Business and Mission Analysis

> The printable version is no longer supported and may have rendering errors. Please update your browser bookmarks and please use the default browser print function instead.

Lead Author: **Garry Roedler,** **Contributing Author:** *Rick Adcock*

Concept Definition is the set of systems engineering (SE) activities in which the problem space and the needs and requirements of the business or enterprise and stakeholders are closely examined. The activities are grouped and described as generic processes which include Mission Analysis and Stakeholder Needs and Requirements. Concept Definition begins before any formal definition of the system-of-interest (SoI) is developed.

Mission Analysis focuses on the needs and requirements of business or enterprise — that is, on defining the problem or opportunity that exists (in what is often called the problem space or problem situation), as well as understanding the constraints on and boundaries of the selected system when it is fielded (in what is often called the solution space). The Stakeholder Needs and Requirements process explores and defines the operational aspects of a potential solution for the stakeholders from their point of view, independent of any specific solution. In these two Concept Definition activities, business or enterprise decision makers and other stakeholders describe *what* a solution should accomplish and *why* it is needed. Both *why* and *what* need to be answered before consideration is given to *how* the problem will be addressed (i.e., what type of solution will be implemented) and *how* the solution will be defined and developed.

If a new or modified system is needed, then System Definition activities are performed to assess the system. See Life Cycle Processes and Enterprise Need for further detail on the transformation of needs and

requirements from the business or enterprise and stakeholder levels of abstraction addressed in Concept Definition to the system and system element level of abstraction addressed in System Definition.

The specific activities and sequence of Concept Definition activities and their involvement with the life cycle activities of any system, and in particular the close integration with System Definition activities, will be dependent upon the type of life cycle model being utilized. See Applying Life Cycle Processes for further discussion of the concurrent, iterative and recursive nature of these relationships.

☐

Contents

Topics

Each part of the SEBoK is divided into knowledge areas (KAs), which are groupings of information with a related theme. The KAs in turn are divided into topics. This KA contains the following topics:

- Business or Mission Analysis
- Stakeholder Needs and Requirements

See the article Matrix of Implementation Examples for a mapping of case studies and vignettes included in Part 7 as well as topics covered in Part 3.

Concept Definition Activities

There are two primary activities discussed under concept definition: Mission Analysis and the definition of Stakeholder Needs and Requirements:

1. Mission Analysis begins an iteration of the life cycle of a potential SoI that could solve a problem or realize an opportunity for developing a new product, service, or enterprise. These activities assist business or enterprise decision makers to define the problem space, identify the stakeholders, develop preliminary operational concepts, and distinguish environmental conditions and constraints that bound the solution space. In other words, mission analysis takes the enterprise capability gap or opportunity and defines the problem/opportunity in a manner that provides a common understanding encapsulated in what are referred to as "business or mission needs." Business or mission needs are then used to produce a clear, concise, and verifiable set of business requirements.

2. The Stakeholder Needs and Requirements activity works with stakeholders across the life cycle to elicit and capture a set of needs, expectations, goals, or objectives for a desired solution to the problem or opportunity, referred to as "stakeholder needs". The stakeholder needs are used to produce a clear, concise, and verifiable set of stakeholder requirements. Stakeholder needs and requirements identify and define the needs and requirements of the stakeholders in a manner that enables the characterization of the solution alternatives.

Mission Analysis takes the business and stakeholders' needs and requirements and carries the analysis down from problem space to solution space, including concept, mission, and boundary or context so that a solution concept (at the black-box level) can be selected from the alternatives. Figure 1 in the Mission Analysis topic depicts this interaction. The products and artifacts produced during Concept Definition are then used in System Definition.

The different aspects of how systems thinking is applicable to concept definition are discussed in SEBoK Part 2. In particular, the use of a combination of hard system and soft system approaches depending on the type of problem or class of solution is discussed in Identifying and Understanding Problems and Opportunities and the contrast between top-down and bottom-up approaches in Synthesizing Possible Solutions.

Drivers of Solution on Problem Definition: Push Versus Pull

Problem definition and solution design depend on each other. Solutions should be developed to respond appropriately to well-defined problems. Problem definitions should be constrained to what is feasible in the solution space. System Analysis activities are used to provide the link between problems and solutions.

There are two paradigms that drive the ways in which concept definition is done: *push* and *pull*. The *pull* paradigm is based on providing a solution to an identified problem or gap, such as a missing mission capability for defense or infrastructure. The *push* paradigm is based on creating a solution to address a perceived opportunity, such as the emergence of an anticipated product or service that is attractive to some portion of the population (i.e. whether a current market exists or not). This can impact other life cycle processes, such as in verification and validation, or alpha/beta testing as done in some commercial domains.

As systems generally integrate existing and new system elements in a mixture of push and pull, it is often best to combine a bottom-up approach with a top-down approach to take into account legacy elements, as well as to identify the services and capabilities that must be provided in order to define applicable interface requirements and constraints. This is discussed in Applying Life Cycle Processes.

References

Works Cited

None.

Primary References

ANSI/EIA. 1998. *Processes for Engineering a System*. Philadelphia, PA, USA: American National Standards Institute (ANSI)/Electronic Industries Association (EIA), ANSI/EIA 632-1998.

INCOSE. 2015. 'Systems Engineering Handbook: A Guide for System Life Cycle Processes and Activities', version 4.0. Hoboken, NJ, USA: John Wiley and Sons, Inc, ISBN: 978-1-118-99940-0.

ISO/IEC/IEEE. 2015. *Systems and Software Engineering - System Life Cycle Processes.* Geneva, Switzerland: International Organization for Standardization (ISO)/International Electrotechnical Commission (IEC), Institute of Electrical and Electronics Engineers. ISO/IEC/IEEE 15288:2015.

ISO/IEC/IEEE. 2011. *Systems and Software Engineering - Requirements Engineering.* Geneva, Switzerland: International Organization for Standardization (ISO)/International Electrotechnical Commission/ Institute of Electrical and Electronics Engineers (IEEE), (IEC), ISO/IEC/IEEE 29148.

Additional References

Hitchins, D. 2007. *Systems Engineering: A 21st Century Systems Methodology.* Hoboken, NJ, USA: John Wiley & Sons.

ISO/IEC. 2003. Systems Engineering – A Guide for The Application of ISO/IEC 15288 System Life Cycle Processes. Geneva, Switzerland: International Organization for Standardization (ISO)/International Electrotechnical Commission (IEC), ISO/IEC 19760:2003 (E). http://www.hitchins.net/EmergenceEtc.pdf.

ISO/IEC. 2007. *Systems Engineering – Application and Management of The Systems Engineering Process*. Geneva, Switzerland: International Organization for Standards (ISO)/International Electrotechnical Commission (IEC), ISO/IEC 26702:2007.

Jackson, S., D. Hitchins, and H. Eisner. 2010. "What is the Systems Approach?" INCOSE *Insight.* (April 2010): 41-43.

NASA. 2007. *Systems Engineering Handbook*. Washington, D.C., USA: National Aeronautics and Space Administration (NASA). NASA/SP-2007-6105.

< Previous Article | Parent Article | Next Article >
SEBoK v. 2.7, released 31 October 2022