

**Appendix B to “Analysis of Systems Engineering Competencies and Proficiency Levels by Role for an MBSE-Enabled Project,” submitted for publication to the *IEEE Open Journal of Systems Engineering*, October 2025**

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***Appendix B***

The following tables show the mapping of knowledge, skills, abilities, and behaviors (KSABs) in the Digital Engineering Competency Framework (DECF) v1.1 [1] to tasks in System Requirements Definition and Traceability. Each KSAB listed is followed by numbers in brackets that correspond to tasks in System Requirements Definition and Traceability. For brevity, only the KSABs that were mapped to a task are listed in the following tables.

*Table B.1. System Requirements Definition and Traceability Task Numbers Mapping to KSABs*

<b>Number in KSAB Mapping Tables</b>	<b>Task in System Requirements Definition and Traceability</b>
1	1.1.1: Identify stakeholders and manage engagement, expectations, and needs
2	1.1.2: Define program/system scope, including system boundaries and work breakdown structure
3	1.1.3: Define and manage program/acquisition strategy and implement business rules
4	1.1.4: Define and drive vision and way-ahead for the team
5	1.1.5: Manage project progress and outcome, including understanding the programmatic/technical/cost/ schedule implications of programmatic/technical/cost/schedule decisions
6	1.1.6: Define and manage cost/budget
7	1.1.7: Define and manage schedule, ensuring focus on major milestones
8	1.1.8: Define and manage personnel, roles, teams, and organizational structure, to include internal teaming agreements/needs, meeting cadence, reporting/deliverables requirements, and training
9	1.1.9: Define and manage required tools and equipment, including prototypes, simulators, testbeds, engineering models, etc.
10	1.1.10: Define and manage risk and program compliance
11	1.1.11: Manage access to facilities/spaces and required tools/equipment, including IT infrastructure
12	1.1.12: Define process for and manage Change Management, Configuration Control (requirements, project documentation, etc.), and Quality Control
13	1.1.13: Define, manage, and execute required reviews
14	1.1.14: Manage project documentation/technical document library and compile and deliver relevant contract deliverables and documents
15	1.1.15: Manage Security and maintain Security Classification Guide
16	1.1.16: Manage IT/cyber support and ensure coordination with Security
17	1.2.1: Define functional boundary in terms of the behavior and properties the system will provide, including system performance attributes, throughput, and responsiveness needs
18	1.2.2: Identify/obtain stakeholder key functional/performance requirements and iteratively review

19	1.2.3: Define functions and associated performance, system CONOPs, and Use Cases
20	1.2.4: Define constraints on the program/system, operating environment, interactions with external systems, externally-driven requirements, and required new interfaces; create required documentation
21	1.2.5: Identify and capture system requirements and attributes and create requirements baseline
22	1.2.6: Identify requirements that relate to risk, criticality, critical quality characteristics, and compliance with standards and regulations
23	1.2.7: Begin to define verification success criteria for each requirement, verification strategy, verification method, verification plan, and responsible organization, and continue to iterate
24	1.3.1: Analyze requirements to ensure they are correct, complete, consistent, traceable, understandable, appropriate to level, verifiable/measurable, and feasible, adjudicating and refining as necessary
25	1.3.2: Define critical performance measures
26	1.3.3: Review analyzed requirements with stakeholders and resolve any issues
27	1.3.4: Analyze requirements for criticality (e.g., impact of non-satisfaction) and sensitivity (e.g., impact of partial satisfaction)
28	1.3.5: Prioritize requirements, if needed
29	1.3.6: Develop performance models and analyses to model and/or test to validate and/or verify requirements
30	1.3.7: Determine system compliance criteria and margin to requirements
31	1.4.1: Establish and sustain requirements traceability
32	1.4.2: Establish, document, and manage system requirements change process, including a means to identify impacts of a proposed requirements change
33	1.4.3: Establish and manage baselines for information items, work products, or other artifacts
34	1.4.4: Manage progress of requirements development, change, and satisfaction

*Table B.2. Tasks Mapped to Data Governance Competency*

<b>Proficiency Level</b>	<b>KSABs</b>
Awareness	<ul style="list-style-type: none"> <li>• Aware of the data required to inform program and technical decisions [1- 7, 10, 12-14, 17-34]</li> <li>• Explain the importance of a data model [1, 2, 4, 5, 10, 12-14, 17-34]</li> </ul>
Basic	<ul style="list-style-type: none"> <li>• Assist in providing accessibility, retrievability, security, and protection of data in an ethical manner [1, 11, 14-16, 33]</li> <li>• Critically review, analyze, synthesize, compare, and interpret information [1-7, 10, 12-14, 17-34]</li> <li>• Draw conclusions from relevant and/or missing information [1-7, 10, 12-14, 17-34]</li> <li>• Identify data connections between issues [1-7, 10, 12-14, 17-34]</li> <li>• Understand project-specific needs in the digital environment such as database or data warehouse specifications [9, 16]</li> <li>• Understand and apply principles of usability and accessibility to published information [1, 14]</li> <li>• Understand the definition of data model [1-5, 10, 12-14, 17-34]</li> <li>• Understand the definitions of data governance, data storage, data integration, and monitoring [14, 16]</li> </ul>
Intermediate	<ul style="list-style-type: none"> <li>• Contribute to the development of organizational strategies that address information control requirements [33]</li> </ul>

	<ul style="list-style-type: none"> <li>Update methods, processes, and tools to enable data and model exchanges while protecting property rights for both vendors and the government [1, 2, 10, 12-32, 34]</li> <li>Assess the implications of low-quality data [2, 10, 12-14, 17-32, 34]</li> </ul>
Advanced	<ul style="list-style-type: none"> <li>Ensure that operational problems are identified, monitored, and resolved, using relevant data and data analyses [20, 22-24, 26, 27, 29, 30, 32, 34]</li> <li>Assess and manage risks around the use of information [10]</li> <li>Assess issues which might prevent the organization from making maximum use of its information assets [16]</li> <li>Devise and implement master data management processes, including classification, security, quality, ethical principles, retrieval, and retention processes [1, 14, 15, 16, 33]</li> <li>Ensure effective controls are in place for internal delegation, audit, and control relating to information and records management [12, 14, 33]</li> <li>Identify the implications of copyright, data protection, and other legal issues associated with publishing data [1, 10, 15, 33]</li> <li>Provide expert guidance in the selection, provision, and use of database and data warehouse architectures, software, and facilities [9, 16]</li> <li>Provide specialist advice to those accountable for information governance to correct digital media related compliance issues [10]</li> <li>Recommend remediation actions on information and documentation, records management, information assurance, and data protection, as required [12, 14, 16, 33]</li> </ul>
Expert	<ul style="list-style-type: none"> <li>Identify and manage resources needed for the planning, development, and delivery of specified information and communications systems services (including storage, modifications, and communication of data, voice, text, audio, and images) [1, 9, 14, 16,]</li> <li>Determine the data requirements for the appropriate governance of enterprise digital environment, ensuring clarity of responsibilities and authority, goals and objectives, within a designated area of accountability [16]</li> <li>Develop organizational policies, standards, and guidelines for data management, aligned with principles congruent to the ethical use and dissemination of digital artifacts [1, 14, 33]</li> <li>Establish and communicate the organization's information management strategy [1]</li> <li>Identify the impact of any relevant statutory, internal, or external regulations on the organization's use of information and develop strategies for compliance [10]</li> </ul>

*Table B.3. Tasks Mapped to Data Management Competency*

<b>Proficiency Level</b>	<b>KSABs</b>
Awareness	<ul style="list-style-type: none"> <li>Understand the benefits of data management [1-7, 9, 10, 12-34]</li> <li>Understand the definition of data management [1-7, 9, 10, 12-34]</li> </ul>
Basic	<ul style="list-style-type: none"> <li>Understand, orient to, and integrate new information [1-7, 9, 10, 12-34]</li> <li>Understand how data from the Digital System Model (DSM) is stored, shared, protected, and used [1-5, 10-34]</li> <li>Understand the benefits of data centralization [2-7, 9, 10, 12-34]</li> <li>Understand the definition of library filing construct [2-7, 9, 10, 12-34]</li> </ul>
Intermediate	<ul style="list-style-type: none"> <li>Develop appropriate physical database or data warehouse design elements, within set policies, to meet business change or development project data requirements [9, 16]</li> </ul>

Advanced	<ul style="list-style-type: none"> <li>• Derive data management structures and metadata to support consistency of information retrieval, combination, analysis, pattern recognition and interpretation, throughout the organization [16]</li> <li>• Develop and maintain specialist knowledge of database and data warehouse concepts, design principles, architectures, software, and facilities [16]</li> <li>• Ensure implementation of information and records management policies and standard practice [12, 14, 21, 32, 33]</li> <li>• Ensure that formal information access requests and complaints are dealt with according to approved procedures [11, 16]</li> <li>• Ensure that physical database design policy supports transactional data requirements for performance and availability [16]</li> <li>• Implement physical database designs to support transactional data requirements for performance and availability [9, 16]</li> <li>• Maintain and implement information handling procedures [15, 16]</li> <li>• Manage the iteration, review, and maintenance of data requirements and data models [17-34]</li> <li>• Take responsibility for the accessibility, retrievability, security, quality, retention, and ethical handling of specific subsets of data [11, 12, 15, 16, 32]</li> <li>• Enable the availability, integrity, and searchability of information through the application of formal data and metadata structures and protection measures [14, 16, 21, 33]</li> <li>• Assess the integrity of data from multiple sources [10, 12, 16-20, 22-31, 34]</li> </ul>
Expert	<ul style="list-style-type: none"> <li>• Derive an overall strategy of master data management, within an established information architecture, that supports the development and secure operation of information and digital services [12, 14, 15]</li> <li>• Protect the integrity, availability, authenticity, non-repudiation, and confidentiality of information and data in storage and in transit [14-16]</li> <li>• Review new change proposals and provide specialist advice on information and records management, including advice on and promotion of collaborative working and assessment and management of information-related risk [10, 12, 14]</li> </ul>

*Table B.4. Tasks Mapped to Modeling Competency*

<b>Proficiency Level</b>	<b>KSABs</b>
Awareness	<ul style="list-style-type: none"> <li>• Capture and maintain model provenance and pedigree in order to establish trust, credibility, accuracy, and a basis for judging model reuse [12-14, 17-27, 29-34]</li> <li>• Describe a variety of system analysis techniques which can be used to derive information about a system [2, 17-34]</li> <li>• Describe different types of modeling and provide examples [1, 2, 17-27, 29-34]</li> <li>• Explain why system representations are required and the benefits they can bring to developments [1-5, 14, 15, 17-34]</li> <li>• Understand that system models are created for system development efforts in accordance with applicable standards and policies [1-5, 10, 12-15, 17-34]</li> <li>• Understand the various modeling toolsets [17-27, 29-34]</li> <li>• Describe the scope and limitations of models, including definition, implementation, and analysis [1-5, 10, 15, 17-34]</li> <li>• Explain how the purpose of modeling affects the approach taken [1-5, 17-27, 29-34]</li> <li>• Re-state terms and definitions about models and Digital Engineering in Systems Engineering [1-5, 13-15, 17-34]</li> <li>• Understand "model" in the context of Digital Engineering [1-5, 13, 15, 17-34]</li> </ul>

	<ul style="list-style-type: none"> <li>• Understand the basic modeling concepts, diagrams, data attributes, and the relationship(s) between the modeling language diagrams [1, 2, 5, 13-15, 17-34]</li> </ul>
Basic	<ul style="list-style-type: none"> <li>• Construct models to be traceable from concept to disposal, so that they can become the authoritative source of truth [2, 17-27, 29-34]</li> <li>• Know where to find model descriptions [1, 2, 5, 13-15, 17-34]</li> <li>• Understand the purpose and benefits of modeling [1-5, 13-15, 17-34]</li> <li>• Use appropriate system analysis techniques to derive information about the real system [5, 17-34]</li> <li>• Use models to communicate, collaborate, and perform model-driven lifecycle activities by exchanging information between technical disciplines or organizations [1, 2, 4, 5, 13, 14, 17-34]</li> <li>• Use models to support analysis [5, 17-34]</li> <li>• Use various modeling toolsets [17-27, 29-34]</li> <li>• Apply concepts to start creating system models and architecture products (less complex architecture with fewer coordinating activities) with direct supervision [2, 17-27, 29-34]</li> <li>• Apply modeling techniques to establish, modify, or maintain a data structure and its associated components (entity descriptions, relationship descriptions, attribute definitions) [17-27, 29-34]</li> <li>• Apply published modeling methodologies, i.e., OOSEM, JPL-SA, RUP-SE, etc. [17-27, 29-34]</li> <li>• Assist in creating the system model and required architectural products for a system or system-of-systems in accordance with applicable standards and policies under direct supervision [17-27, 29-34]</li> <li>• Assist in maintaining the system model and required architectural products for a system or system-of-systems in accordance with applicable standards and policies under direct supervision [17-27, 29-34]</li> <li>• Assist in more complex modeling activities [17-27, 29-34]</li> <li>• Build models in a collaborative modeling environment [17-27, 29-34]</li> <li>• Comply with style guides to properly develop system models [10, 17-27, 29-34]</li> <li>• Define governing modeling plans, processes, and appropriate tools for a project, and use these to monitor and control systems modeling activities for a system or system element [2, 4, 9, 17-27, 29-34]</li> <li>• Develop plans to digitally represent the system of interest, using an approach that uses models to enable the orchestration of activities, the efficient management of work products and multidisciplinary teams to results in the digital representation in the SOI [2, 4, 17-34]</li> <li>• Explain policy and guidance about models, simulations, and Digital Engineering [1-4, 10, 12, 14, 15, 17-34]</li> <li>• Explain the use of models in Digital Engineering (DE) [1, 3-5, 13-15, 17-34]</li> <li>• Utilize modeling language tools to create or maintain architectural products based on data provided [17-27, 29-34]</li> <li>• Utilize Unified Modeling Language (UML) based tools to create or maintain architectural products based on data provided [17-27, 29-34]</li> <li>• Understand the types of data models (conceptual, logical, physical) [1, 2, 14, 15, 17-34]</li> <li>• Identify key considerations for implementing a digital system model successfully [1, 17-34]</li> <li>• Understand the steps of the model-test-model approach: long-term planning, pre-test modeling, field test, post-test modeling, model validation/accreditation [23, 27, 29, 30, 32]</li> <li>• Understand the benefits and potential risks in the model-test-model approach [10, 23, 27, 29, 30, 32]</li> </ul>
Intermediate	<ul style="list-style-type: none"> <li>• Create system models for system development efforts in accordance with applicable standards and policies [17-27, 29-34]</li> <li>• Define the interrelationships among model elements and diagrams [5, 13, 15, 17-34]</li> <li>• Explain why models are developed for a specific purpose or use and provide examples [1, 2, 4, 5, 13, 15, 17-34]</li> </ul>

- Have a well-developed understanding of modeling tools and how to implement them in both classified and unclassified environments [9, 15, 17-27, 29-34]
- Model current and desired scenarios, as directed [17-27, 29-34]
- Review the system model created by others [5, 13, 15, 17-34]
- Select appropriate tools and techniques for system modeling and analysis [2, 9, 17-27, 29-34]
- Use model formalisms to aid in the development, integration, and curation of models, [17-34]
- Use modeling language, concepts, diagrams, data attributes [2, 17-34]
- Ability to design models based on data [2, 17-27, 29-34]
- Analyze the system model [5, 15, 17-27, 29-34]
- Apply design, modeling, and quality assurance techniques, based upon a detailed understanding of business processes, to establish, modify, or maintain data structures and associated components (entity descriptions, relationship descriptions, attribute definitions) [12, 17-27, 29-34]
- Assess aspects of model quality to ensure conformance to language and method constraints [12, 17-27, 29-34]
- Contribute to model development and interpretation activities [2, 5, 15, 17-27, 29-34]
- Conversant with techniques covering full range of modeling situations [17-27, 29-34]
- Develop accurate, complete, trusted, and reusable models [2, 17-27, 29-34]
- Develop Digital Artifacts, according to intent [2, 17-27, 29-34]
- Develop models with input from subject matter experts and communicate the results back to them for review and confirmation [2, 17-27, 29-34]
- Explain why models have a limit of valid use, and the risks of using models outside those limits [1, 2, 4, 5, 10, 15, 17-34]
- Gain agreement from subject matter experts to models produced [17-34]
- Generate system models [17-27, 29-34]
- Implement system model and architecture [17-27, 29-34]
- Implement the strategy and approach to be adopted for the modeling on a system or system element [3, 17-27, 29-34]
- Integrate and curate models across disciplines to support cohesive model driven lifecycle activities [5, 17-27, 29-34]
- Interpret and use outcomes of modeling, with guidance [1, 2, 5, 15, 17-34]
- Lead and determine appropriate representation of a system or system element [17-27, 29-34]
- Maintain the system model for a system or system-of-systems in accordance with applicable standards and policies with minimal or no supervision [17-27, 29-34]
- Manage framework for system model [17-27, 29-34]
- Organize complex models [17-27, 29-34]
- Review how the system model is aligned with the framework [17-27, 29-34]
- Review system model to identify system components or capabilities based on the application [17-34]
- Review the creation of system models (e.g., Interface Control Document, SysML diagrams) produced by other systems engineers to ensure proper format and content [10, 12, 13, 15, 17-27, 29-34]
- Select appropriate modeling techniques for meeting assigned objectives [2, 17-27, 29-34]
- Use modeling and simulation tools and techniques to represent a system or system element [2, 17-27, 29-34]

	<ul style="list-style-type: none"> <li>• Use system models for collaboration of design and technical reviews to execute trade-off and design analyses, prototype, manufacture, test, and sustainment of the developed system [1, 5, 13, 15, 17-34]</li> </ul>
Advanced	<ul style="list-style-type: none"> <li>• Advise on selection of appropriate modeling or analysis approach, based on understanding the strengths and weaknesses of various modeling techniques [17-27, 29-34]</li> <li>• Develop approaches to integrating modeling tools with other types of engineering tools such as requirements management tools and configuration management tools [3, 12, 17-27, 29-34]</li> <li>• Prepare instructions in support of collaboration of model development, to ensure accurate use and operation between technical disciplines and organizations [3, 17-27, 29-34]</li> <li>• Adapt approach to accommodate the specifics of a given situation or system of interest being modeled [17-27, 29-34]</li> <li>• Analyze system models [5, 13, 15, 17-34]</li> <li>• Apply a range of mathematical, statistical, or predictive modeling techniques in consultation with experts if appropriate, and with sensitivity to the limitations of the techniques [5, 17-27, 29-34]</li> <li>• Coach new and experienced practitioners in systems modeling and analysis [17-27, 29-34]</li> <li>• Conduct advanced modeling activities for significant change programs and across multiple business functions [17-27, 29-34]</li> <li>• Conduct analyses (e.g., gap, impact, interoperability) of the system model and architectural products [5, 17-34]</li> <li>• Contribute to discussions about the choice of the modeling approach to be used [2, 4, 17-27, 29-34]</li> <li>• Define and document enterprise-level policies, procedures, guidance, and best practice for systems modeling and analysis, including associated tools [3, 4, 9, 10, 12, 17-27, 29-34]</li> <li>• Determine how to integrate or federate models [17-27, 29-34]</li> <li>• Develop framework for system model [17-27, 29-34]</li> <li>• Ensure that DE activities and digital artifacts development are performed according to intent [1-4, 17-34]</li> <li>• Evaluate system models created and maintained by others [13, 17-34]</li> <li>• Identify and maintain an approach that integrates models generated by all stakeholders to digitally represent the SOI throughout the lifecycle [2-4, 17-27, 29-34]</li> <li>• Investigate corporate data requirements, and apply data analysis, modeling, and quality assurance techniques, to establish, modify, or maintain data structures and their associated components (entity descriptions, relationship descriptions, attribute definitions) [12]</li> <li>• Manage complex system model development and analysis efforts [2, 4, 17-27, 29-34]</li> <li>• Plan own modeling activities, selecting appropriate techniques and the correct level of detail for meeting assigned objectives [17-27, 29-34]</li> <li>• Prioritize the creation of system models to meet larger program milestones and events [2, 4, 13, 17-34]</li> <li>• Prioritize the maintenance of system models to meet larger program milestones and Systems Engineering Technical Review (SETR) events [2, 4, 13, 17-34]</li> <li>• Responsible for planning and coordinating team modeling activities and for ensuring the quality of their work [12, 17-27, 29-34]</li> <li>• Review and judge the outputs of systems modeling ensuring the results can be used for the intended purpose [12, 13, 15, 17-27, 29-34]</li> <li>• Review complex modeling work [13, 15, 17-27, 29-34]</li> <li>• Set standards for data modeling and design tools and techniques, advise on their application, and ensure compliance [3, 4, 10, 12, 17-27, 29-34]</li> </ul>

	<ul style="list-style-type: none"> <li>Verify the creation of system models and architectural products (e.g., Interface Control Document, DoDAF viewpoints, SysML diagrams) produced by other systems engineers to ensure proper format and content [12, 13, 15, 17-27, 29-34]</li> </ul>
Expert	<ul style="list-style-type: none"> <li>Review and judge the suitability of systems modeling and analysis approaches and results [13, 17-27, 29-34]</li> <li>Advise and arbitrate on complex or sensitive issues relating to systems modeling [17-27, 29-34]</li> <li>Apply a wide-ranging knowledge of the strengths and weaknesses of available modeling techniques, to advise on the appropriateness of selected approaches in any given level of complexity and novelty [17-27, 29-34]</li> <li>Contribute to system modeling best practices [10, 17-27, 29-34]</li> <li>Defines strategy and approach to be used for modeling and analysis of complex or novel system or system elements [2, 4, 17-27, 29-34]</li> <li>Has continuing responsibility for the maintenance of models for a designated function [17-27, 29-34]</li> <li>Influence key stakeholders within and beyond the enterprise boundary in systems modeling and analysis [1, 4, 17-34]</li> <li>Lead the development of architectures for complex solutions, ensuring consistency with specified requirements agreed with both external, and internal customers [2-4, 17-27, 29-34]</li> <li>Within a business change program, manage the target design, policies, and standards, working proactively to maintain a stable, viable architecture and ensure consistency of design across projects within the program [10]</li> </ul>

*Table B.5. Tasks Mapped to Simulation Competency*

<b>Proficiency Level</b>	<b>KSABs</b>
Awareness	<ul style="list-style-type: none"> <li>Describe the scope and limitations of model simulations, including definition, implementation, and analysis [27, 29, 30, 34]</li> <li>Explain how the purpose of modeling and simulation affect the approach taken [1-4]</li> <li>Explain the relevance of outputs from systems modeling analysis, and how these relate to overall system development [1-5, 12-15, 17-30, 34]</li> <li>Describe different types of simulation and provide examples [29, 30, 34]</li> <li>Describe the scope and limitations of simulations, including definition, implementation, and analysis [29, 30, 34]</li> <li>Explain how the purpose of simulation affects the approach taken [4, 29, 30, 34]</li> <li>Re-state terms and definitions about simulations in Systems Engineering [29, 34]</li> <li>Understand the various simulation toolsets [29, 34]</li> </ul>
Basic	<ul style="list-style-type: none"> <li>Explain the use of models and simulations within a digital engineering environment [3-5, 12, 13, 15, 17-30, 34]</li> <li>Explain why models and simulations have a limit of valid use, and the risks of using models and simulations outside those limits [10, 27, 29, 30, 34]</li> <li>Use established techniques as directed, to model simple subject areas with clearly-defined boundaries [2, 17-27, 29-31, 34]</li> <li>Understand the definitions of modeling and simulation [2-5, 12, 13, 15, 29, 30, 34]</li> <li>Understand the definition of models and simulation [2-5, 12, 13, 15, 29, 30, 34]</li> <li>Explain the use of simulations in Digital Engineering (DE) [1-5, 12, 13, 15, 27-30, 34]</li> <li>Use various simulation toolsets [29, 30, 34]</li> </ul>
Intermediate	<ul style="list-style-type: none"> <li>Assist in complex modeling activities [17-22, 25, 27, 29-31, 34]</li> <li>Applies modeling and simulation applications and tools, to cover a full range of modeling simulations [29, 30, 34]</li> </ul>

	<ul style="list-style-type: none"> <li>• Integrate modeling capabilities with other product and analytical models including physics-based models [29, 30, 34]</li> <li>• Use system analysis techniques to derive information about the real system, with guidance [17-31, 34]</li> <li>• Use tools and techniques to conduct analysis of models, with guidance [17-31, 34]</li> <li>• Understand different types of models (mathematical, process, text vs graphics-based, low- vs high-level models, flat vs hierarchical [17-31, 34]</li> <li>• Understand considerations for implementing a Digital System Model (DSM) [2-5, 17-31, 34]</li> <li>• Understand how models and digital artifacts can be used to represent technical coherency using DE concepts [17-31, 34]</li> <li>• Understand the process for peer review of models, simulations, and digital artifacts [12, 17-27, 29-32, 34]</li> <li>• Understand the spectrum of peer review approaches for modeling and simulation and the implications of each (desk checking, pair programming, team review, walkthrough, formal inspection) [12, 29, 30, 32, 34]</li> <li>• Explain why simulations have a limit of valid use, and the risks of using simulations outside those limits [10, 27, 29, 30, 34]</li> <li>• Interpret and use outcomes of simulation with guidance [29, 30, 34]</li> <li>• Select appropriate tools and techniques for system modeling simulation [9, 29, 30, 34]</li> <li>• Use simulation tools and techniques to represent a system or system element [29, 30, 34]</li> </ul>
Advanced	<ul style="list-style-type: none"> <li>• Apply modeling and simulation techniques to forecast the demand upon a particular resource or service [17-22, 24, 25, 27-30, 34]</li> <li>• Advise on the choice of modeling techniques and approach, to communicate with customers accordingly [17-27, 29, 30, 34]</li> <li>• Analyze system designs (including system elements and enabling system elements), to provide a greater understanding of the reasons for defects and failures at all levels [23, 25, 27, 29, 30, 34]</li> <li>• Apply a range of mathematical, statistical, predictive modeling, or machine-learning techniques in consultation with experts if appropriate, and with sensitivity to the limitations of the techniques [29, 30, 34]</li> <li>• Understand that various modeling and simulation applications and tools are required to cover a full range of modeling and simulation situations [29, 34]</li> <li>• Coordinate complex modeling work [17-22, 25, 27, 30]</li> <li>• Develop and implement clearly defined digital modeling plans and method statements [17-22, 24, 25, 27, 29, 30, 34]</li> <li>• Ensure staff use the model to support their analysis [17-30, 34]</li> <li>• Ensure that appropriate modeling and simulation tools and methods are available, understood, and employed in architecture development [29, 34]</li> <li>• Use models to identify and evaluate alternative architectures and the trade-offs in cost, performance, and scalability [5, 29, 30, 34]</li> <li>• Implement the strategy and approach to be adopted for the modeling and analysis on a system or system element [17-28, 30, 34]</li> <li>• Understand the need to include modeling, simulation, and Digital Engineering tasks in the request for proposal (RFP) [3, 4]</li> <li>• Understand the need to obtain the appropriate model, simulation, and digital engineering artifact deliverables using the proper contractual mechanism [3, 4, 14]</li> <li>• Advise on selection of appropriate modeling or analysis approach, based on understanding the strengths and weaknesses of various simulation techniques [17-22, 25, 27]</li> <li>• Review and judge the outputs of systems simulations, ensuring the results can be used for the intended purpose [27, 29, 30, 34]</li> </ul>
Expert	<ul style="list-style-type: none"> <li>• Advise on the suitability and limitations of models and analysis techniques used [17-22, 24, 25, 27]</li> <li>• Apply a wide-ranging knowledge of the strengths and weaknesses of available modeling and analysis techniques, to advise on the appropriateness of selected approaches in any given level of complexity and novelty [17-25, 27]</li> </ul>

	<ul style="list-style-type: none"> <li>• Develop the capabilities and the requirement sets within digital modeling and simulation environment [17-22, 24, 25, 27, 29, 30, 34]</li> <li>• Ensure the maintenance of models for a designated function [17-22, 24, 25, 27-30, 34]</li> </ul>
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*Table B.6. Tasks Mapped to Artificial Intelligence/Machine Learning Competency*

<b>Proficiency Level</b>	<b>KSABs</b>
Awareness	<ul style="list-style-type: none"> <li>• Ability to describe text classification, information retrieval, information extraction [16]</li> </ul>
Basic	<ul style="list-style-type: none"> <li>•</li> </ul>
Intermediate	<ul style="list-style-type: none"> <li>•</li> </ul>
Advanced	<ul style="list-style-type: none"> <li>•</li> </ul>
Expert	<ul style="list-style-type: none"> <li>•</li> </ul>

*Table B.7. Tasks Mapped to Data Visualization Competency*

<b>Proficiency Level</b>	<b>KSABs</b>
Awareness	<ul style="list-style-type: none"> <li>• Understand the benefits of data visualization [1-7, 10, 12, 13, 17-32, 34]</li> <li>• Understand the definition of data visualization [1, 2, 4-7, 10, 12, 13, 17-32, 34]</li> </ul>
Basic	<ul style="list-style-type: none"> <li>• Describe the benefits of data visualization across a variety of stakeholders [1, 2, 4-7, 10, 12, 13, 17-32, 34]</li> </ul>
Intermediate	<ul style="list-style-type: none"> <li>• Ability to determine the most appropriate visual representation for the specific need [1, 2, 4-7, 10, 12, 13, 17-32, 34]</li> <li>• Ability to do information retrieval on a corpus of documents [1, 2, 5-7, 10, 12-14, 17-25, 27-32, 34]</li> <li>• Ability to implement methods and tools to represent patterns of what happened in the past providing predictive behaviors [5-7]</li> <li>• Ability to implement processes to explore data [5-7, 14]</li> <li>• Ability to implement the most appropriate visual representation for the specific need [1, 2, 4-7, 10, 12, 13, 17-32, 34]</li> <li>• Ability to represent what patterns of what happened in the past [5-7]</li> <li>• Identify, evaluate, select, and apply hardware or software tools or technological solutions appropriate to support data visualization [9]</li> </ul>
Advanced	<ul style="list-style-type: none"> <li>• Ability to determine the most representative metrics for the specific need [1, 2, 5-7, 10, 12, 13, 17-30, 32, 34]</li> <li>• Ability to evaluate results of knowledge representation and extraction [5-7]</li> </ul>
Expert	<ul style="list-style-type: none"> <li>•</li> </ul>

*Table B.8. Tasks Mapped to Data Analytics Competency*

<b>Proficiency Level</b>	<b>KSABs</b>
Awareness	<ul style="list-style-type: none"> <li>• Explain the difference between structured and unstructured data [14, 16]</li> <li>• Understand the difference between SQL and NoSQL databases [14, 16]</li> </ul>

Basic	<ul style="list-style-type: none"> <li>• Apply data analysis, design, and modeling techniques to establish, modify, or maintain a data structure and its associated components (entity descriptions, relationship descriptions, attribute definitions) [14, 17-21, 23-25, 27-34]</li> <li>• Leverage data and analytics to enable insights and achieve faster and better data-driven decisions [3-7, 10, 13, 17-30, 32, 34]</li> <li>• Understand definition of data, metadata, telecommunication, databases [14, 16]</li> <li>• Ability to determine the elements required to describe what happened in the past [5-7]</li> <li>• Ability to interact with data engineering procedures and methods [14]</li> </ul>
Intermediate	<ul style="list-style-type: none"> <li>• Apply data analysis, design, modeling, and quality assurance techniques, based upon a detailed understanding of business processes, to establish, modify, or maintain data structures and associated components (entity descriptions, relationship descriptions, attribute definitions) [3, 14]</li> <li>• Identify, evaluate, select, and apply hardware or software tools or technological solutions appropriate to the task at hand (e.g., use statistical tools to show reliability of data) [9, 29, 34]</li> <li>• Interpret and use outcomes of data analysis, with guidance [4-7, 10, 13, 17-32, 34]</li> <li>• Undertake data analysis activities and deliver analysis outputs, in accordance with customer needs and conforming to agreed standards [5-7, 10, 13, 17, 19, 20, 23-25, 27, 29, 30, 32, 34]</li> <li>• Ability to determine patterns in what happened in the past [5-7]</li> <li>• Ability to implement methods and tools to understand what happened in the past [5-7]</li> <li>• Ability to implement methods and tools to understand why something happened in the past [5-7]</li> <li>• Ability to represent what happened in the past and why it happened [5]</li> <li>• Define governing modeling and analysis plans, processes, and appropriate tools for a project, and use these to monitor and control systems modeling and analysis activities for a system or system element [29, 34]</li> <li>• Implement the strategy and approach to be adopted for analysis on a system or system element [3, 29, 34]</li> <li>• Lead and determine appropriate analysis of a system or system element [17, 19, 20, 23-25, 27, 29, 30, 32, 34]</li> </ul>
Advanced	<ul style="list-style-type: none"> <li>• Contribute to the data engineering of digital information systems with the creation of reports, technology road mapping, and the sharing of knowledge and insights [13, 29, 30, 34]</li> <li>• Develop data hypotheses and methods, evaluate analytics models, share insights and findings, and continue to iterate with additional data [5, 17, 19, 20, 23-25, 27, 29, 30, 32, 34]</li> <li>• Establish and manage methods, techniques, and capabilities to enable the organization to analyze data, to generate insights, create value, and drive decision-making [5]</li> <li>• Evaluate the need for analytics, assess the problems to be solved and what internal or external data sources to use or acquire [5-7, 17-20, 23-25, 27-29, 32, 34]</li> <li>• Know the data required to information program and technical decisions [4-7, 10, 12-15, 17-34]</li> <li>• Manipulate specific data from information services, to satisfy defined information needs [5-7]</li> <li>• Specify and apply appropriate mathematical, statistical, predictive modeling, or machine-learning techniques to analyze data, generate insights, create value, and support decision-making [5-7, 17, 19, 20, 23-25, 27, 29, 30, 32, 34]</li> <li>• Adapt approach to accommodate the specifics of a given situation or system of interest being analyzed [6, 7, 29, 30, 34]</li> <li>• Lead and determine appropriate analysis of a complex system or system elements [17, 19, 20, 23-25, 27, 29, 30, 32, 34]</li> <li>• Review and judge the outputs of systems analysis, ensuring the results can be used for the intended purpose [13, 17, 19-21, 23-25, 27, 29, 32, 34]</li> </ul>

Expert	•
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*Table B.9. Tasks Mapped to Digital Architecting Competency*

<b>Proficiency Level</b>	<b>KSABs</b>
Awareness	<ul style="list-style-type: none"> <li>• Understand how a model-based systems engineering approach can enable architectural design [1-5, 17-34]</li> <li>• Understand system model and architectural concepts, including the DoDAF framework [1-5, 17-34]</li> <li>• Understand how architecture enables a model-based systems engineering approach [1-5, 17-34]</li> </ul>
Basic	<ul style="list-style-type: none"> <li>• Create system digital models and basic architecture products, under direct supervision [17-27, 29-34]</li> <li>• Assist in creating the system digital model and required architectural products for a system or system-of-systems in accordance with applicable standards and policies under direct supervision [17-27, 29-34]</li> <li>• Describe what it means for a digital model to be accurate, complete, trusted, and reusable [1-5, 10, 12, 17-34]</li> <li>• Identify and locate data necessary to create system model and architectural products when using architecting tools [2, 17-34]</li> <li>• Identify the relationship(s) between defense architecture frameworks and system models [3, 4]</li> <li>• Interact with relevant stakeholders to create digital engineering oriented architecture for a system's design [1, 2, 17-34]</li> <li>• Utilize modeling languages to create or maintain system architectural products based on data provided [2, 17-27, 29-34]</li> <li>• Comply with style guides to properly develop architectural products [10, 12, 17-27, 29-34]</li> <li>• Understand the concept of digital thread [3-5, 18-34]</li> <li>• Understand how digital threads work in the acquisition lifecycle [3-5, 18-34]</li> <li>• Understand how digital artifacts support system of systems approaches, program interoperability, and modularity [1-5, 17-34]</li> <li>• Understand how the use of digital artifacts can be used to effectively support interoperability [2-5, 17-34]</li> <li>• Understand how the use of digital artifacts can be used to effectively support Modular Open System Approach (MOSA) [2-5, 17-34]</li> </ul>
Intermediate	<ul style="list-style-type: none"> <li>• Provide architecture assessment to make decisions based on the architecture to ensure requirements are met for the system development throughout the lifecycle [4, 5, 10, 13, 17-34]</li> <li>• Apply system model and architectural concepts based on different stakeholder views and how they relate [1, 4, 17-34]</li> <li>• Collaborate with disciplinary subject matter experts to create system models and architectural products [17-27, 29-34]</li> <li>• Collaborate with disciplinary subject matter experts to maintain system models and architectural products [17-27, 29-34]</li> <li>• Create required architectural products for a system or system-of-systems in accordance with applicable standards and policies with minimal or no supervision [17-27, 29-34]</li> <li>• Demonstrate a full understanding of system model and architectural techniques [17-27, 29-34]</li> <li>• Review architecture diagrams [1, 5, 10, 13, 15, 17-34]</li> <li>• Review how the system model and architecture are aligned with the framework [13, 17-34]</li> <li>• Review system architectural products (e.g., structural diagram, behavior diagram, requirements diagram, parametric diagram) to identify system components or capabilities based on the application [5, 17-34]</li> <li>• Review the architectural products created by others, including digital twins and digital assets [13, 17-34]</li> <li>• Understand the ways digital artifacts can be used to support a MOSA [2-5, 17-27, 29-34]</li> <li>• Analyze architectural products using system models [17-34]</li> </ul>

	<ul style="list-style-type: none"> <li>• Contribute to the system model for a system-of-systems architecture effort to establish the framework by which systems are designed [17-27, 29-34]</li> <li>• Maintain the required architectural products for a system or system-of-systems in accordance with applicable standards and policies with minimal or no supervision [17-27, 29-34]</li> <li>• Manage framework for the architecture [17-27, 29-34]</li> <li>• Review how the architecture is aligned with the framework [13, 17-27, 29-34]</li> <li>• Review the creation of architectural products (e.g., DoDAF viewpoints) produced by other systems engineers to ensure proper format and content [12, 13, 15, 17-27, 29-34]</li> <li>• Identify digital interfaces and integration approaches with the contractor [2, 4, 17-34]</li> </ul>
Advanced	<ul style="list-style-type: none"> <li>• Contribute to the development of solution architectures in specific business, infrastructure, or functional areas, using model-based engineering methods and digital artifacts [2, 17-27, 29-34]</li> <li>• Utilize architecture products to assist with analysis of alternatives to make a recommendation for the best solution [5, 10, 17-34]</li> <li>• Analyze system architecture models [5, 10, 17-34]</li> <li>• Apply architecture to the remaining system disciplines and specification development [17-27, 29-34]</li> <li>• Develop framework for the system architecture [17-27, 29-34]</li> <li>• Ensure that appropriate tools and methods are available, understood, and employed in architecture development [1-4, 9, 16-27, 29-34]</li> <li>• Evaluate digital architectural products created and maintained by others [13, 15, 17-34]</li> <li>• Identify and evaluate alternative architectures and the trade-offs in cost, performance, and scalability [5, 10, 17-34]</li> <li>• Lead the development of solution architectures in specific business, infrastructure or functional areas [18-27, 29-34]</li> <li>• Manage complex system architectural development and analysis efforts [3, 4, 17-27, 29-34]</li> <li>• Prioritize the creation of architectural products to meet larger program milestones and events [3, 4, 13, 17-34]</li> <li>• Prioritize the maintenance of architectural products to meet Systems Engineering Technical Review (SETR) events [3, 4, 13, 17-34]</li> <li>• Review program integrated architectures for release outside of the system command [13, 15, 17-27, 29-34]</li> <li>• Support the technical authority expert in approving architectural products and submitting waivers and deviations for approval [18-27, 29-34]</li> <li>• Utilize architectural products to assist with analysis of alternatives to provide a set of technically acceptable solutions [5, 10, 17-34]</li> <li>• Verify architecture products for the technical authority [12, 13, 17-27, 29-34]</li> <li>• Verify the creation of architectural products (e.g., DoDAF viewpoints) produced by other systems engineers to ensure proper format and content [12, 13, 17-27, 29-34]</li> <li>• Verify the maintenance of architectural products (e.g., DoDAF viewpoints) produced by other systems engineers to ensure proper format and content [12, 13, 17-27, 29-34]</li> </ul>
Expert	<ul style="list-style-type: none"> <li>• Lead and oversee the framework for system digital model and architecture [3, 4]</li> </ul>

*Table B.10. Tasks Mapped to Digital Requirements Modeling Competency*

Proficiency Level	KSABs
Awareness	<ul style="list-style-type: none"> <li>• Explain the importance of digital requirements modeling [2-4, 17-34]</li> </ul>

Basic	<ul style="list-style-type: none"> <li>• Use requirements traceability when modeling a system-of-interest [2, 17-34]</li> <li>• Contribute to requirements management using digital modeling [2, 17-34]</li> <li>• Use requirements traceability matrix [17-34]</li> </ul>
Intermediate	<ul style="list-style-type: none"> <li>• Capture stakeholder high-level requirements by documenting stated needs in the form of a model, to assist in the clarification and translation of need statements into a more digital engineering oriented language for proper architecture definition [1, 2, 17-34]</li> <li>• Create requirements traceability in the digital model architecture [2, 17-27, 29-34]</li> <li>• Ensure traceability between requirements and specifications [2, 17-34]</li> <li>• Generate a system specification in a digital enterprise environment model where all requirements and RDs are generated from the modeled system [2, 17-27, 29-34]</li> <li>• Generate models using requirements and use case diagrams to include requirements elicitation, generation, analysis, verification, and validation [18-34]</li> <li>• Generate system models with functional allocation to operational requirements to determine system functions to include capability, operational, functional, and physical architecture to establish the allocated, functional, and product baselines based on sound, proven standards [17-19, 21-34]</li> <li>• Perform requirements engineering using digital techniques, deriving lower level requirements &amp; traceability of parent-child relationships to establish, validate, and maintain a set of system requirements at all system and subsystem levels [17-34]</li> <li>• Query the model for how reliability requirements are addressed [20-32, 34]</li> <li>• Translate requirements into system specifications using digital modeling products [2, 17-34]</li> <li>• Understand relationships between system requirements and the system being developed [2, 4, 17-34]</li> <li>• Create requirements traceability building on architectural products [18-34]</li> <li>• Generate a system specification in a model where all requirements and RDs are generated from the modeled system behavior, performance, structure, qualities, and interfaces to form the baseline of the system performance traced to the CDD requirements to include verification methods which can also be used for source selection [2, 17-34]</li> <li>• Perform requirements engineering deriving lower-level requirements &amp; traceability of parent-child relationships to establish, validate, and maintain a set of system requirements for all system and subsystem levels [17-32, 34]</li> <li>• Provide system model to make decisions based on the architecture to ensure requirements are met for the system development throughout the lifecycle [2, 5, 10, 12-14, 17-34]</li> <li>• Translate requirements into system specifications using architecture products [2, 17-27, 29-34]</li> </ul>
Advanced	<ul style="list-style-type: none"> <li>• Ascertain needs requirements of project to ensure proper modeling tools and technology are selected for the current project [1-4, 9, 17-27, 29, 30, 32-34]</li> <li>• Examine engineering artifacts and trace designs to requirements [17-34]</li> <li>• Develop the capabilities and the requirement sets within the digital enterprise environment [1, 2, 17-27, 29-34]</li> <li>• Ensure staff are involved with configuration or requirements management [3, 4, 12, 13, 17-34]</li> </ul>
Expert	<ul style="list-style-type: none"> <li>• Lead the modeling development of digital models for complex solutions, ensuring consistency with specified requirements agreed with both external, and internal customers [3, 4, 17-27, 29-31, 33, 34]</li> </ul>

*Table B.11. Tasks Mapped to Digital Validation and Verification Competency*

<b>Proficiency Level</b>	<b>KSABs</b>
Awareness	<ul style="list-style-type: none"> <li>Develop an understanding of the role of testing within system development, as a tool for design improvement as well as a verification process [3-5, 10, 12, 13, 23-25, 27-30, 32, 34]</li> </ul>
Basic	<ul style="list-style-type: none"> <li>Explain the validation and verification process of the digital model [12]</li> <li>Understand how digital twins can be used for T&amp;E/V&amp;V [23, 29, 34]</li> </ul>
Intermediate	<ul style="list-style-type: none"> <li>Create test cases using own in-depth technical analysis from model-based engineering methods, of both functional and non-functional specifications (such as reliability, efficiency, usability, maintainability, and portability) [24, 25, 27, 29, 30, 34]</li> <li>Analyze and report test activities and results using model-based engineering methods and tools [13, 24-30, 34]</li> <li>Understand the specific definition of verification with regards to DE [12, 23, 29]</li> <li>Understand the specific definition of validation with regards to DE [12, 23, 29]</li> <li>Understand the use of a digital ecosystem for VV&amp;A of the system [29]</li> <li>Verify that products are aligned with the review and/or analysis [12, 13, 23]</li> </ul>
Advanced	<ul style="list-style-type: none"> <li>Verify system model for the technical authority [12]</li> </ul>
Expert	<ul style="list-style-type: none"> <li></li> </ul>

*Table B.12. Tasks Mapped to Model-Based Systems Engineering Processes Competency*

<b>Proficiency Level</b>	<b>KSABs</b>
Awareness	<ul style="list-style-type: none"> <li>Knowledgeable about digital model project lifecycle [1-5, 13, 15, 17-34]</li> <li>Understand the use of models in the context of digital engineering [1-5, 13, 15, 17-34]</li> <li>Understand need to assess aspects of model quality including conformance to modeling language and application method constraints [12, 17-34]</li> <li>Understand published modeling methodologies, i.e., OOSEM, JPL-SA, RUP-SE, etc. [3, 17-34]</li> <li>Understand the basic fundamentals of Model-Based Systems Engineering (MBSE), Model-Based Engineering (MBE), and the broader Model-Centric Engineering (MCE) concepts [1-5, 13, 15, 17-34]</li> <li>Understand the uses of system models for system development efforts in accordance with applicable standards and policies [1-5, 10, 13, 15, 17-34]</li> <li>Understand the value that modeling concepts bring to complex system development efforts throughout the system lifecycle [1-5, 13, 15, 17-34]</li> <li>Understand the importance of model traceability from concept to disposal in maintaining an authoritative source of truth [1-3, 13, 15, 17-34]</li> <li>Understand the workforce needs for the development and use of digital artifacts during the acquisition lifecycle [2-4, 17-34]</li> <li>Understand the definition of digital artifact [1-5, 13, 15, 17-34]</li> <li>Understand how digital artifacts can be used across the acquisition lifecycle (DoD 5000.02) [1-5, 13, 15, 17-34]</li> </ul>
Basic	<ul style="list-style-type: none"> <li>Assist with the evaluation of system-of-interest change requests using MBSE processes [12, 32, 34]</li> </ul>

	<ul style="list-style-type: none"> <li>• Contribute to modeling tasks employing a model-based systems engineering approach [2, 17-27, 29-34]</li> <li>• Describe digital artifacts contribution to the following engineering concepts: Systems of Systems (SoS), program interoperability, and modularity [1-5, 13, 15, 17-34]</li> <li>• Describe how digital system model artifacts advance the state-of-the-practice of digital engineering [1-5, 13, 15, 17-34]</li> <li>• Develop digital model artifacts, according to intent [2, 17-34]</li> <li>• Analyze and interpret the results obtained using model-based engineering methods and tools [17-34]</li> <li>• Understand model-based engineering methods, tools, and technologies that may assist in streamlining work and improving productivity [17-34]</li> <li>• Evaluate the system model and architectural products created and maintained by others [13, 15, 17-34]</li> <li>• Explain the difference in digital enterprise environment stakeholder views [1, 2, 13, 17-34]</li> <li>• Use appropriate representations of a system or system element in order to derive information about the real system [2, 5, 17-34]</li> <li>• Use model formalisms to aid in the development, integration, and curation of models [2, 17-34]</li> <li>• Use modeling toolsets to generate diagrams, to establish system model data attributes [2, 17-34]</li> <li>• Use models as the basis for defining, evaluating, comparing, and optimizing alternatives and making decisions [1, 2, 5, 13, 15, 17-34]</li> <li>• Use system models for design analysis [1, 2, 13, 15, 17-34]</li> <li>• Contribute to the system model development and interpretation activities [1, 2, 17-34]</li> <li>• Apply digital modeling tools to the solution of an engineering problem [17-34]</li> <li>• Understand digital artifacts and their use [1-4, 13, 15, 17-34]</li> <li>• Understand how to represent systems and systems of systems (SoS) technical data in the digital engineering environment [1-4, 15, 17-34]</li> <li>• Understand the concept of digital twin and how it can be used in an acquisition environment [1-4, 23, 27, 30]</li> <li>• Understand elements that can make up the digital twin [1-4, 23, 27, 29, 30]</li> <li>• Understand how digital twin can be used for understanding operation and maintenance [1-4, 23, 27, 29, 30]</li> <li>• Understand how the use of models and digital artifacts contributes to technical coherency [1-5, 17-34]</li> <li>• Understand the definitions of models, digital artifacts, and information sharing and how these are related [1-5, 13, 17-34]</li> <li>• Understand why digital artifacts are used and common examples of digital artifacts [1-5, 13, 15, 17-34]</li> <li>• Understand the characteristics of digital artifacts, as well as potential benefits, including: accessibility, alignment, consistency, comprehensiveness, precision, data limitations, relevancy, accuracy, and ownership [1-5, 17-34]</li> <li>• Identify key stakeholder groups that will produce and consume digital artifacts [1-5, 13, 17-34]</li> <li>• Understand how strategic leadership may create or consume digital artifacts [1-5, 13, 15]</li> <li>• Understand how program managers may create or consume digital artifacts [5, 13, 15, 17-34]</li> <li>• Understand how systems engineers may create or consume digital artifacts [1-5, 13, 15, 17-34]</li> <li>• Understand the risk of using digital artifacts with respect to workforce, change, data accuracy, the DE ecosystem, and data consistency [1-5, 10, 15, 17-34]</li> <li>• Understand how digital artifacts can be used to effectively support SoS [1-5, 13, 15, 17-34]</li> <li>• Understand how Digital Artifacts can be used to support interoperability [1-5, 13, 15, 17-34]</li> </ul>
Intermediate	<ul style="list-style-type: none"> <li>• Analyze the system model and architecture products [1, 2, 5, 13, 15, 17-34]</li> <li>• Build models in a digital enterprise environment collaborative modeling environment [2, 17-27, 29-34]</li> </ul>

	<ul style="list-style-type: none"> <li>• Ensure digital artifacts are up-to-date, consistent, interoperable, accessible, uncorrupted, and properly and safely stored [1, 2, 5, 12, 14, 15, 17-34]</li> <li>• Generate digital enterprise environment system models [2, 17-34]</li> <li>• Integrate all other model domains and physics-based models with the system model [23, 27, 29, 30]</li> <li>• Maintain system models for system development efforts in accordance with applicable standards and policies to reduce acquisition lifecycle timeline [17-27, 29-34]</li> <li>• Review system models to identify system components or capabilities based on the application [1, 2, 15, 17-34]</li> <li>• Select and define appropriate representations of a system or system element [2, 17-34]</li> <li>• Understand need to organize complex models, define the interrelationships among model elements and diagrams [1-5, 17-34]</li> <li>• Understand the capabilities and the requirement sets within the digital enterprise environment [2-5, 17-34]</li> <li>• Use digital enterprise environment tools and techniques to represent a system or system element [2, 17-34]</li> <li>• Use models to support engineering activities and decision making across the lifecycle [1-5, 13, 15, 17-34]</li> <li>• Use system models for system development efforts in accordance with applicable standards and policies to reduce acquisition lifecycle timeline [1-4, 10, 17-34]</li> <li>• Conduct operational, architectural, and requirements research, analysis, and documentation of assigned programs [2-5, 15, 17-34]</li> <li>• Understand the definition of model-based systems engineering (MBSE) and the differences/similarities between this and DE [1-5, 13, 17-34]</li> <li>• Use the risk management process to manage the risk of using digital artifacts [3-5, 10, 15, 17-34]</li> </ul>
Advanced	<ul style="list-style-type: none"> <li>• Apply advanced concepts, principles, and practices of model-based systems engineering process [17-27, 29-34]</li> <li>• Coordinate the assessment of risks to the availability, integrity, and confidentiality of systems that support critical business processes, using model-based engineering methods and digital artifacts [3, 4, 10, 15]</li> <li>• Integrate supporting engineering disciplines and specification development into system architecture [17-27, 29-34]</li> <li>• Integrate MBSE processes for complex system development efforts to appropriately represent the system requirements and design within the digital enterprise environment [17-27, 29-34]</li> <li>• Identify sources of error in model-based engineering methods and take appropriate corrective action [12, 17-34]</li> <li>• Conduct analysis to ensure interoperability with external programs, systems, or capabilities [17-34]</li> <li>• Evaluate and select appropriate model-based engineering methods and tools in line with agreed policies and standards [2-4, 9, 10, 17-27, 29-34]</li> <li>• Design MBSE solutions for complex systems including operational, architectural, and requirements research, analysis, and documentation of assigned programs [2, 17-27, 29-34]</li> <li>• Ensure that digital engineering activities and digital artifacts development are performed according to intent [1, 3, 4, 13, 17-34]</li> <li>• Evaluate supervision of the system model and architectural products created and maintained by others [17-27, 29-34]</li> <li>• Identify and maintain an approach that integrates models generated by all stakeholders to digital represent the system of interest throughout the lifecycle [1-4, 17-27, 29-34]</li> <li>• Implement MBSE solutions for complex systems [2-4, 17-27, 29-34]</li> <li>• Implement plans to digitally represent the system of interest, using an approach that uses models to enable the orchestration of activities, the efficient management of work, and the integration of work products and multidisciplinary teams to result in the digital representation of the system of interest [2-4, 17-27, 29-34]</li> </ul>

	<ul style="list-style-type: none"> <li>• Determine appropriate representations or analysis of the digital model [17-34]</li> <li>• Determine appropriate representations or analysis of complex system or system elements [17-34]</li> <li>• Lead complex system model and architectural development and analysis efforts [17-34]</li> <li>• Lead the development of digital models in specific business, infrastructure, or functional area [17-27, 29-34]</li> <li>• Lead the integration and combination of different models and analyses for a system or system element [17-27, 29-34]</li> <li>• Maintain the system model and required architectural products for a system or system-of-systems in accordance with applicable standards and policies with minimal or no supervision [17-27, 29-34]</li> <li>• Plan modeling activities, selecting appropriate techniques and the correct level of detail for meeting assigned objectives [2, 3, 17-27, 29-34]</li> <li>• Plan and coordinate team modeling activities and for ensuring the quality of their work [2, 3, 17-27, 29-34]</li> <li>• Review the creation of system models and architectural products and artifacts produced by other systems engineers to ensure proper format and content [12, 13, 15, 17-34]</li> <li>• Review the maintenance of system models and architectural products and artifacts produced by other systems engineers to ensure proper format and content [12, 13, 15, 17-34]</li> <li>• Support the technical authority expert in approving standard modeling and architectural products and submitting waivers and deviations for approval [17-27, 29-34]</li> <li>• Understand system designs (including system elements and enabling system elements), which provides an overall understanding of the reasons for defects and failures at all levels within a system [1, 17-34]</li> <li>• Utilize digital model artifacts to assist with analysis of alternatives to provide a set of technically acceptable solutions [17_34]</li> <li>• Use system model and architectural products to conduct gap analysis [17-34]</li> <li>• Apply integration using the integrated modeling environment to execute the MBSE process for complex system development efforts to represent the system requirements and design [17-27, 29-34]</li> <li>• Implement MBSE operational, architectural, and requirements research, analysis, and documentation of assigned programs [2, 3, 17-27, 29-34]</li> <li>• Verify the creation of system models and architectural products (e.g., Interface Control Document, DoDAF viewpoints, modeling language-based diagrams) produced by other systems engineers to ensure proper format and content [12, 13, 15, 17-27, 29-34]</li> <li>• Verify the maintenance of system models and architectural products (e.g., Interface Control Document, DoDAF viewpoints, modeling language-based diagrams) produced by other systems engineers to ensure proper format and content [12, 13, 15, 17-27, 29-34]</li> <li>• Integrate MBSE solutions for intricate systems and is responsible for operational, architectural, and requirements research, analysis, and documentation of solutions for intricate systems and is responsible for assigned programs [17-27, 29-34]</li> </ul>
Expert	<ul style="list-style-type: none"> <li>• Evaluate multiple system models and architectures at the mission or system-of-system level [13, 17-27, 29-34]</li> <li>• Formalize the application of models to support system requirements, design, analysis, verification, and validation activities beginning in the conceptual design phase and continuing throughout all lifecycle phases [3, 4, 17-27, 29-34]</li> <li>• Create value from the model-based engineering process for stakeholders by maintaining the principles of professional standards, accountability, openness, equality, diversity, and clarity of purpose [1-4, 13, 15, 17-34]</li> <li>• Engage with senior managers to ensure the business portfolio will deliver the agreed upon digital artifact objectives [1-4, 13]</li> <li>• Provide advice to support the design of service components including designing in flexible and scalable capacity, using model-based engineering methods and digital artifacts [17-27, 29-34]</li> </ul>

	<ul style="list-style-type: none"> <li>• Recommend and implement corrective action by engaging and influencing senior management, using results from model-based engineering methods and tools [1, 23, 27, 29, 30, 31]</li> <li>• Manage the target design, policies, and standards, working proactively to maintain a stable, viable modeling and simulation architecture and ensure consistency of design across projects within the program [17-27, 29-34]</li> </ul>
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*Table B.13. Tasks Mapped to Digital Model-Based Reviews Competency*

<b>Proficiency Level</b>	<b>KSABs</b>
Awareness	<ul style="list-style-type: none"> <li>• Aware of the digital model-based review process [1, 3-5, 7, 8, 10, 12, 13, 17-31, 33, 34]</li> <li>• Understand the importance of peer reviews [12, 17-31, 34]</li> </ul>
Basic	<ul style="list-style-type: none"> <li>• Coordinate with subject matter experts to review and confirm information and results from models [5, 10, 12, 13, 17-31, 34]</li> </ul>
Intermediate	<ul style="list-style-type: none"> <li>• Conduct model-based reviews and audits, to ensure effective collaboration for system-of-interest evolution [10, 12, 13, 18-32, 34]</li> <li>• Confer with subject matter experts on models produced to gain concurrence on results [5, 10, 12, 13, 17-32, 34]</li> <li>• Review resulting models with stakeholders and gain resolution to resultant issues [10, 12, 13, 17-32, 34]</li> <li>• Use system models for analysis of design and technical reviews to execute trade-off and design analyses, prototype, manufacture, test, and sustainment of the developed system [5, 13, 28-30, 34]</li> <li>• Use system models for collaboration during design and technical reviews to execute trade-off and design analyses, prototype, manufacture, test, and sustainment of the developed system [5, 13, 29, 30, 34]</li> <li>• Verify that system model products developed are aligned with the review and/or analysis [13, 28, 29, 30, 34]</li> </ul>
Advanced	<ul style="list-style-type: none"> <li>• Define the series and sequence of model-based engineering activities to bring stakeholders to the required level of commitment, prior to formal reviews [1, 3, 7, 13, 17-31, 34]</li> <li>• Conduct technical reviews to evaluate digital products on a continuous basis as the technical baseline matures, and inform decisions [5, 12, 13, 17-32, 34]</li> <li>• Communicate modeling results to managers and obtain feedback for agreement [13]</li> <li>• Provide advice on technical aspects of solution development and integration (including requests for changes, deviations from specifications, etc.) and ensure that relevant technical strategies, policies, standards, and practices (including security) are applied correctly [5, 12, 13, 17-32, 34]</li> <li>• Utilize system model and architectural products to conduct reviews [5, 13, 17-32, 34]</li> </ul>
Expert	<ul style="list-style-type: none"> <li>•</li> </ul>

*Table B.14. Tasks Mapped to Project and Program Management Competency*

<b>Proficiency Level</b>	<b>KSABs</b>
Awareness	<ul style="list-style-type: none"> <li>• Understand that modeling and simulation provide insight into program cost, schedule, performance, and associated risks [2-7, 10, 17-34]</li> <li>• Understand the challenges and benefits for planning and execution of projects in digital engineering ecosystem [2-10, 12-14, 17-34]</li> </ul>
Basic	<ul style="list-style-type: none"> <li>• Understand the importance of including DE consideration in contracts: Build, extend, and maintain the DSM [2-4]</li> </ul>

	<ul style="list-style-type: none"> <li>• Understand the importance of including contractual systems tasks and elements in the DSM taxonomy and the WBS (DID, pricing, CDRL, SOO, PWS, SOW, specs, etc.) [2, 3, 14]</li> <li>• Understand how DE tasks and products are incorporated into a contract [1-7, 10, 14, 32, 34]</li> <li>• Understand the differences in contracting for document-based versus model-based acquisition [2-4, 6, 7, 14]</li> <li>• Understand the role and importance of models, simulations, and data in improving project management [2-7, 32, 34]</li> <li>• Understand the process for digital engineering as it relates to acquisition [1-7, 17-31, 33]</li> <li>• Identify the DE tasks and products that need to be accomplished [2, 5, 7, 10, 14, 17-34]</li> <li>• Identify the tasks that should be completed by the contractor/developer [2, 6-8]</li> <li>• Understand the importance of the Program and Contract WBSs. Identify how digital engineering tasks and artifacts can be included in WBS structures. [2, 5-7, 32, 34]</li> <li>• Understand how to reflect DE tasks and products in the SOW, SOO, and PWS. [2, 3, 7]</li> <li>• Understand the importance of including DE consideration in contracts: develop and maintain the digital twin [23, 29, 30]</li> <li>• Understand the importance of including DE consideration in contracts: use digital artifacts for analysis in place of briefing charts [3, 4, 13, 17-31, 33]</li> <li>• Understand the importance of including DE consideration in contracts: design and integrate architecture for the DE infrastructure [17-31, 33]</li> <li>• Understand how to include DE-related tasks and artifacts into the RFP, specifically sections B, C, L, and M [3]</li> <li>• Identify the ways models and source codes should be delivered to the government in the contract, including any programs required for running models or codes [3, 4, 8, 10, 14, 17-22, 24-28, 31, 33]</li> <li>• Understand the interaction between digital engineering and program risk (i.e., how digital engineering can mitigate some risks and introduces others) [5, 10, 22, 23, 25, 27, 29, 30, 32, 34]</li> <li>• Understand how cohesively using digital artifacts throughout the acquisition lifecycle is critical to program success [2-4, 6, 7, 10, 13, 23, 29, 30]</li> <li>• Understand the ways that stakeholders can use digital artifacts in a SoS context (describe, distinguish, determine, communicate, draw, and allow) [1, 17-31, 33]</li> </ul>
Intermediate	<ul style="list-style-type: none"> <li>• Ensure that program/project leads and/or service owners adhere to the agreed portfolio management model-based engineering approach and timetable and that they provide the appropriate information to agreed targets of timelines and accuracy [4, 5, 7, 10, 32, 34]</li> <li>• Advise on program cost, schedule, performance, and supportability risk assessments, using knowledge gleaned from digital engineering methods and tools [2, 5-7, 10, 23, 25, 29, 30, 32, 34]</li> <li>• Lead system modeling for a project [17-22, 24, 26-28, 31, 33]</li> <li>• Manage models are that produced within a project [9, 12, 14, 17-22, 24-28, 31, 33]</li> <li>• Understand the importance of including DE consideration in contracts: use DE practices during acquisition [2-4]</li> <li>• Understand how to properly reflect IP and Data Rights considerations in a contract [1-4, 8, 15, 17-31, 33]</li> <li>• Understand the importance of develop and maintain the digital artifacts for consideration in contracts [2-4, 9, 23, 29, 30]</li> <li>• Understand the importance of develop and maintain the digital twin for consideration in contracts [23, 29, 30]</li> <li>• Include the tasks, interfaces, and integration approaches in the RFP and final contract [2, 3, 7, 8]</li> <li>• Identify the mechanisms and artifacts for reflecting DE tasks and deliverables in a contract (e.g., WBS, CDRL, DID, SOW, SOO, PWS) [2, 3, 7, 14]</li> </ul>

	<ul style="list-style-type: none"> <li>• Use digital artifacts to mitigate risks in schedule, cost, requirements, and design [2-7, 10, 23, 25, 29, 30, 32, 34]</li> </ul>
Advanced	<ul style="list-style-type: none"> <li>• Able to formalize the development, integration, and use of models to inform enterprise and program decision making [1-7, 13, 17-34]</li> <li>• Use model-based engineering methods to reduce the time and cost of iterative build, test, and fix cycles in order to create greater efficiencies in design and manufacturing [2-7, 10, 17-34]</li> <li>• Design and implement a model-based testing strategy to ensure that continuity plans and procedures address exposure to risk and that agreed levels of continuity are maintained [23, 29, 30]</li> <li>• Define new project and support them throughout their lifecycle [1-4, 10]</li> <li>• Implement model-based engineering methods and tools at a program, project, and team level including selection and tailoring in line with agreed standards [2-4, 9, 17-31, 33]</li> <li>• Take action to ensure targets are met within established safety and quality procedures, including, where appropriate, handover of digital artifacts to the client [5-7, 10, 17-34]</li> <li>• Prioritize the creation of system model and architectural products to meet larger program milestones and events [2-5, 7, 13, 32, 34]</li> </ul>
Expert	<ul style="list-style-type: none"> <li>• Implement processes which support cost-effective technology development and selection decisions [3-7]</li> </ul>

*Table B.15. Tasks Mapped to Organizational Development Competency*

<b>Proficiency Level</b>	<b>KSABs</b>
Awareness	<ul style="list-style-type: none"> <li>• Aware of the organizational plans in the organization [8]</li> </ul>
Basic	<ul style="list-style-type: none"> <li>• Understand the organizational plans in the organization [8]</li> <li>• Understand the workforce needs in terms of: specific skills and abilities required; competency standards; and training and development needs [4]</li> <li>• Aware of the organizational plans in the organization [8]</li> </ul>
Intermediate	<ul style="list-style-type: none"> <li>•</li> </ul>
Advanced	<ul style="list-style-type: none"> <li>• Monitor and report progress on organization readiness targets, organization engagement activity, training design and deployment activities, key operational metrics, and return to productivity measures, using model-based engineering methods and digital artifacts [8]</li> <li>• Provide advice, guidance, and expertise to support adoption of model-based methods and tools, and adherence to policies and standards [3, 4, 9, 10, 12]</li> <li>• Play a leading role in establishing modeling language-based MBSE at an enterprise [3, 4]</li> </ul>
Expert	<ul style="list-style-type: none"> <li>• Establish a systems modeling culture and environment, leveraging the capabilities of the organization [3, 4, 8]</li> <li>• Develop organizational policies, standards, and guidelines for model-based engineering methods and artifacts [3, 12]</li> <li>• Lead the establishment of MBSE at an enterprise level [4]</li> <li>• Initiate the business implementation plan, including all the activities that the business needs to do to prepare for new technical components and technologies, including using model-based engineering methods [3]</li> <li>• Lead the establishment of an MBSE enterprise with the use of formalized modeling language and ontology [4]</li> <li>• Set direction and lead in the introduction and use of model-based engineering techniques, methodologies, and tools to match overall business requirements, ensuring consistency across all user groups [3, 4, 8]</li> </ul>

*Table B.16. Tasks Mapped to Digital Engineering Policy and Guidance Competency*

<b>Proficiency Level</b>	<b>KSABs</b>
Awareness	<ul style="list-style-type: none"> <li>Understand the maintenance of system models for system development efforts are accomplished in accordance with applicable standards and policies [2-4, 10, 12, 17-34]</li> </ul>
Basic	<ul style="list-style-type: none"> <li>Define plans, processes, and appropriate tools for model governance and analysis on a project [3, 4, 9, 12, 14]</li> <li>Understand the role of digital engineering with respect to existing DoD acquisition practices [3, 4]</li> </ul>
Intermediate	<ul style="list-style-type: none"> <li>Create and update the documentation of digital engineering methods and tools [3, 4, 9, 12]</li> <li>Update engineering processes, manuals, and instructions to achieve desired digital engineering benefits [3, 4, 12]</li> </ul>
Advanced	<ul style="list-style-type: none"> <li>Contribute to organizational policies, standards, and guidelines for methods and tools [3, 4, 9, 12]</li> <li>Tailor processes in line with agreed standards and evaluation of digital engineering methods and tools [3, 4, 12]</li> <li>Develop policy and guidance about models, simulations, and digital engineering [3, 4, 12]</li> <li>Maintain standards or guidance for the execution of model-based systems engineering and architectural design [3, 4, 10, 12]</li> <li>Manage the system model and architecture products for policy compliance and framework alignment [2-4, 10, 12, 17-34]</li> <li>Review and judge the adequacy of tailoring of enterprise-level systems modeling and analysis processes for specific requirements [12]</li> </ul>
Expert	<ul style="list-style-type: none"> <li>Create standards or guidance for the execution of model-based system engineering and architectural design [3, 4, 12]</li> <li>Define modeling standards and quality targets for an organization [3, 4, 12]</li> <li>Define strategy and approach to be used for modeling and analysis of complex or novel system or system elements [3, 4, 12]</li> <li>Ensure that appropriate model-based engineering methods and standards (corporate, industry, national, and international) are adhered to [2-4, 10, 12, 17-34]</li> <li>Create governance approaches for model-based systems engineering activities and digital artifacts to enable governance activity to be conducted with reasonable independence from management activity, in line with the organization's corporate governance requirements [3, 4, 12]</li> </ul>

*Table B.17. Tasks Mapped to Configuration Management Competency*

<b>Proficiency Level</b>	<b>KSABs</b>
Awareness	<ul style="list-style-type: none"> <li>Aware of the configuration management policies, standards, and guidelines [2, 4, 10, 12-14, 17-34]</li> </ul>
Basic	<ul style="list-style-type: none"> <li>Apply tools, techniques, and processes to administer, track, log, report on, and correct configuration items, components, and changes [2, 12, 14, 15, 17-34]</li> <li>Assist with audits to check the accuracy of information and undertakes any necessary corrective action under direction [2, 12, 14, 15, 17-34]</li> <li>Contribute to configuration management using digital modeling [2, 12, 17-34]</li> </ul>
Intermediate	<ul style="list-style-type: none"> <li>Create traceability records from test cases back to requirements [12, 23-31, 34]</li> <li>Ensure that users comply with identification standards for object types, environments, processes, lifecycles, documentation, versions, formats, baselines, releases, and templates [2, 4, 12, 14, 17-34]</li> </ul>

	<ul style="list-style-type: none"> <li>• Perform audits to check the accuracy of information and undertake any necessary corrective action under direction [2, 12, 14, 15, 17-34]</li> <li>• Assess the details of digital enterprise environment hardware/software items that have been installed and removed so that configuration management records can be updated [12]</li> <li>• Verify and approve changes ensuring protection of assets and components from unauthorized change, diversion, and inappropriate use [2, 12, 14, 15, 17-34]</li> </ul>
Advanced	<ul style="list-style-type: none"> <li>• Contribute to development of configuration management strategies, policies, standards, and guidelines in accordance with model-based engineering methods and digital artifacts [12, 14, 33]</li> <li>• Agree to the scope of configuration management processes and the configuration items and related information to be controlled [10, 12, 33]</li> <li>• Develop, configure, and maintain tools (including automation) to identify, track, log, and record accurate, complete, and current information [12]</li> <li>• Ensure that operational processes are in place to maintain secure configuration, consistent classification and management of configuration items, and for the verification and audit of configuration items [3, 4, 12, 14]</li> <li>• Identify, evaluate, and manage the adoption of appropriate tools, techniques, and processes (including automation) for configuration management of digitally-based artifacts and systems [12]</li> <li>• Plan the capture and management of configuration items and related information [10, 12, 14, 33]</li> <li>• Propose and agree on the configuration items to be uniquely identified with naming conventions [12]</li> <li>• Assess reports on the status of the configuration management of digital artifacts and systems to define, measure, assess, improve, tailor, and/or automate methods and tools used to support the digital enterprise environment [12]</li> </ul>
Expert	<ul style="list-style-type: none"> <li>• Develop configuration management strategies, policies, standards, and guidelines for digital engineering related artifacts [12]</li> <li>• Develop new methods such as automation and organizational capabilities for the configuration management of digital artifacts [12]</li> </ul>

*Table B.18. Tasks Mapped to Software Construction Competency*

Proficiency Level	KSABs
Awareness	•
Basic	•
Intermediate	•
Advanced	• Specify user/system interfaces, including validation and error correction procedures, processing rules, access, security, and audit controls [11]
Expert	•

*Table B.19. Tasks Mapped to Software Engineering Competency*

Proficiency Level	KSABs
Awareness	•

Basic	<ul style="list-style-type: none"> <li>• Identify and report testing software issues and risks, associated with own work [10]</li> <li>• Receive and respond to routine requests for software security support [15, 16]</li> </ul>
Intermediate	<ul style="list-style-type: none"> <li>• Assist in the configuration of software and equipment and the systems testing of platform-specific versions of one or more software products [16]</li> <li>• Carry out agreed system software maintenance tasks [9]</li> <li>• Correct malfunctions on system installations [9, 16]</li> <li>• Document software faults, implement resolutions, and retest to agreed standards [10]</li> </ul>
Advanced	<ul style="list-style-type: none"> <li>• Assess software-associated risks and specify recovery routines and contingency procedures [10, 16]</li> <li>• Contribute to the development of software information assurance policies, standards, and guidelines [9]</li> <li>• Investigate and coordinate the resolution of potential and actual software service problems [9, 16]</li> <li>• Investigate software security breaches in accordance with established procedures and recommend required actions and support/follow-up to ensure these are implemented [15, 16]</li> <li>• Plan the installation and testing of new versions of system software [9]</li> <li>• Prepare and maintain operational documentation for system software [9]</li> <li>• Process and analyze software security evidence in line with policy, standards, and guidelines and support production of forensics findings and reports [10, 16]</li> <li>• Provide reports on progress, anomalies, risks, and issues associated with the overall software project [10]</li> <li>• Provide software specialist advice to support others [9]</li> <li>• Specify requirements for software digital, data, resources, and tools [9]</li> </ul>
Expert	<ul style="list-style-type: none"> <li>• Lead complex security investigations engaging additional specialists if required [15]</li> <li>• Manage all risks associated with software testing and take preventative action when any risks become unacceptable</li> <li>• Manage complex software security investigations engaging additional specialists if required [15]</li> <li>• Review new software application proposals and provide specialist advice on security issues and implications [15, 16]</li> <li>• Set policies, standards, and guidelines for how an organization conducts software digital forensic investigations [15, 16]</li> </ul>

*Table B.20. Tasks Mapped to Digital Environment Development Competency*

<b>Proficiency Level</b>	<b>KSABs</b>
Awareness	<ul style="list-style-type: none"> <li>• Describe the basic concept of digital engineering within a digital enterprise environment [1-7, 9-34]</li> </ul>
Basic	<ul style="list-style-type: none"> <li>• Streamline contracting, procurement, legal, and business practices by transitioning to a model-based approach [3-7]</li> <li>• Relate the importance of methodology to achieving digital engineering within a digital engineering enterprise [3, 4]</li> <li>• Understand the definition of technical coherency [4]</li> <li>• Understand the characteristics of technical coherency [4]</li> <li>• Understand the challenges and benefits of developing a digital engineering ecosystem [4, 9, 16]</li> <li>• Understand the components of the digital engineering ecosystem [9, 16]</li> <li>• Understand at a high level the infrastructure components of the digital engineering ecosystem, including hardware, software, networks, and MPTs and how these will interact in a digital engineering ecosystem [9, 16]</li> </ul>

	<ul style="list-style-type: none"> <li>• Understand how digital thread and digital twin work within the DE Ecosystem [23-25, 27, 29, 30, 34]</li> </ul>
Intermediate	<ul style="list-style-type: none"> <li>• Leverage technologies currently available in the marketplace, while finding high-payoff solutions for decision making in acquiring, deploying, and maintaining the enterprise digital environment [9, 16]</li> <li>• Review digital enterprise environment requirements and specifications, and define test conditions [9, 16]</li> <li>• Ensure the digital enterprise environment supports evaluating concepts, engaging the user, and identifying tradeoffs using a digital representation of the system of interest [16]</li> </ul>
Advanced	<ul style="list-style-type: none"> <li>• Ensure that operational procedures and working practices for decision making in acquiring, deploying, and maintaining the enterprise digital environment are fit for purpose and current [9, 16]</li> <li>• Develop, mature, and implement digital enterprise environment tools [16]</li> <li>• Contribute to development of policy, standards, and procedures for decision making for acquiring, deploying, and maintaining a digital environment that is compliant with relevant policies [10, 16]</li> <li>• Develop, mature, and use digital engineering methodologies in place of document-based approaches [1-7, 9, 10, 12-34]</li> <li>• Evaluate and identify digital engineering tools for stakeholders based on current and future needs [1, 9, 16]</li> <li>• Lead the processes of design, procurement, installation, upgrading, operation, control, maintenance (including storage, modification, and communication of data, voice, text, audio, and images) and the effective use of digital enterprise environment components, and monitor their performance [9, 16]</li> <li>• Identify information and communication systems that support the digital enterprise environment processes and manage the relationship with specialists with authority for those systems [9, 16]</li> <li>• Produce outline digital enterprise environment system designs and specifications, and overall architectures, topologies, configuration databases, and design documentation of networks and networking technology within the organization [9, 16]</li> <li>• Produce specifications of cloud-based or on-premises components, tiers, and interfaces, for translation into digital enterprise environment using selected services and products [9, 16]</li> <li>• Review digital enterprise environment related requirements and specifications, and define digital enterprise environment test conditions [9, 16]</li> <li>• Develop digital enterprise environment application installation procedures and standards [16]</li> </ul>
Expert	<ul style="list-style-type: none"> <li>• Create and maintain overall digital enterprise environment network plans to support the organization's business strategy and service level agreements with customers [16]</li> <li>• Establish a digital enterprise environment supporting infrastructure and environment to perform activities, collaborate, and communicate across stakeholders [1, 16]</li> <li>• Establish an end-to-end digital engineering enterprise by focusing on production, delivery, and sustainment of the end item [16]</li> <li>• Lead the development of digital enterprise environment organizational capabilities for methods and tools (including automation) to ensure adoption and adherence to policies and standards [16]</li> <li>• Provide hardware and software recommendations to perform digital enterprise environment activities [16]</li> <li>• Review new digital enterprise environment-related software application procurement proposals and provide specialist advice on digital enterprise environment security issues and implications [16]</li> <li>• Specify requirements for digital enterprise environment, data, resources, and tools [1, 9, 16]</li> <li>• Take responsibility for major aspects of digital enterprise environment network specifications and design within the organization [16]</li> </ul>

*Table B.21. Tasks Mapped to Management Competency*

<b>Proficiency Level</b>	<b>KSABs</b>
Awareness	<ul style="list-style-type: none"> <li>Describe how digital engineering tasks and products are incorporated into a contract [2-4, 6-8, 10, 13, 14]</li> <li>Describe the risks and opportunities of using digital engineering [1-8, 10, 12, 15-34]</li> </ul>
Basic	<ul style="list-style-type: none"> <li>Manage risks associated with digital enterprise environment testing and take preventative action when risks become unacceptable [9, 10, 15, 16]</li> <li>Explain the concept of authoritative source of truth [1-5, 13, 17-34]</li> </ul>
Intermediate	<ul style="list-style-type: none"> <li>Produce routine reports to assist in digital environment management activities and decision making [9, 16]</li> </ul>
Advanced	<ul style="list-style-type: none"> <li>Produce reports as appropriate for digital enterprise environment portfolio governance, including making recommendations for changes to the portfolio [16]</li> <li>Review current and proposed digital enterprise environment for compliance with the organization's obligations (including legislation, regulatory, contractual, and agreed standards/policies) and adherence to overall strategy [9, 10, 15]</li> <li>Ensure the workforce has proper digital engineering qualifications [4, 8]</li> <li>Control digital environment assets in one or more significant areas, ensuring that the administration of the acquisition, storage, distribution, movement, and disposal of assets is carried out [9, 12, 16]</li> <li>Maintain and update content management processes to meet the needs of users including those with disabilities [12, 14]</li> <li>Support a model-based culture and environment, leveraging capabilities of the digital enterprise environment infrastructure of the organization [3, 4, 8]</li> <li>Take responsibility for organization's digital engineering projects, providing effective team leadership, including information flow to and from team members during project work [3, 4, 9, 16]</li> </ul>
Expert	<ul style="list-style-type: none"> <li>Identify leadership teams (e.g., champions, sponsors, etc.) that are accountable to actively participate in managing and implementing the digital transformation efforts [3, 4, 8]</li> <li>Make a deliberate effort to transform the workforce to promote a cultural change, including efforts such as training, education, strategic communication, leadership, and continuous improvements in model-based engineering methods [4, 8]</li> <li>Transform the culture by encouraging the workforce to develop and implement enterprise-wide digital enterprise environment strategies [3, 4, 8]</li> </ul>

*Table B.22. Tasks Mapped to Communications Competency*

<b>Proficiency Level</b>	<b>KSABs</b>
Awareness	<ul style="list-style-type: none"> <li>Advance digital engineering policy, guidance, specifications, and standards by using commonality in terminology, developing a shared understanding of concepts, and ensuring consistency and rigor in implementing digital engineering across engineering activities [1-5, 9, 10, 12, 13, 15, 17-34]</li> </ul>
Basic	<ul style="list-style-type: none"> <li>Communicate using digital model artifacts from the digital enterprise environment [1-7, 10, 12, 13, 17-34]</li> </ul>
Intermediate	<ul style="list-style-type: none"> <li>Communicate and share the digital modeling strategy for a specific project [1-5, 10, 12, 13, 17-34]</li> </ul>

Advanced	<ul style="list-style-type: none"> <li>Investigate and manage the adoption of appropriate model-based tools, techniques, and processes (including automation) for the management of digital enterprise environment systems and services [9, 16]</li> <li>Collate digital enterprise environment usage conclusions and recommendations and present lessons learned to stakeholders [9, 16]</li> </ul>
Expert	<ul style="list-style-type: none"> <li>Engage with and influence senior-levels and project teams through digital enterprise environment management processes, ensuring that the infrastructure is managed to provide agreed levels of service and data integrity. [1]</li> <li>Communicate and execute the digital engineering vision, strategy, and implementation by providing a mechanism for people to ask questions and provide feedback, establishing priorities and key milestones, and defining roles and responsibilities of staff [4, 8]</li> <li>Establish the appropriate guidance to enable transparent decision-making to be demonstrated, working with senior leaders to ensure the needs of principal stakeholders are understood, the value proposition offered by digital enterprise environment is accepted by these stakeholders and the evolving needs of the stakeholders and their appetite for balancing benefits, opportunities, costs, and risks is embedded into strategic and operational plans. [1, 4]</li> </ul>

*Table B.23. Tasks Mapped to Planning Competency*

Proficiency Level	KSABs
Awareness	<ul style="list-style-type: none"> <li>Aware of the digital enterprise environment continuity management plan [3, 9, 16]</li> </ul>
Basic	<ul style="list-style-type: none"> <li>Participate in the coordination of the digital enterprise environment content management [3, 16]</li> <li>Understand the stakeholder that will be impacted by the switch to a digital ecosystem and the roles and responsibilities of these stakeholders [1, 3, 4]</li> </ul>
Intermediate	<ul style="list-style-type: none"> <li>Coordinate digital enterprise environment content management processes to meet the needs of users, including those with disabilities [3, 16]</li> <li>Plan the digital enterprise environment infrastructure necessary to provide the digital application services to meet service-level agreements [9]</li> </ul>
Advanced	<ul style="list-style-type: none"> <li>Implement and contribute to the development of a digital enterprise continuity management plan [3, 16]</li> <li>Lead the preparation of digital enterprise environment technical plans and, in liaison with business assurance and project staff, ensure that appropriate digital engineering related resources are made available, within a change program [3, 9]</li> </ul>
Expert	<ul style="list-style-type: none"> <li>Ensure that a framework of policies, standards, processes, and practices is in place to guide provision of digital enterprise environment services, and that suitable monitoring of the governance framework is in place to report on adherence to these obligations [3, 9]d</li> </ul>

*Table B.24. Tasks Mapped to Digital Environment Operations Competency*

Proficiency Level	KSABs
Awareness	<ul style="list-style-type: none"> <li>Follow digital enterprise environment procedures, including performing simple installations, replacing consumable items, checking correct working of installations, and documenting/reporting on work done [9, 16]</li> <li>Understand that as a model repository, the digital enterprise environment can be used as a single authoritative source of truth [1-5, 10, 12-34]</li> </ul>

	<ul style="list-style-type: none"> <li>• Understand established digital engineering publishing processes and dashboards used to distribute digital content (formally or informally) to interested stakeholders [1-7, 9, 10, 12-34]</li> </ul>
Basic	<ul style="list-style-type: none"> <li>• Adapt to changes in digital enterprise environment process and technology [16]</li> <li>• Identify digital environment related operational problems and contribute to their resolution, checking that they are managed in accordance with agreed standards and procedures [9, 16]</li> <li>• Understand digital enterprise environment technical publication concepts, tools, and methods and they way in which these are used [1-7, 9, 10, 12-34]</li> <li>• Use organization's agreed to digital enterprise environment procedures to publish content, and create and maintain data records [1-7, 9, 10, 12-34]</li> </ul>
Intermediate	<ul style="list-style-type: none"> <li>• Carry out agreed upon operational procedures, including infrastructure configuration, installation, and maintenance [9, 16]</li> <li>• Contribute to digital enterprise environment capacity modeling and planning [9, 16]</li> <li>• Provide technical expertise to enable the correct application of digital enterprise environment operational procedures [9, 16]</li> <li>• Configure digital engineering methods and tools to address the project needs [9, 16]</li> <li>• Implement systems and controls for digital enterprise environment to measure performance and manage risk [9, 10, 16]</li> <li>• Use digital enterprise environment content publishing systems to manage published content across different channels [1-3, 5-7, 9, 10, 12-34]</li> <li>• Use standard procedures and tools to carry out defined digital enterprise environment system backups, restoring data where necessary [9, 16]</li> <li>• Provide support on the use of existing model-based engineering methods and tools [9, 16]</li> </ul>
Advanced	<ul style="list-style-type: none"> <li>• Configure modeling tools to automate the provisioning, testing, and deployment of new and changed digital enterprise environment infrastructure [9, 16]</li> <li>• Create digital modeling and simulation artifacts and technology roadmaps, and share knowledge and insights from processes and results, with others [1, 2, 5, 17-34]</li> <li>• Define digital environment configurations required for testing with reference to agreed upon testing standards [9, 16]</li> <li>• Ensure that digital information is presented effectively [1-7, 9, 10, 12-34]</li> <li>• Provide expert technical knowledge in the systems testing of platform-specific versions of the digital enterprise environment products, on varying platforms [9, 16]</li> <li>• Perform digital enterprise environment activities related to administration of assets [1, 2, 5, 9, 12, 14-34]</li> <li>• Provide specialist guidance and advice to less experienced colleagues to ensure best use is made of available digital environment assets, and to maintain or improve the digital environment installation service [16]</li> <li>• Select appropriate channels through which digital content should be published, providing advice to content authors on how to leverage features of relevant digital channels and suggest methods and tools [3, 9, 14, 16]</li> </ul>
Expert	<ul style="list-style-type: none"> <li>• Control digital environment assets in one or more significant areas, ensuring that administration of the acquisition, storage, distribution, movement, and disposal of assets is carried out [9, 14, 16]</li> <li>• Set parameters for the prioritization of digital resources and the changes to be implemented [9, 16]</li> </ul>

*Table B.25. Tasks Mapped to Digital Environment Support Competency*

Proficiency Level	KSABs
Awareness	<ul style="list-style-type: none"> <li>• Aware of the maintenance and support plans of the digital enterprise environment [9, 16]</li> <li>• Understand the tools, techniques, and processes to log, track, and report on configuration items, components, and changes [9, 12, 16]</li> </ul>
Basic	<ul style="list-style-type: none"> <li>• Contribute to digital enterprise environment maintenance, installation, and problem resolution [9, 16]</li> <li>• Obtain and analyze digital enterprise environment usage data, and present it effectively [16]</li> <li>• Ensure that project-specific needs are supported in the digital enterprise environment [9]</li> <li>• Conduct tests on digital enterprise environment installations with guidance [9, 16]</li> </ul>
Intermediate	<ul style="list-style-type: none"> <li>• Apply tools, techniques, and processes to create and maintain an accurate digital enterprise environment register [9, 16]</li> <li>• Assess digital environment associated risks, and specify recovery routines and contingency procedures [9, 10, 16]</li> <li>• Contribute to the planning and implementation of maintenance and installation of infrastructure components for virtualized environments [9, 16]</li> <li>• Contribute to the planning and implementation of maintenance and installation work, including building and configuration of infrastructure components in digital environments [9, 16]</li> <li>• Contribute to investigations of problems and faults concerning the installation of digital environment hardware and/or software and confirm the correct working of digital installations [9, 16]</li> <li>• Correct digital environment malfunctions, calling on other experienced colleagues and external resources if required [9, 16]</li> <li>• Identify potential hazards or risks related to the use of digital enterprise environment tools and equipment [9, 10, 16]</li> <li>• Install or remove digital enterprise environment hardware and/or software, and associated connections, using supplied installation instructions and tools, and where appropriate, handover to the client [9, 16]</li> <li>• Maintain accurate records of various metrics related to digital artifacts and digital enterprise environment infrastructure [9, 16]</li> <li>• Provide assistance to digital enterprise environment users following agreed upon procedures for further help or escalation [16]</li> <li>• Maintain and troubleshoot digital enterprise environment tools and technologies [9, 16]</li> <li>• Use infrastructure management tools to collect and report on digital enterprise environment load and performance statistics and to automate the provisioning, testing, and deployment of new and changed infrastructure [9, 16]</li> <li>• Create test cases using own in-depth technical analysis from model-based engineering methods, of both functional and non-functional specifications (such as reliability, efficiency, usability, maintainability, and portability) [9, 16]</li> <li>• Analyze and report test activities and results using model-based engineering methods and tools [9, 16]</li> <li>• Understand the specific definition of verification regarding DE [9, 16]</li> <li>• Understand the specific definition of validation with regard to DE [9, 16]</li> <li>• Understand the use of a digital ecosystem for VV&amp;A of the system [9, 16]</li> <li>• Verify that products developed are aligned with review and/or analysis [9, 16]</li> </ul>
Advanced	<ul style="list-style-type: none"> <li>• Use appropriate digital enterprise environment tools, techniques, and proprietary guidelines to conform to application programming interface definitions for new or existing platforms and applications [9, 16]</li> <li>• Schedule and supervise all digital enterprise environment maintenance and installation work [9, 16]</li> <li>• Act to highlight and resolve potential instances of digital enterprise environment unauthorized usage such as unlicensed copies of software [9, 16]</li> </ul>

	<ul style="list-style-type: none"> <li>• Develop, mature, and implement methods and processes to support digital enterprise environment activities across the enterprise and lifecycle [9, 16]</li> <li>• Understand basic approaches for maintenance, installation, and problem resolution for digital environments [9, 16]</li> <li>• Create and maintain an inventory of information assets, which are subject to relevant oversight [9, 12, 16]</li> <li>• Analyze and implement technological innovations in digital environment to enable end-to-end digital enterprise [9, 16]</li> <li>• Develop digital enterprise environment installation procedures and standards, and schedule installation work [9, 16]</li> <li>• Document digital environment related faults, implement resolutions, and retest to agreed standards [9, 16]</li> <li>• Draft and maintain standards and procedures for digital enterprise environment component capacity management [9, 16]</li> <li>• Identify and analyze problems and issues with decision making for acquiring, deploying, and maintaining enterprise digital environment and recommend corrective actions [9, 16]</li> <li>• Implement agreed upon digital enterprise environment infrastructure changes and maintenance routines [9, 16]</li> <li>• Manage and maintain service compliance of all digital enterprise environment service assets in line with business and regulatory requirements involving knowledge of financial and technical processes, tools, and techniques [9, 16]</li> <li>• Manage digital enterprise environment capacity modeling and forecasting activities [9, 16]</li> <li>• Produce and analyze registers and histories of authorized digital enterprise environment assets (including secure master copies of software, documentation, data, licenses, and agreements for supply, warranty, and maintenance) and verify that all these assets are in a known state and location [9, 16]</li> <li>• Produce reports and analysis to support digital enterprise environment asset management activities and aid decision making [9, 16]</li> <li>• Produce reports on progress, anomalies, risks, and issues associated with a digital enterprise environment modeling project [9, 10, 16]</li> <li>• Provide specialist guidance information to support digital enterprise environment systems testing and quality assurance functions, to assist in improving procedures [9, 12, 16]</li> <li>• Undertake routing installations and deinstallations of digital enterprise environment items of hardware and/or software [9, 16]</li> <li>• Use infrastructure management tools to determine digital enterprise environment load and performance statistics [9, 16]</li> <li>• Oversee maintenance, installation, and problem resolution for digital enterprise environment [9, 16]</li> <li>• Configure digital enterprise environment tools to maintain records of user requests, contact details, and outcomes [9, 11, 16]</li> <li>• Extend the digital enterprise environment model to define test strategies or cases [9, 16]</li> </ul>
Expert	<ul style="list-style-type: none"> <li>• Contribute to the creation and maintenance of digital environment policy, standards, procedures, and documentation for security [9, 15, 16]</li> <li>• Determine digital environment testing policies, including processes related to security [9, 15, 16]</li> <li>• Investigate and coordinate the resolution of potential and actual digital enterprise environment service problems [9, 16]</li> <li>• Lead and manage investigations into complex digital enterprise environment issues, engaging additional specialists if required [9, 16]</li> <li>• Plan all aspects of the infrastructure necessary to ensure provision of digital enterprise environment network services to meet organization's business strategy and service level agreements with customers [9, 16]</li> <li>• Provide authoritative advice and guidance on any aspect of digital environment test planning and execution [9, 16]</li> <li>• Provide information and advice on digital enterprise environment issues such as maintenance of hardware assets, licensing of software, protection of intellectual property, and legal obligations [9, 15, 16]</li> <li>• Provide reports and proposals for digital enterprise environment improvements to specialists, users, and managers [9, 16]</li> <li>• Report on digital enterprise environment portfolio status as appropriate [9, 16]</li> </ul>

	<ul style="list-style-type: none"> <li>Review information, in conjunction with service level agreements, to identify any digital enterprise environment capacity issues and specify any required changes [9, 16]</li> </ul>
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*Table B.26. Tasks Mapped to Digital Environment Security Competency*

<b>Proficiency Level</b>	<b>KSABs</b>
Awareness	<ul style="list-style-type: none"> <li>Understand digital enterprise environment access and controls for the authoritative source of truth in the digital enterprise environment [1-5, 9-34]</li> <li>Understand the purpose of the application and operation of digital environment physical, procedural, and technical security controls AND Provide advice and guidance on the application and operation of digital environment physical, procedural, and technical security controls [11, 15, 16]</li> <li>Maintain relevant records and documentation on digital enterprise environment security administration tasks [16]</li> <li>Perform simple digital enterprise environment security administration tasks [16]</li> <li>Receive and respond to routine digital enterprise environment requests for security support [11, 15, 16]</li> <li>Secure digital enterprise environment infrastructure and protect intellectual property [11, 15, 16]</li> </ul>
Basic	<ul style="list-style-type: none"> <li>Assist in the investigation and resolution of issues relating to access controls and security systems [11, 15, 16]</li> <li>Develop policies, standards, processes, and guidelines for ensuring the physical and electronic security of digital environments [10, 11, 15, 16]</li> </ul>
Intermediate	<ul style="list-style-type: none"> <li>Assist users in defining their access rights and privileges [11, 15, 16]</li> <li>Interpret digital enterprise environment information assurance and security policies and apply these to appropriately manage risks [10, 15, 16]</li> <li>Perform non-standard digital enterprise environment security administration tasks and resolve security administration issues [16]</li> <li>Provide advice and guidance to ensure adoption of an adherence to digital enterprise environment information assurance architectures, strategies, policies, standards, and guidelines [10, 15, 16]</li> <li>Apply and maintain specific security controls as required by organizational policy and local risk assessments [11, 15, 16]</li> <li>Perform basic risk assessments for digital enterprise environment information systems [10, 15, 16]</li> <li>Use digital testing methods to support digital enterprise environment information assurance [16]</li> </ul>
Advanced	<ul style="list-style-type: none"> <li>Contribute to the development of information security policy, standards, and guidelines [15, 16]</li> <li>Contribute to the creation and maintenance of digital environment policy, standards, procedures, and documentation for security [15, 16]</li> <li>Develop corporate information assurance policy, standards, and guidelines [15, 16]</li> <li>Obtain and act on vulnerability information and conduct security risk assessments, business impact analysis, and accreditation on digital enterprise environment [10, 15, 16]</li> <li>Perform security risk, vulnerability assessments, and business impact analysis for digital enterprise environment [10, 15, 16]</li> <li>Ensure that all identified breaches in digital enterprise environment security are promptly and thoroughly investigated and that any system changes required to maintain security are implemented [4, 11, 15, 16]</li> <li>Ensure that digital enterprise environment security records are accurate and complete and that requests for support are dealt with according to set standards and procedures [15, 16]</li> </ul>

	<ul style="list-style-type: none"> <li>• Investigate digital enterprise environment security breaches in accordance with established procedures and recommend required actions and support/follow up to ensure these are implemented [11, 15, 16]</li> <li>• Assess impact of suspected cyber-attacks and manage security incidents, supporting digital enterprise environment digital forensics where appropriate [11, 15, 16]</li> <li>• Maintain digital enterprise environment security administration processes and check that all requests for support are dealt with according to agreed procedures [11, 15, 16]</li> <li>• Monitor the application and compliance of digital enterprise environment security administration procedures and review information systems for actual or potential breaches in security [15, 16]</li> <li>• Process and analyze evidence of digital enterprise environment security breaches in line with policy, standards, and guidelines and support production of forensics findings and reports [11, 15, 16]</li> <li>• Provide advice and guidance on digital enterprise environment-based security strategies to manage identified risks and ensure adoption of IT-industry standard processes [10, 11, 15, 16]</li> <li>• Provide guidance in defining digital enterprise environment access rights and privileges [4, 11, 15, 16]</li> <li>• Provide secure connected information network recommendations to perform digital enterprise environment activities [9, 15, 16]</li> </ul>
Expert	<ul style="list-style-type: none"> <li>• Develop and communicate corporate information security policy, standards, and guidelines [3, 4, 15, 16]</li> <li>• Develop policies, standards, processes, and guidelines for ensuring the physical and electronic security of automated systems [15, 16]</li> <li>• Ensure compliance between business strategies and information assurance by setting strategies, policies, standards, and practices and leading the provision of information assurance expertise, advice, and guidance across all of the organization's digital enterprise environment [3, 4, 15, 16]</li> <li>• Ensure that all identified breaches in digital environment security are promptly and thoroughly investigated and that any changes required to maintain security are implemented [4, 15, 16]</li> <li>• Ensure that the digital environment policy and standards for security administration are fit for purpose, current, and are correctly implemented [4, 10, 15, 16]</li> <li>• Ensure that the policy and standards for digital enterprise environment security administration are fit for purpose, current, and are correctly implemented [4, 10, 15, 16]</li> <li>• Direct the development, implementation, delivery, and support of a digital enterprise environment information security strategy aligned to the strategic requirements of the business [3, 4, 15, 16]</li> <li>• Lead the provision of authoritative advice and guidance on the requirements for digital enterprise environment security controls in collaboration with experts in other functions such as legal, technical support [15, 16]</li> <li>• Lead the provision of information security resources expertise, guidance, and systems necessary to execute strategic and operational plans across all of the organization's digital enterprise environment systems [15, 16]</li> <li>• Set policies, standards, and guidelines for how the organization conducts digital enterprise environment digital forensic investigations [15, 16]</li> <li>• Establish digital enterprise environment access and controls for the authoritative source of truth [3, 4]</li> </ul>

*Table B.27. Tasks Mapped to Digital Literacy Competency*

<b>Proficiency Level</b>	<b>KSABs</b>
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Awareness	<ul style="list-style-type: none"> <li>• Use established publishing processes according to appropriate guidelines, for example, to release, retire, or convert content into a format suitable for publication [2, 5, 14-34]</li> <li>• Follow digital engineering procedures, including performing simple installations, replacing consumable items, checking correct working of installations, and documenting/reporting on work done [16]</li> <li>• Understand that as a model repository, the digital engineering framework can be used as a single authoritative source of technical truth [1-5, 10, 12-15, 17-34]</li> </ul>
Basic	<ul style="list-style-type: none"> <li>• Act as a contributor to modeling tasks on a design engineering team [15, 17-34]</li> <li>• Apply modeling tasks employing a model-based systems engineering approach [2, 17-34]</li> <li>• Define test conditions for given requirements [23, 27, 29-32]</li> <li>• Describe digital artifacts' contribution to the following engineering concepts: Systems of Systems (SoS), program interoperability, and modularity [1-5, 10, 13, 15, 17-34]</li> <li>• Describe how digital artifacts advance the state of practice in Digital Engineering [1-5, 10, 13, 15, 17-34]</li> <li>• Describe the purpose of different stakeholder views [1, 2, 13, 15, 17-34]</li> <li>• Document results in accordance with agreed procedures [1, 2, 5-7, 10, 13, 15, 17-34]</li> <li>• Establish access and controls for the authoritative source of truth [11, 12, 14-16]</li> <li>• Explain the difference in stakeholder views [1, 2, 13, 15, 17-34]</li> <li>• Maintain records and advise relevant persons of actions taken [1, 2, 5-7, 10, 12-34]</li> <li>• Perform digital engineering activities related to administration of assets [12, 14, 16-34]</li> <li>• Relate the importance of a methodology to achieving Digital Engineering [1-3, 5, 10, 13, 17-34]</li> <li>• Understand technical publication concepts, tools, and methods and the way in which these are used [1-3, 5, 13-34]</li> <li>• Use agreed on procedures to create and maintain an accurate register of assets [10, 12, 14, 16]</li> <li>• Use agreed procedures to publish content [1-3, 5, 9, 10, 13-34]</li> </ul>
Intermediate	<ul style="list-style-type: none"> <li>• Capture stakeholder high-level requirements [1-4, 15, 17-34]</li> <li>• Coordinate content management processes to meet the needs of users, including those with disabilities [1, 11, 12, 14]</li> <li>• Communicate information security risks and issues to business managers and others [10, 15, 16]</li> <li>• Maintain accurate records of user requests, contact details, and outcomes [11, 15, 16]</li> <li>• Provide advice and guidance to ensure adoption of and adherence to information assurance architectures, strategies, policies, standards, and guidelines [10, 12, 15, 16]</li> <li>• Respond to security breaches in line with security policy and record the incidents and take action [11, 15, 16]</li> <li>• Review the architectural products created by others [2, 13, 15, 17-34]</li> <li>• Submit waivers and deviations for approval [2, 5, 13, 17-34]</li> <li>• Take into account any legal issues related to publishing, including that associated copyright concerns are adequately managed [1, 14, 15]</li> <li>• Use content publishing systems to manage published content across different channels [1-3, 12, 14-34]</li> <li>• Use digital artifacts to advance the state of practice in Digital Engineering [1-5, 13, 15, 17-34]</li> </ul>
Advanced	<ul style="list-style-type: none"> <li>• Advise on the choice of techniques and approach and influence customers accordingly [1-4, 17-34]</li> <li>• Collate conclusions and recommendations and present forensics findings to stakeholders [1, 2, 5-7, 13, 17-34]</li> <li>• Conduct investigations to correctly gather, analyze, and present the totality of findings, including digital evidence – to both business and legal audiences [5-7]</li> </ul>

- Conduct technical reviews on a continuous basis, especially as the technical baseline matures, to produce digital artifacts and inform decisions [1, 5, 13, 17-34]
- Coordinate information resources to meet specific business objectives whilst maintaining the principles of professional standards, accountability, openness, equality, diversity, and clarity of purpose [3, 5-7, 13]
- Create and maintain an inventory of information assets, which are subject to relevant legislation [12]
- Create reports and technology roadmaps and share knowledge and insights with others [1, 2, 5, 17-34]
- Define and communicate the test strategy for the project [23, 27, 29-32]
- Develop and implement quality plans and method statements [12]
- Ensure asset controllers, infrastructure teams, and the business coordinate and optimize value, maintain control, and maintain appropriate legal compliance [10]
- Explain the purpose of and provide advice and guidance on the application and operation of elementary physical, procedural, and technical security controls [15, 16]
- Identify, assess, and communicate associated risks related to asset management [10, 15]
- Identify information and communication systems that support the critical business processes and manage the relationship with specialists with authority for those systems [16]
- Identify the implications of copyright, data protection, and other legal issues associated with publishing [1, 15]
- Investigate major breaches of security and recommend appropriate control improvements [11, 15, 16]
- Investigate suspected attacks and manage security incidents, using digital forensics where appropriate [11, 15, 16]
- Manage client relationships with respect to testing matters [23, 27, 29-32]
- Manage large programs [1-7]
- Monitor the effectiveness of installations, and ensure that appropriate recommendations for change are made [9, 16]
- Obtain and act on vulnerability information and conduct security risk assessments, business impact analysis, and accreditation on complex information systems [10, 15, 16]
- Obtain input from and communicate modeling results to senior managers for agreement [17-34]
- Perform security risk, vulnerability assessments, and business impact analysis for medium complexity information systems [10, 15, 16]
- Plan effective data storage, sharing, and publishing within the organization [9, 16]
- Plan large programs [1-4, 6, 7]
- Produce and analyze registers and histories of authorized assets (including secure master copies of software, documentation, data, licenses and agreements for supply, warranty, and maintenance), and verify that all these assets are in a known state and location [16]
- Propose and agree on the configuration items (CIs) to be uniquely identified with naming conventions [12]
- Provide advice and guidance on security strategies to manage identified risks and ensure adoption and adherence to standards [10, 15, 16]
- Provide specialist advice to those accountable for governance to correct compliance issues [10]
- Provide specialist expertise in the design characteristics of data management systems (DBMS) or data warehouse products/services [9, 16]
- Report on the status of configuration management [12]
- Review current and proposed information systems for compliance with the organization's obligations (including legislation, regulatory, contractual, and agreed standards/policies) and adherence to overall strategy [10]
- Review the benefits and value of digital engineering methods and tools [1, 2, 4, 5, 9, 13, 17-34]

	<ul style="list-style-type: none"> <li>• Schedule and supervise all IT maintenance and installation work [16]</li> <li>• Select appropriate channels through which content should be published, providing advice to users and content authors to leverage the features of the relevant channels and tools used [1, 15]</li> <li>• Support a systems modeling culture and environment, leveraging the capabilities of the organization [2-5, 8, 13, 15, 17-34]</li> </ul>
Expert	<ul style="list-style-type: none"> <li>• Develop the overall strategy for the delivery of information and knowledge, including preferred media, overall information structure, and rules for formatting content to meet the needs of the organization and its desired audience [3, 4, 15]</li> <li>• Act as the organization's contact for relevant regulatory authorities [10]</li> <li>• Communicate and execute the digital engineering vision, strategy, and implementation by providing a mechanism for people to ask questions and provide feedback [4, 8]</li> <li>• Communicate and execute the digital engineering vision, strategy, and implementation by providing resources, establishing priorities and key milestones, and defining roles and responsibilities to enable [4]</li> <li>• Demonstrate efficient communication among stakeholders about relationships between system requirements and the system being developed, through creating and maintaining precise engineering artifacts and traceability of designs to requirements [1, 2, 4, 13, 17-34]</li> <li>• Develop configuration management strategies, policies, standards, and guidelines for digital engineering related artifacts [12]</li> <li>• Develop new methods such as automation and organizational capabilities for the configuration management of digital artifacts [12]</li> <li>• Develop organizational policies, standards, and guidelines for data management, aligned with ethical principles [14, 15]</li> <li>• Develop organizational policies, standards, and guidelines for information and records management ensuring that uniformly recognized and accepted data definitions are developed and applied throughout the organization [14]</li> <li>• Develop policy and strategies to ensure all of the performance measures of IT services meet the needs of the business and performs to any service level agreements which may be in place [9, 16]</li> <li>• Engage with and influence senior-level stakeholders and project teams through change management processes, ensuring that the infrastructure is managed to provide agreed levels of service and data integrity [1, 2, 12]</li> <li>• Engage with and influence relevant stakeholders to obtain organizational commitment to technology roadmaps [1, 3, 4, 13]</li> <li>• Ensure that a framework of policies, standards, process, and practices is in place to guide provision of enterprise IT services, and that suitable monitoring of the governance framework is in place to report on adherence to these obligations, as needed [16]</li> <li>• Ensure that adequate procedures, standards, tools, and resources are in place to ensure the appropriate quality of material published by or on behalf of the organization and it is in a form accessible to all potential users, including those with disabilities [1, 9, 12, 14]</li> <li>• Ensure that any legal issues related to publishing, including associate copyright concerns, are adequately managed [1, 10, 14, 15]</li> <li>• Ensure that the business processes and information required to support the organization are defined, and devise appropriate processes and data architecture [3, 4, 6, 7, 9]</li> <li>• Establish a supporting infrastructure and environment to perform activities, collaborate, and communicate across stakeholders [1, 9]</li> <li>• Establish and communicate the organization's information management strategy, developing it as an integral part of the business strategy [16]</li> <li>• Establish and maintain the policies for compliance with the organization's obligations (including legislation, regulatory, contractual, and agreed standards/policies), holding the management team to account [10]</li> <li>• Establish new projects and support them through their lifecycle [1-4, 6, 7, 10, 13]</li> <li>• Formalize the application of models to support system requirements, design, analysis, verification, and validation activities beginning in the conceptual design phase and continuing throughout development and later lifecycle phases [2-5, 13, 17-34]</li> <li>• Inspire creativity and flexibility in the management and application of IT [16]</li> </ul>

	<ul style="list-style-type: none"> <li>• Lead the establishment and maintenance of a function that provides a consistent and integrated approach to IT governance in line with the organization's corporate governance requirements [9, 16]</li> <li>• Lead the provision of authoritative advice and guidance on the requirements for security controls in collaboration with experts in other functions such as legal, technical support [15]</li> <li>• Lead the provision of information security resources expertise, guidance, and systems necessary to execute strategic and operational plans across all of the organization's information systems [9, 15, 16]</li> <li>• Manage client relationships with respect to all testing matters [23, 27, 29-32]</li> <li>• Measure and monitor adherence to standards and ensure consistent execution of the process across the organization [12, 15]</li> <li>• Outline key business engagement messages that need to be communicated throughout the program/project [1-4, 13]</li> <li>• Produce network design policies, philosophies, and criteria covering connectivity, capacity, interfacing, security, resilience, recovery, access, and remote access [9, 11, 16]</li> <li>• Promote awareness of, and commitment to, asset control [12]</li> <li>• Promote the continuing economic and effective provision of services, ensuring that all changes to assets and services are appropriately and accurately controlled and recorded [9, 12]</li> <li>• Provide assurance to principal stakeholders that IT services meet the organization's obligations (including legislation, regulatory, contractual, and agreed standards/policies) [9, 16]</li> <li>• Provide guidance in defining access rights and privileges [11, 12, 15, 16]</li> <li>• Provide information and advice on issues such as maintenance of hardware assets, licensing of software, protection of intellectual property, and legal obligations [9, 15, 16]</li> <li>• Provide resources to drive adoption of, and adherence to, policies and standards [3, 10, 12, 15]</li> <li>• Responsible for compliance with regulations, standards, and codes of good practice relating to information and documentation, records management, information assurance, and data protection [10, 12, 14-16]</li> <li>• Review information, in conjunction with service level agreements, to identify any capacity issues and specify any required changes [9]</li> <li>• Take overall responsibility for planning effective data storage, security, quality, sharing, availability, retention, and publishing within the organization [9, 14-16]</li> </ul>
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*Table B.28. Tasks Mapped to Digital Engineering Value Proposition Competency*

<b>Proficiency Level</b>	<b>KSABs</b>
Awareness	<ul style="list-style-type: none"> <li>• Understand the benefits of working in a digital engineering environment (more efficient and effective) [1-7, 9-34]</li> <li>• Understand the definition of digital engineering [1-7, 9-34]</li> </ul>
Basic	<ul style="list-style-type: none"> <li>• Understand the benefits of digital engineering: greater integration among engineering activities that is enabled through the use of models, simulations, and data that are both well-defined and well-formed, all housed in a single DE Ecosystem; A complex system of systems may involve multiple geographically distributed stakeholders, sometimes with competing priorities and interests. Programs involve ever-greater levels of technology, software, and requirements for both capability and security. [1-7, 9, 10, 12-34]</li> <li>• Understand digital engineering guidance, capabilities, benefits, roles, responsibilities, and activities [1-5, 10-34]</li> <li>• Understand the benefits of digital engineering and the laws that support digital engineering [4, 6, 7]</li> </ul>

	<ul style="list-style-type: none"> <li>• Understand the benefits of implementing a digital engineering ecosystem: traceability, digital data, MPTs, historical systems information, authoritative source of truth, documents generated from environment, not by hand [1-7, 9, 10, 12-34]</li> <li>• Understand the “community acceptance” model, which includes review, V&amp;V, and accreditation to create credibility and trust [4, 12]</li> <li>• Understand the elements of trust in the community acceptance model (context, governance, accuracy, applicability of MPTs, community buy-in) [1-5, 10, 12-34]</li> <li>• Understand the role of stakeholder engagement in building trust in the DE ecosystem [1, 4]</li> </ul>
Intermediate	<ul style="list-style-type: none"> <li>• Understand the limitations of current document-based engineering acquisition practices [1-7, 9, 10, 12-34]</li> <li>• Understand the challenges of current document-based acquisition system (linear, inefficient) [1-7, 9, 10, 12-34]</li> <li>• Understand how digital engineering can reduce program risk [1-7, 9, 10, 12-34]</li> </ul>
Advanced	•
Expert	•

*Table B.29. Tasks Mapped to DoD Policy/Guidance Competency*

<b>Proficiency Level</b>	<b>KSABs</b>
Awareness	<ul style="list-style-type: none"> <li>• Ensure the correct implementation of standards and procedures in digital enterprise environment projects [1-7, 9, 10, 12-34]</li> <li>• Understand DoD policy and guidance about models, simulations, and DE in the context of SE [1-7, 9, 10, 12-34]</li> <li>• Understand why the DoD is interested in digital engineering [3, 4]</li> </ul>
Basic	•
Intermediate	•
Advanced	•
Expert	•

KSABs for the Coaching and Mentoring Competency were assigned to roles, not to tasks, so there is no table for this competency.

*Table B.30. Tasks Mapped to Decision Making Competency*

<b>Proficiency Level</b>	<b>KSABs</b>
Awareness	•
Basic	• Leverage technologies currently available in the marketplace, while finding high-payoff solutions [3, 4, 9]
Intermediate	<ul style="list-style-type: none"> <li>• Use technological innovations to improve decision making, system capabilities, and performance of computationally intensive engineering activities [3-5]</li> <li>• Identify potential hazards or risks related to the use of tools and equipment [9, 10, 15, 16]</li> <li>• Interpret information assurance and security policies and apply these in order to manage risks [9, 10, 15, 16]</li> <li>• Produce routine reports and analysis to support asset management activities and decision making [5-7, 10-34]</li> </ul>
Advanced	<ul style="list-style-type: none"> <li>• Provide reports on the consolidated status of information controls to inform effective decision making [11, 15, 16]</li> <li>• Contribute to development of policy, standards, and procedures for compliance with relevant legislation [4, 10, 14-16]</li> </ul>

	<ul style="list-style-type: none"> <li>• Contribute to organizational policies, standards, and guidelines for methods and tools [3, 4, 9, 11, 12, 15, 16]</li> <li>• Contribute to the development of analytics policy, standards, and guidelines [4]</li> <li>• Ensure that operational procedures and working practices are fit for purpose and current [3, 4, 9-12, 14-16]</li> <li>• Identify problems and issues and recommend corrective actions [1-7, 9-34]</li> <li>• Make decisions based on that information, including the need to make changes to the systems [1-7, 9-34]</li> <li>• Manage and maintain the service compliance of all IT and service assets in line with business and regulatory requirements involving knowledge of financial and technical processes, tools, and techniques [9, 10, 16]</li> <li>• Produce reports and analysis to support asset management activities and aid decision making [5-7, 9-11, 13-34]</li> </ul>
Expert	<ul style="list-style-type: none"> <li>• Authorize allocation of resources for the planning, development, and delivery of all information systems services and products [3, 4, 9]</li> <li>• Authorize organizational policies governing the conduct of management of change initiatives and standards of professional conduct [3, 4]</li> <li>• Authorize the structure of portfolios, and be responsible for alignment with business strategy/objectives and with emerging IT and digital opportunities [3, 4]</li> <li>• Determine project testing standards for all phases, influencing all parties to conform to those standards [4]</li> <li>• Ensure that the policies and standards for capacity management are fit for purpose, current, and are correctly implemented [9]</li> <li>• Establish the appropriate guidance to enable transparent decision-making to be demonstrated, working with senior leaders to ensure the needs to principal stakeholders are understood, the value proposition offered by enterprise IT is accepted by these stakeholders and the evolving needs of the stakeholders and their appetite for balancing benefits, opportunities, costs, and risks is embedded into strategic and operational plans [1, 3, 4, 13]</li> <li>• Initiate assessment of consequences and risks arising from decisions to obtain, change, or continue the possession or use of an asset, system, or service [5, 9, 10, 32]</li> <li>• Monitor performance and take corrective action where necessary and in line with policies [3-7, 9, 14-34]</li> <li>• Plan and manage implementation of processes and procedures, tools and techniques for monitoring and managing the performance of automated systems and services [9, 11, 16]</li> <li>• Take full responsibility for budgeting, estimating, planning, and objective setting [2-4, 6, 7]</li> <li>• Undertake and/or direct reviews as necessary to ensure management decision-making is transparent, and that an appropriate balance between benefits, opportunities, costs, and risks can be demonstrated to principal stakeholders [3, 4, 5, 13]</li> </ul>

*Table B.31. Tasks Mapped to Software Literacy Competency*

<b>Proficiency Level</b>	<b>KSABs</b>
Awareness	<ul style="list-style-type: none"> <li>• Develop an understanding of the role of testing within system development, as a tool for design improvement as well as a validation process [23, 27, 29, 30]</li> <li>• Contribute, under supervision, to infrastructure operation [16]</li> <li>• Maintain relevant records and documentation on security administration tasks [15, 16]</li> <li>• Perform simple security administration tasks [15, 16]</li> <li>• Secure IT infrastructure and protect intellectual property [1-4, 9-11, 13-34]</li> </ul>
Basic	<ul style="list-style-type: none"> <li>• Adapt quickly to changes in process or technology [1-7, 10-34]</li> </ul>

	<ul style="list-style-type: none"> <li>• Assist with the evaluation of change requests [12, 16]</li> <li>• Conduct tests and correct malfunctions on system installations [9, 16]</li> <li>• Contribute to maintenance, installation, and problem resolution [9, 16]</li> <li>• Contribute, as required, to investigations of problems and faults concerning the installation of hardware and/or software and confirm the correct working of installations [9, 16]</li> <li>• Interpret, execute, and record test cases in accordance with project plans [23, 27, 29, 30]</li> <li>• Obtain and analyze usage data, and present it effectively [9, 16]</li> <li>• Receive and respond to routine requests for security support [15, 16]</li> </ul>
Intermediate	<ul style="list-style-type: none"> <li>• Apply tools, techniques and processes to create and maintain and accurate asset register [9, 12, 16]</li> <li>• Apply tools, techniques, and processes to track, log, and correct information related to configuration items [12, 16]</li> <li>• Contribute to the development of installation procedures and standards [9, 16]</li> <li>• Contribute to the implementation of maintenance and installation work [9, 16]</li> <li>• Contribute to vulnerability assessments [9, 11, 15, 16]</li> <li>• Document faults, implement resolutions, and retest to agreed standards [9, 16]</li> <li>• Install or remove hardware and/or software, and associated connections, using supplied installation instructions and tools, and where appropriate, handover to the client [9, 16]</li> <li>• Perform non-standard security administration tasks and resolve security administration issues [15, 16]</li> <li>• Provide assistance to users in a professional manner following agreed upon procedures for further help or escalation [11, 16]</li> <li>• Report details of all hardware/software items that have been installed and removed so that configuration management records can be updated [9, 16]</li> <li>• Review requirements and specifications, and define test conditions [9]</li> <li>• Understand the capabilities and the requirement sets within modeling and simulation software [17-34]</li> <li>• Use infrastructure management tools to collect and report on load and performance statistics and to automate the provisioning, testing, and deployment of new and changed infrastructure [9, 16]</li> <li>• Use standard procedures and tools to carry out defined system backups, restoring data where necessary [9, 16]</li> </ul>
Advanced	<ul style="list-style-type: none"> <li>• Act to highlight and resolve potential instances of unauthorized assets such as unlicensed copies of software [9, 16]</li> <li>• Assess associated risks, and specify recovery routines and contingency procedures [9, 16]</li> <li>• Contribute to digital forensic investigations [9, 16]</li> <li>• Contribute to setting service level agreements, and plan the infrastructure necessary to provide the network services to meet such agreements [9, 16]</li> <li>• Contribute to the development of information assurance policies, standards, and guidelines [16]</li> <li>• Contribute to the planning and implementation of maintenance and installation work, including building and configuration of infrastructure components in virtualized environments [9, 16]</li> <li>• Control IT assets in one or more significant areas, ensuring that administration of the acquisition, storage, distribution, movement, and disposal of assets is carried out [9, 16]</li> <li>• Coordinate and manage planning of the system and/or acceptance tests, including software security testing, within development or integration project or program [15]</li> <li>• Correct malfunctions, calling on other experienced colleagues and external resources if required [9, 16]</li> </ul>

	<ul style="list-style-type: none"> <li>• Create and maintain network plans for own area of responsibility [9, 16]</li> <li>• Develop installation procedures and standards and schedule installation work [9, 16]</li> <li>• Develop the capabilities and the requirement sets within modeling and simulation software [17-34]</li> <li>• Document details of all hardware/software items that have been installed and removed so that configuration management records can be updated [9, 16]</li> <li>• Ensure that all identified breaches in security are promptly and thoroughly investigated and that any system changes required to maintain security are implemented [9, 11, 15, 16]</li> <li>• Ensure that security records are accurate and complete and that requests for support are dealt with according to set standards and procedures [15, 16]</li> <li>• Identify operational problems and contribute to their resolution, checking that they are managed in accordance with agreed standards and procedures [9, 16]</li> <li>• Implement agreed on infrastructure changes and maintenance routines [9, 16]</li> <li>• Install and test new versions of system software [9, 16]</li> <li>• Investigate and coordinate the resolution of potential and actual service problems [9, 16]</li> <li>• Investigate security breaches in accordance with established procedures and recommend required actions and support/follow-up to ensure these are implemented [11, 15, 16]</li> <li>• Maintain security administration processes and check that all requests for support are dealt with according to procedures [11, 15, 16]</li> <li>• Monitor the application and compliance of security administration procedures and review information systems for actual or potential breaches in security [11, 15, 16]</li> <li>• Process and analyze evidence in line with policy, standards, and guidelines and support production of forensics findings and reports [11, 15, 16]</li> <li>• Produce outline system designs and specifications, and overall architectures, topologies, configuration databases, and design documentation of networks and networking technology within the organization [9, 16]</li> <li>• Produce specifications of cloud-based or on-premises components, tiers, and interfaces, for translation into detailed designs using selected services and products [9]</li> <li>• Provide authoritative advice and guidance on any aspect of test planning and execution [3, 4, 23, 27, 29, 30]</li> <li>• Provide reports and proposals for improvement, to specialists, users, and managers [9, 16]</li> <li>• Provide reports on progress, anomalies, risks, and issues associated with the overall project [10, 15]</li> <li>• Provide specialist advice to support others [16]</li> <li>• Provide specialist guidance and advice to less experienced colleagues to ensure best use is made of available assets, and to maintain or improve the installation service [9, 16]</li> <li>• Provide specialist guidance information to support systems testing and quality assurance functions to assist in improving procedures [16]</li> <li>• Specify requirements for environment, data, resources, and tools [3, 4, 9]</li> <li>• Undertake routine installations and deinstallations of hardware and/or software [9, 16]</li> <li>• Use infrastructure management tools to determine load and performance statistics [9, 16]</li> </ul>
Expert	<ul style="list-style-type: none"> <li>• Ensure the availability of hardware, software, and resources for the systems testing of platform specific versions of one or more software products [16]</li> <li>• Contribute to the development of organizational strategies that address information control requirements [3, 4, 15]</li> </ul>

	<ul style="list-style-type: none"> <li>• Contribute to the development of organizational strategies that address the evolving business risk and information control requirements [3, 4, 15]</li> <li>• Define configurations required for testing with reference to agreed testing standards [23, 27, 29, 30]</li> <li>• Determine testing policy and own the supporting processes including software security testing [15]</li> <li>• Ensure sites deliver site implementation plans that align with the overall plan [3, 4, 9, 16]</li> <li>• Ensure that the policy and standards for security administration are fit for purpose, current, and are correctly implemented [16]</li> <li>• Lead complex investigations engaging additional specialists if required [9, 16]</li> <li>• Manage all risks associated with the testing and take preventative action when any risks become unacceptable [10, 23, 27, 29, 30]</li> <li>• Manage complex investigations engaging additional specialists if required [9, 16]</li> <li>• Plan all aspects of the infrastructure necessary to ensure provision of network services to meet organization's business strategy and service level agreements with customers [3, 4, 9]</li> <li>• Provide hardware and software to perform digital engineering activities [3, 4, 9, 16]</li> <li>• Provide secure connected information networks to perform digital engineering activities [3, 4, 9, 15, 16]</li> <li>• Provide technical management of an IT operation, ensuring that agreed service levels are met and all relevant policies and procedures are adhered to [9, 16]</li> <li>• Set policies, standards, and guidelines for how the organization conducts digital forensic investigation [16]</li> <li>• Set strategy for monitoring and managing the performance of IT-related systems and services, in respect of their contribution to business performance and benefits to the business [9, 16]</li> <li>• Take responsibility for major aspects of network specification and design within the organization [9, 16]</li> </ul>
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