Logistics System Engineering.

Definition of System Engineering.

An engineering discipline whose responsibility is to create and execute an interdisciplinary process to ensure that the customer and stakeholder's needs are satisfied in a high-quality, trustworthy, and cost and schedule efficient manner throughout a system's entire life cycle.
Logistics System Engineering.

System Engineering Process.

- State the problem.
- Investigate alternatives.
- Model the system.
- Integrate.
- Launch the system.
- Assess performance.
- Re-evaluate.

[Blanchard, pp28 - 30]
Logistics System Engineering.

System life-cycle phases and its relationship.

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[Blanchard, pp258]

1. Needs Analysis.
   - Functions to be performed

2. System Requirement.
   - Feasibility Analysis.
   - Operational Requirement.
   - Maintenance Concept.
   - Technical Performance Measure (TPM)
   - System Specification

3. Function Analysis & Requirement Allocation.
   - Lower-level Specifications

Feedback


5. System Test and Evaluation.
   - Design Validation

   System Retirement.
Conceptual design. (Block 1 and 2)

Conceptual design constitutes the first step in the overall design process and is initiated in response to an identified customer need.

- Feasibility studies are accomplished.
- System operational requirements and the maintenance concept are defined.
- A top-level functional analysis for the system may be completed, the system specification is prepared to describe the design requirements for the system.
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Preliminary design. (Block 3)

It involves translating system level requirements into detailed qualitative and quantitative design requirements. It includes functional analysis and allocation. This involves

- Identification of alternative system operational functions and sub-functions and maintenance functions.
- The allocation of requirements from the top-level system to the various subsystems in terms of performance and effectiveness requirements and system supportability.
- System optimization through evaluation of system alternatives involving reviewing the trade-offs within each system as compared with other systems.
- System synthesis and definition involving putting together the proposed system in analytical form or in a physical model based on detailed specifications.
Detailed design. (Block 4 and 5)

It is referred to as full-scale development. It involves:

- Detailed descriptions of subsystems and elements, etc., comprising the prime mission equipment and the elements of the logistics support system,
- Development of an engineering model or prototype that will allow testing and verification of design adequacy.
- Test and evaluation of mode.
- Redesign and retest of a system as necessary.
Logistics System Engineering Process.

- Definition of need
- Conceptual design
  - Feasibility study-alternative technologies
  - System operational requirements (operational functions)
  - System maintenance concept (maintenance functions)
  - Advance system/product planning-system engineering management plan (SEMP), logistics planning
  - System specification

- Preliminary system design (advance development)
  - System operational functions—(block diagrams)
  - Maintenance functions
  - Allocation of performance and effectiveness factors, design criteria, etc.
  - Allocation of system support requirements
  - Detailed plans and specifications

- System analysis, trade-off studies, and optimization
  - System/subsystem tradeoffs and evaluation of alternatives
  - Development of system support configuration
  - Detailed plans and specifications

- System synthesis and definition
  - Preliminary design—description and structuring of alternative design configurations
  - Development, test, and evaluation of engineering models
  - Design documentation and review

- Production and/or construction
  - Manufacture/production/test of prime system elements and system support elements
  - System assessment (data collection, analysis, and evaluation)
  - System modification(s) for corrective action

- System utilization and life-cycle support
  - System assessment
  - System modifications/changes

- System retirement

Feedback and corrective action

Applied research
Performance Check.

1. An essential element of preliminary design is the utilization of a ____________ approach as a basis for the identification of design requirements for each hierarchical level of the system.

2. The allocation of requirements occurs:
   A. Before the system synthesis analysis.           B. After the functional analysis.
   C. Concurrently with the functional analysis.       D. After the system retirement.
Performance Check.

3. If the reliability of an item is high enough and the cost is low enough then we would presume that:
   A. Repair should take place at the organizational maintenance level.
   B. The item should be discarded at failure.
   C. Repair should take place at the depot maintenance level.
   D. The item should be always repaired if at all possible.

4. The candidate system which is theoretically the most favorable for the criteria defined is called the __________ candidate system.
Performance Check.

5. ____________ is the process of choosing the optimal candidate system.
   A. Formal optimization.                    B. Trade off analysis.

6. The mathematical model:
   A. Is often overcomplicated.
   B. Offers significant benefits.
   C. Does not predict future events.
   D. Is often unrealistic and does not tend to indicate cause and effect relationships.
Performance Check.

7. Characteristics that are directly measurable from the candidate systems that are necessary to the formulation of sub models or criterion functions are called ________________.
   A. Design parameters.               B. Design-planning parameters.

8. When considering the application of the analytical model should:
   A. Consider all factors and represent the dynamics of the system.
   B. Consider only the major factors (min3 - max6) and represent the dynamics of the system.
   C. Consider all relevant factors and represent the dynamics of the system.
   D. Consider only two factors of which one is commonly cost and represent the dynamics of the system.
9. Sensitivity analysis:
   A. Is sometimes used in System analysis.
   B. Is often used because it accurately identifies cost problems.
   C. Is often used because it is very easy.
   D. Is often used to identify the effect of varying certain parameters on the system as a whole.

10. ____________ analysis considers all conditions which might cause failure or major malfunctions with the aim of achieving a stable design.
    A. Stability  B. Functional  C. Sensitivity  D. Compatibility
Performance Check.

Solutions.

1  2  3  4  5  6  7  8  9  10
D  B  B  B  A  B  B  C  D  A