

Answer

The main criticism that I would make of Shenhar's model is that it seems to imply a separation of the technical and managerial processes. Such a separation is undesirable and may be disastrous. A second objection is that Shenhar's model seems to imply that, while the technical process is specific to systems engineering, the managerial process is generic in character. This criticism may arise from the way that the diagram has been drawn. **The text that accompanies the diagram suggests the following as the most common activities of systems engineering managers.**

1. The identification of an operational need with an opportunity to create a system to respond to this need.
2. Setting the exact system and functional requirements to ensure the best fit to customer needs.
3. Dividing and allocating the functional requirements into different sub functions and modes of operation.
4. Choosing the system concept that will best fit these requirements.
5. Designing the system architecture, based on the chosen concept.
6. Dividing the system into separate sub-systems and components to ensure overall optimisation, fewest interfaces, and fewest mutual effects of the various sub-systems.
7. Optimising the specifications of the various sub-systems through simulation, analysis and trade studies.
8. Managing the interaction with various engineering groups that performed the design of the sub-systems while integrating various people and disciplines.
9. Performing the integration of the various sub-systems into a total system.
10. Evaluating the performance and qualifications of the final system through simulation and testing activities.
11. Demonstrating the operating system to customers and convincing them that it responds to their needs.

The following are the technical activities associated with systems engineering (Shenhar, 1999, pp. 116–18).

1. Need identification and customer linkage. To identify the need and the system opportunity by matching need and technical feasibility and be the link bond between customer needs and system idea and design during the entire process of system creation.
2. Requirements management. To develop a set of system and functional requirements based on customer needs.
3. Architecture and system design. To be the lead person in envisioning the system's concept, and to create the link between the system's requirements and the system's configuration.
4. Integration. To see the entire picture and how each part contributes to the performance and feasibility of the system as a whole. Also, to coordinate the work of the various disciplines and professions involved and manage the interfaces among them such that the result is an overall optimal system.
5. Analysis, development and testing. To collect data from various sources, perform modelling and simulation and analyse them as a basis for decision making to confirm that the system is designed to its requirements; and to test and verify that the system built will meet these requirements as designed.
6. Process management. To plan, document, direct and follow the systems engineering process.
7. Technical and risk management. The process of systems engineering involves technical and trade-off decisions and the resolution of technical problems and conflicts at different interface

points. These conflicts are primarily professional rather than personal, and reflect the different views of the distinct disciplines involved in creation of the system. This role also involves risk assessment on various system elements and overall risk management during the system creation.

8. Leading, coordinating and managing. In addition to being a technical manager, the systems engineer must be a manager of activities and leader and coordinator of people. The job includes dealing with work plans, schedules, and budgets, but also working with people – organising their work, motivating them, communicating with them, and dealing with their needs.

9. Logistics and operations management. To consider and include maintenance, operation, logistics, and disposal concerns during the requirements, design, and development phases, and to 'escort' the users during the operational phase of the system, to 'break them in', to answer questions and solve anomalies.

10. Information management. To see the overall information needs of the system, plan the forms and means in which information will be created, disseminated and stored, and direct the process of information sharing and configuration control.