

14. Systems Design and Engineering

Systems Design and Engineering deals with integrating aspects of other engineering disciplines, ensuring that all likely aspects of a project or system are considered and efficiently integrated together. This area contains a strong cross coupling to industrial engineering. Refer to the Systems Engineering Body of Knowledge (SEBoK) for additional details.

14.1. Mission Engineering

14.1.1. Articulation and analysis of purpose for the system

14.2. Requirements Analysis and Allocation

14.2.1. Requirements statements

14.2.2. Obtaining requirements

14.2.3. Derived and allocated requirements

14.2.4. Requirements analysis

14.2.5. System specification

14.2.6. Interfaces

14.2.6.1. Internal

14.2.6.2. External

14.2.7. Value engineering

14.2.8. Sensitivity analysis

14.2.9. Trade studies

14.3. System Architecting

14.3.1. Architecture descriptions

14.3.2. Steps in system architecting

14.3.3. Fundamental design choices in constructing a system

14.3.4. 80-20 rule

14.4. Subsystem Design

14.4.1. Detailed design of elements

14.4.2. Interface control

14.5. System Construction

14.5.1. Hardware, software, human components

14.5.2. Integration

14.6. Verifying and Validating Requirements

14.6.1. Verification program components

14.6.1.1. Requirements

14.6.1.2. Planning

14.6.1.3. Success criteria

14.6.1.4. Reports

14.6.1.5. Compliance

- 14.6.2. Test and evaluation
- 14.6.3. Design of experiments (DOE)
- 14.6.4. Satisfaction of all user and customer requirements

14.7. Design Iteration

- 14.7.1. Refinement
- 14.7.2. Convergence
- 14.7.3. Robust systems

14.8. Product and Services Design

14.9. Role of Models in Systems Design Process

- 14.9.1. Model vs. actual system
- 14.9.2. System objectives/user input
- 14.9.3. Analyzing model output for system design decisions

14.10. Completing the Systems Engineering Process

- 14.10.1. Establishing a systematic and repeatable process
 - 14.10.1.1. Technical performance measures
 - 14.10.1.2. Technical data management
 - 14.10.1.3. Configuration management
- 14.10.2. Life cycle costing
 - 14.10.2.1. Cost estimation models and techniques
 - 14.10.2.1.1. Design, development, manufacturing, operations, and supportability
 - 14.10.2.2. Cost effective trade-offs to customer problems (see Engineering Economic Analysis knowledge area)
- 14.10.3. Limitation of humans in systems
- 14.10.4. Risk analysis
 - 14.10.4.1. Cost, schedule, and performance risk
- 14.10.5. Concurrent engineering
- 14.10.6. Integrated logistics support
 - 14.10.6.1. Interoperability and harmonious system operation
- 14.10.7. Reliability, maintainability, availability (see Quality and Reliability Engineering knowledge area)
- 14.10.8. Quality assurance and management (see Quality and Reliability Engineering knowledge area)
- 14.10.9. Specialty engineering
- 14.10.10. Preplanned product improvement
- 14.10.11. Training
- 14.10.12. Documentation
- 14.10.13. Production
- 14.10.14. Installation
- 14.10.15. Operations and maintenance
- 14.10.16. Operations evaluation/reengineering
- 14.10.17. Systems engineering management

- 14.10.17.1. Planning
- 14.10.17.2. Organizing
- 14.10.17.3. Directing
- 14.10.17.4. Monitoring

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