will be verified.							
Identify and plan for the necessary enabling systems or services needed to support integration.							
Obtain or acquire access to the enabling systems or services to be used to support integration.							
Identify constraints for integration to be incorporated in the system/software requirements, architecture or design.							
Obtain implemented software system elements in accordance with agreed schedules.							
Integrate the implemented elements.							
Record integration results and anomalies encountered.							
Maintain traceability of the integrated software system elements.							
Provide key artifacts and information items that have been selected for baselines							
5.2.9 Verification process							
Define the verification strategy, which includes the following:							

Technical Processes		Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Justification /Exclusion	Reference Standard
Process	Effective Rating	0	1	2	3		
Identify the verification scope, including the software system, element, or artifact, the properties to be verified, and the expected results.							
Identify the constraints that potentially limit the feasibility of verification actions.							
Identify verification priorities.							
Identify constraints from the verification strategy to be incorporated in the system/software requirements, architecture, or design.							
Define the purpose, conditions and conformance criteria for each verification action.							
Select appropriate verification methods or techniques and associated criteria for verification actions, such as inspection, analysis, demonstration, or testing.							
Select appropriate verification methods or techniques and associated criteria for verification actions, such as inspection, analysis, demonstration, or testing.							
Obtain or acquire access to the enabling systems or services to be used to support verification							
Define the verification procedures, each supporting one or a set of verification actions.							
Perform the verification procedures.							
Review verification results and anomalies encountered and identify follow-up actions.							
Record incidents and problems during verification and track their resolution.							
Obtain stakeholder agreement that the software system or element meets the specified requirements.							
Maintain traceability of the verified software							

Technical Processes		Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Justification /Exclusion	Reference Standard
Process	Effective Rating	0	1	2	3		
system elements							
Provide key artifacts and information items that have been selected for baselines.							
5.2.10 Transition process							
Define a strategy for managing software releases and other software system transitions, including the following considerations:							
▪ establishing the type of transition and transition success criteria;							
▪ determining the frequency of recurring transitions, such as updates and upgrades to development, test, and operational software systems;							
▪ minimizing security risks, disruption, and downtime during transition;							
▪ archiving, destroying, or converting and validating data from previous systems to the new system; including data received through external interfaces;							
▪ contingency planning for problem resolution, backup and return to the last working system version;							
▪ scheduling transitions consistent with ongoing business processing, with phased or synchronized transition of systems							
▪ change management for stakeholders, including interface partners, human operators, system administrators, and software system or service users;							
▪ associated strategies for validation of the transitioning system or element;							

Technical Processes		Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Justification /Exclusion	Reference Standard
Process	Effective Rating	0	1	2	3		
▪ initiating user support and maintenance activities with the transfer and update of system design documentation, user documentation, and test procedures; and							
▪ concurrent execution of the Transition, Operations, and Disposal processes, when a new system is commissioned and an old system is decommissioned.							
Identify and define facility, site, communications network, or target environment changes needed for software system installation or transition.							
Identify information needs and arrange for user documentation and training of operators, users, and other stakeholders necessary for system utilization and support							
Prepare detailed transition information, such as plans, schedules, and procedures.							
Identify system constraints from transition to be incorporated in the software system requirements, architecture or design.							
Identify and plan for the necessary enabling systems or services needed to support transition							
Obtain or acquire access to the enabling systems or services to be used							
Prepare the site of operation or virtual environment in accordance with installation requirements.							
Deliver the software system or element for installation at the correct location and time.							
Install the product in its physical or virtual operational location and interface to its environment.							
Provide user documentation and training for the operators, users, and other							

Technical Processes		Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Justification /Exclusion	Reference Standard
Process	Effective Rating	0	1	2	3		
stakeholders necessary for product utilization and support.							
Perform activation and check-out, including the following as agreed:							
▪ Demonstrate proper installation of the software system.							
▪ Demonstrate the installed or transitioned product is capable of delivering its required functions							
▪ Demonstrate the functions provided by the system are sustainable by the enabling systems							
▪ Review the software system for operational readiness							
▪ Commission the software system for operations.							
Record transition results and anomalies encountered.							
Record transition incidents and problems and track their resolution.							
Maintain traceability of the transitioned software system elements.							
Provide key artifacts and information items that have been selected for baselines.							
5.2.11 Validation process							
▪ Define the validation strategy, which includes the following:							
▪ Identify the validation scope, including the characteristics of the software system, element, or artifact to be validated, and the expected results of validation.							

Technical Processes		Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Justification /Exclusion	Reference Standard
Process	Effective Rating	0	1	2	3		
▪ Identify the constraints that potentially limit the feasibility of validation actions.							
▪ Identify validation priorities.							
Identify system constraints from the validation strategy to be incorporated in the stakeholder requirements.							
Define the purpose, conditions and conformance criteria for each validation action.							
Select appropriate validation methods or techniques and associated criteria for each validation action.							
Identify and plan for the necessary enabling systems or services needed to support validation							
Obtain or acquire access to the enabling systems or services to be used to support validation.							
Define the validation procedures, each supporting one or a set of validation actions							
Perform the validation procedures in the defined environment.							
Perform the validation procedures in the defined environment.							
Record incidents and problems during validation and track their resolution							
Obtain stakeholder agreement that the software system or element meets the stakeholder needs.							
Maintain traceability of the validated system elements							
Provide key artifacts and information items that have been selected for baselines.							
5.2.12 Operation process							
Define an operation strategy, including the							

Technical Processes		Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Justification /Exclusion	Reference Standard
Process	Effective Rating	0	1	2	3		
following considerations:							
▪ The expected or agreed capacity, availability, response time, and security of services as they are introduced, routinely operated and withdrawn from service;							
▪ The human resources strategy, depending on the need to define training and qualification requirements, train or obtain personnel to control and monitor software system operations, administer system access, and support customer service requests and user assistance							
▪ The release criteria and schedules of the software system to permit modifications that sustain existing or enhanced services;							
▪ The approach to implement the operational modes in the Operational Concept, including normal operations and preparations for, and testing of, envisioned types of contingency operations;							
▪ Measures for operation that will provide insight into performance levels;							
▪ The operational and occupational safety strategy for operators and others using or in contact with the software system during operation, accounting for safety regulations							
▪ The environmental protection and sustainability strategy for operating the software system							
Identify system constraints from operation to be incorporated in changes to the system/software requirements, architecture, design, implementation, or transition.							

Technical Processes		Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Justification /Exclusion	Reference Standard
Process	Effective Rating	0	1	2	3		
Identify and plan for the necessary enabling systems or services needed to support operation							
Obtain or acquire access to the enabling systems or services to be used.							
Identify or define training and qualification requirements for personnel needed for software system operation.							
Depending on the need for human intervention and control of operations, assign trained, qualified personnel to be operators.							
Use the software system in its intended operational environment.							
Apply materials and other resources, as required, to operate the software system and sustain its services.							
Monitor software system operation, including consideration of the following:							
▪ Managing adherence to the operation strategy (e.g., operational procedures);							
▪ Recording and reporting significant events, such as possible breaches of software and data confidentiality and integrity;							
▪ Operating the software system in a safe manner and compliant with legislated guidelines e.g., those concerning occupational safety and environmental protection;							
▪ Recording when software system or service performance is not within acceptable parameters							
Consistent with the operational strategy, develop and, where feasible, automate operational procedures to minimize the risk of operational anomalies.							

Technical Processes		Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Justification /Exclusion	Reference Standard
Process	Effective Rating	0	1	2	3		
Consistent with the operational strategy, analyze measurements to confirm that:							
▪ Service performance is within acceptable parameters or agreed service levels for the agreed workload;							
▪ System and service availability and response times are acceptable;							
▪ Cost of operation is consistent with objectives and constraints; and							
▪ Potential improvements are identified and prioritized.							
Perform contingency operations, if necessary.							
Record results of operation and anomalies encountered.							
Record operational incidents and problems and track their resolution							
Maintain traceability of the operational services and configuration items.							
Provide key artifacts and information items that have been selected for baselines.							
Provide assistance and consultation to the customers and users to resolve complaints, incidents, problems, and service requests.							
Record and monitor requests and subsequent actions for support.							
Determine the degree to which the delivered software system or services satisfy the needs of the customers and users.							

Technical Processes		Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Justification /Exclusion	Reference Standard
Process	Effective Rating	0	1	2	3		
5.2.13 Maintenance process							
Define a maintenance strategy, including consideration of the following:							
▪ Establishing priorities, typical schedules, and procedures for performing, verifying, distributing, and installing software maintenance changes in conformance with operational availability requirements;							
▪ Establishing techniques and methods for becoming aware of the need for corrective, adaptive, and perfective maintenance;							
▪ Periodic assessment of the design characteristics in case of evolution of the software system and of its architecture;							
▪ Forecasting potential obsolescence of components and technologies using information on technical changes in related systems;							
▪ Establishing priorities and resources to obtain access to the correct versions of the product and product information needed for performing maintenance (e.g., scheduled or phased installation maintenance patches or software upgrades);							
▪ Measures for maintenance that will provide insight into performance levels, effectiveness, and efficiency, including access to historical fault and failure;							
▪ Agreed rights to data and the impact on data in the system during problem resolution and maintenance activity;							

Technical Processes		Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Justification /Exclusion	Reference Standard
Process	Effective Rating	0	1	2	3		
▪ Approach to assure that counterfeit or unauthorized system elements are not introduced into the system;							
▪ Impact of the maintenance change on other software systems elements versus the risk of leaving a reported software anomaly in place;							
▪ The skill and personnel levels required to effect system or software repairs or replacements, fixes, patches, updates, and upgrades, considering legal and regulatory requirements regarding health and safety, security, and the environment.							
For non-software elements, define a logistics strategy throughout the life cycle, including acquisition and operational considerations: the number and type of replacement elements to be stored, their storage locations and conditions, their anticipated replacement rate, and their storage life and renewal frequency.							
Identify constraints from maintenance to be incorporated in the system/software requirements, architecture, or design.							
Identify trades such that the system and associated maintenance and logistics actions result in a solution that is affordable, operable, supportable, and sustainable.							
Identify and plan for the necessary enabling systems or services needed to support maintenance.							
Obtain or acquire access to the enabling systems or services to be used.							

Technical Processes		Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Justification /Exclusion	Reference Standard
Process	Effective Rating	0	1	2	3		
Review stakeholder requirements, complaints, events, incident and problem reports to identify corrective, adaptive, perfective and preventive maintenance needs.							
Analyze the impact of maintenance changes on data structures, data, and related software functions, user documentation, and interfaces							
Upon encountering unexpected faults that cause a software system failure, restore the system to operational status.							
Implement the procedures for correction of flaws (defects) and errors, or for replacement or upgrade of system elements.							
Perform preventive maintenance by replacing, patching, augmenting, or upgrading software system elements, to improve the performance of a software system that is projected to reach unacceptable service levels, e.g., lack of capacity due to increases in demand or stored data, or to avoid unacceptable operating conditions, e.g., running with outdated security software.							
Identify when adaptive or perfective maintenance is required.							
Obtain resources to support the software system through its life cycle or the project's life (acquisition logistics).							
Monitor the quality and availability of replacement elements and enabling systems, their delivery mechanisms and their continued integrity during storage.							

Technical Processes		Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Justification /Exclusion	Reference Standard
Process	Effective Rating	0	1	2	3		
Implement mechanisms for software system or element distribution, including packaging, handling, storage and communications or transportation needed for items during the life cycle.							
Confirm that logistics actions to fulfill software system or element supportability requirements or achieve operational readiness are planned and implemented.							
Record incidents and problems, including their resolutions, and significant maintenance and logistics results.							
Identify and record trends of incidents, problems, and maintenance and logistics actions.							
Maintain traceability of the system elements being maintained.							
Provide key artifacts and information items that have been selected for baselines.							
Monitor and measure customer satisfaction with system and maintenance support							
5.2.14 Disposal process							
Define a disposal strategy for the software system, to include each system element and to identify and address critical disposal needs, including the following considerations:							
▪ Permanent termination of the system's functions and delivery of services, e.g., physical destruction of data storage devices, or transition of the software system elements for future reuse in modified or adapted form;							

Technical Processes		Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Justification /Exclusion	Reference Standard
Process	Effective Rating	0	1	2	3		
▪ Identification of ownership and responsibility for retention or destruction of data and intellectual property in the software system;							
▪ Transformation of the product into, or retention in a socially and physically acceptable state, thereby avoiding subsequent adverse effects on stakeholders, society and the environment;							
▪ The health, safety, security and privacy concerns applicable to disposal actions and to the long-term condition of resulting physical material and information							
▪ Notification to relevant stakeholders of significant disposal activities, e.g., retirement or replacement of a system, software products or services, retirement schedule, or replacement options;							
▪ Identification of schedules, actions, responsibilities, and resources for disposal activities.							
Identify constraints on disposal for the system/software requirements, architecture and design characteristics, or implementation techniques.							
Identify and plan for the necessary enabling systems or services needed to support disposal.							
Obtain or acquire access to the enabling systems or services to be used.							
Specify containment facilities, storage locations, inspection criteria and storage periods, if the software system or data is to be stored, consistent with security and environmental considerations.							

Technical Processes		Not Performed	Partially/ Informally performed	Planned and tracked	Well Defined	Justification /Exclusion	Reference Standard
Process	Effective Rating	0	1	2	3		
Define preventive methods to preclude disposed elements and materials that should not be repurposed, reclaimed or reused from re-entering the supply chain.							
Deactivate the software system or element to prepare it for removal.							
Remove the software system, its elements, its data, and non-reusable material from use or production for appropriate disposition and action.							
Withdraw impacted operating staff from the software system or system element and record relevant operating knowledge.							
Reuse, recycle, recondition, overhaul, archive, or destroy designated software system elements.							
Conduct destruction of the system elements, as necessary, to reduce the amount of waste treatment or to make the waste easier to handle							
Confirm that detrimental health, safety, security, and environmental conditions following disposal have been identified and treated.							
Return the environment to its original state or to a state that is specified by agreement.							
Archive information gathered through the lifetime of the product to permit audits and reviews in the event of long-term hazards to health, safety, security and the environment, and to permit future software system creators and users to build a knowledge base from experience.							