

# SEBoK Table of Contents

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## Navigating the SEBoK

The SEBoK may be searched in the same way as a traditional wiki. In addition, navigation links have been added to each page. Please use these links if you would like to navigate the SEBoK sequentially through the table of contents. These links look like:

< Previous Article | Parent Article | Next Article >

- *Previous* - The "Previous" link will take you back one article in the table of contents.
- *Next* - The "Next" link will take you forward one article in the table of contents.
- *Parent* - The "Parent" link takes you up one level in the table of contents.)



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Part 3: Systems Engineering and Management

Part 4: Applications of Systems Engineering

Part 5: Enabling Systems Engineering

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Part 8: Emerging Knowledge

## **Part 1: SEBoK Introduction**

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- Introduction to the SEBoK
  - Scope of the SEBoK
  - Structure of the SEBoK
- Introduction to Systems Engineering
  - Systems Engineering Overview
  - Fundamentals for Digital Engineering
  - Economic Value of Systems Engineering
  - A Brief History of Systems Engineering
  - Systems Engineering: Historic and Future Challenges
  - Systems Engineering and Other Disciplines
  - Fundamentals for Future Systems Engineering
- SEBoK Users and Uses
  - Guidance for Systems Engineering Novices
  - Guidance for Systems Engineers
  - Guidance for Engineers
  - Guidance for Systems Engineering Customers
  - Guidance for Educators and Researchers
  - Guidance for General Managers

## **Part 2: Foundations of Systems Engineering**

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- Knowledge Area: Systems Engineering Fundamentals
  - Introduction to Systems Engineering Fundamentals
  - Systems Engineering Core Concepts
  - Systems Engineering Principles
  - Systems Engineering Heuristics
- Knowledge Area: The Nature of Systems
  - Types of Systems
  - Cycles and the Cyclic Nature of Systems
- Knowledge Area: Systems Science
  - History of Systems Science
  - Systems Approaches
  - Complexity
  - Emergence
- Knowledge Area: Systems Thinking
  - What is Systems Thinking?

- Concepts of Systems Thinking
- Principles of Systems Thinking
- Patterns of Systems Thinking
- Knowledge Area: Representing Systems with Models
  - What is a Model?
  - Why Model?
  - Types of Models
  - System Modeling Concepts
  - Integrating Supporting Aspects into System Models
  - Modeling Standards
- Knowledge Area: Systems Approach Applied to Engineered Systems
  - Overview of the Systems Approach
  - Engineered System Context
  - Identifying and Understanding Problems and Opportunities
  - Synthesizing Possible Solutions
  - Analysis and Selection between Alternative Solutions
  - Implementing and Proving a Solution
  - Deploying, Using, and Sustaining Systems to Solve Problems
  - Applying the Systems Approach

## **Part 3: Systems Engineering and Management**

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- Systems Engineering STEM Overview
- Model-Based Systems Engineering (MBSE)
- Knowledge Area: System Life Cycle Approaches - formerly "Systems Lifecycle Approaches"
  - Generic Life Cycle Model
  - Applying Life Cycle Processes
- Knowledge Area: System Life Cycle Models - formerly "System Lifecycle Models"
  - System Life Cycle Process Drivers and Choices - formerly "System Lifecycle Process Drivers and Choices"
  - Vee Life Cycle Model - formerly "System Lifecycle Process Models: Vee"
  - Incremental Life Cycle Model - formerly "System

## Lifecycle Process Models: Incremental"

- Agile Systems Engineering - formerly "System Lifecycle Process Models: Agile Systems Engineering"
- Process Integration
- Lean Engineering
- Knowledge Area: Systems Engineering Management
  - Technical Planning
  - Assessment and Control
  - Decision Management
  - Requirements Management - [New article](#)
  - Risk Management
  - Configuration Management
  - Information Management
  - Quality Management
  - Measurement
- Knowledge Area: System Concept Definition - formerly "Business and Mission Analysis"
  - Business or Mission Analysis
  - Stakeholder Needs Definition - formerly "Stakeholder Needs and Requirements"
- System Requirements Definition - formerly "Stakeholder Requirements Definition"
- Knowledge Area: System Architecture Design Definition - [New Article](#)
  - Functional Architecture
  - Logical Architecture
  - Physical Architecture
- System Detailed Design Definition
- System Analysis
- System Realization
- System Implementation
- System Integration
- System Verification
- System Transition
- System Validation
- System Operation
- Knowledge Area: System Maintenance - [updated KA structure](#)
  - Logistics

- Service Life Management
- Service Life Extension
- Capability Updates, Upgrades, and Modernization
- System Disposal and Retirement
- Knowledge Area: Systems Engineering Standards
  - Relevant Standards
  - Alignment and Comparison of Systems Engineering Standards
  - Application of Systems Engineering Standards

## **Part 4: Applications of Systems Engineering**

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- Knowledge Area: Product Systems Engineering
  - Product Systems Engineering Background
  - Product as a System Fundamentals
  - Business Activities Related to Product Systems Engineering
  - Product Systems Engineering Key Aspects
  - Product Systems Engineering Special Activities
- Knowledge Area: Service Systems Engineering
  - Service Systems Background
  - Fundamentals of Services
  - Properties of Services
  - Scope of Service Systems Engineering
  - Value of Service Systems Engineering
  - Service Systems Engineering Stages
- Knowledge Area: Enterprise Systems Engineering
  - Enterprise Systems Engineering Background
  - The Enterprise as a System
  - Related Business Activities
  - Enterprise Systems Engineering Key Concepts
  - Enterprise Systems Engineering Process Activities
  - Enterprise Capability Management
- Knowledge Area: Systems of Systems (SoS)
  - Architecting Approaches for Systems of Systems
  - Socio-Technical Features of Systems of Systems
  - Capability Engineering
  - Mission Engineering
- Knowledge Area: Healthcare Systems Engineering

- Overview of the Healthcare Sector
- Systems Engineering in Healthcare Delivery
- Systems Biology
- Lean in Healthcare

## **Part 5: Enabling Systems Engineering**

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- Knowledge Area: Enabling Businesses and Enterprises
  - Systems Engineering Organizational Strategy
  - Determining Needed Systems Engineering Capabilities in Businesses and Enterprises
  - Organizing Business and Enterprises to Perform Systems Engineering
  - Assessing Systems Engineering Performance of Business and Enterprises
  - Developing Systems Engineering Capabilities within Businesses and Enterprises
  - Culture
- Knowledge Area: Enabling Teams
  - Team Capability
  - Team Dynamics
  - Diversity, Equity, and Inclusion
  - Technical Leadership in Systems Engineering
- Knowledge Area: Enabling Individuals
  - Roles and Competencies
  - Assessing Individuals
  - Developing Individuals
  - Ethical Behavior

## **Part 6: Related Disciplines**

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- Knowledge Area: Systems Engineering and Environmental Engineering
- Knowledge Area: Systems Engineering and Geospatial/Geodetic Engineering
  - Overview of Geospatial/Geodetic Engineering
  - Relationship between Systems Engineering and Geospatial/Geodetic Engineering
  - Further Insights into Geospatial/Geodetic Engineering

- Knowledge Area: Systems Engineering and Industrial Engineering
- Knowledge Area: Systems Engineering and Project Management
  - The Nature of Project Management
  - An Overview of the PMBOK® Guide
  - Relationships between Systems Engineering and Project Management
  - The Influence of Project Structure and Governance on Systems Engineering and Project Management Relationships
  - Procurement and Acquisition
  - Portfolio Management
- Knowledge Area: Systems Engineering and Software Engineering
  - Software Engineering in the Systems Engineering Life Cycle
  - The Nature of Software
  - An Overview of the SWEBOK Guide
  - Key Points a Systems Engineer Needs to Know about Software Engineering
  - Software Engineering Features - Models, Methods, Tools, Standards, and Metrics
- Knowledge Area: Systems Engineering and Aerospace Engineering - **Desired Article!**
- Knowledge Area: Systems Engineering and Electrical Engineering - **Desired Article!**
- Knowledge Area: Systems Engineering and Mechanical Engineering
- Knowledge Area: Systems Engineering and Civil Engineering - **Desired Article!**
- Knowledge Area: Systems Engineering and Economics - **Desired Article!**
- Knowledge Area: Systems Engineering and Enterprise IT
- Knowledge Area: Systems Engineering and Quality Attributes
  - A Framework for Viewing Quality Attributes from the Lens of Loss
  - Human Systems Integration
  - Manufacturability and Producibility
  - System Adaptability

- System Affordability
- System Hardware Assurance
- System Reliability, Availability, and Maintainability
- System Resilience
- System Resistance to Electromagnetic Interference
- System Safety
- System Security

## **Part 7: Systems Engineering Implementation Examples**

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- Matrix of Implementation Examples
- Implementation Examples
- Construction System Examples - **Desired Article!**
- CyberPhysical System Examples - **Desired Article!**
- Defense System Examples
  - Submarine Warfare Federated Tactical Systems
  - Virginia Class Submarine
- Geospatial System Examples - **Desired Article!**
- Information System Examples
  - Complex Adaptive Taxi Service Scheduler
  - Successful Business Transformation within a Russian Information Technology Company
  - FBI Virtual Case File System
- Management System Examples
  - Project Management for a Complex Adaptive Operating System
- Medical System Examples
  - Next Generation Medical Infusion Pump
  - Medical Radiation
  - Design for Maintainability
- Space System Examples
  - Global Positioning System Case Study
  - Global Positioning System Case Study II
  - Russian Space Agency Project Management Systems
  - How Lack of Information Sharing Jeopardized the NASA/ESA Cassini/Huygens Mission to Saturn
  - Hubble Space Telescope
  - Applying a Model-Based Approach to Support

- Requirements Analysis on the Thirty-Meter Telescope
- Miniature Seeker Technology Integration Spacecraft
- Apollo 1 Disaster
- Transportation System Examples
  - Denver Airport Baggage Handling System
  - FAA Advanced Automation System (AAS)
  - Federal Aviation Administration Next Generation Air Transportation System
  - UK West Coast Route Modernisation Project
  - Reverse Engineering a UAV Prototype using Agile Practices
  - Standard Korean Light Transit System Vignette
- Utilities Examples
  - Northwest Hydro System
  - Singapore Water Management

## **Part 8: Emerging Knowledge**

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- Emerging Topics
  - Introduction to SE Transformation
  - Socio-technical Systems
  - Artificial Intelligence
  - Verification and Validation of Systems in Which AI is a Key Element
  - Transitioning Systems Engineering to a Model-based Discipline
  - Model-Based Systems Engineering Adoption Trends 2009-2018
  - Digital Engineering
  - Set-Based Design
  - System of Systems and Complexity
- Emerging Research

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