Structure of the SEBoK

The **Guide to the Systems Engineering Body of Knowledge (SEBoK)** is a living authoritative guide that discusses knowledge relevant to Systems Engineering. SEBoK does not contain all of this knowledge itself but provides a starting point and key resources to allow the reader to navigate the wider body of knowledge that exists in published sources. To do this, SEBoK:

- Defines relevant knowledge and structures it to facilitate understanding.
- Provides short discussions of key ideas, principles and concepts within that structure.
- Points to reference sources important to the discipline, which explore these ideas in more detail.

In doing this, it is inevitable that differences in terminology, alternative approaches, and even fundamentally different ways of thinking within the knowledge will appear. SEBoK attempts were possible to provide clarity of similar or overlapping ideas, or to highlight real differences and the reasons behind them. In particular, the SEBoK Glossary of Terms contains the most used or generally agreed upon definitions of terms when it can, but may highlight more than one definition if needed to show breadth of current thinking.

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SEBoK Structure

Figure 1, below, illustrates the eight parts of the SEBoK and how they are related.

Figure 1 Scope of SEBoK Parts and related knowledge (SEBoK Original).

The scope of each part and the key relationships amongst them are briefly discussed below. For a more detailed discussion of how this structure was evolved, see (Adcock et al, 2016).

Overview of Parts

Part 1: SEBoK Introduction

This part explains the scope, context, and structure of

the SEBoK, and of systems engineering (SE).

An overview of who should use the SEBoK, and for what purpose, is followed by detailed use cases. Systems engineering's economic value, history, and relationship to other disciplines are discussed. Part 1 also contains a section which discusses the future evolution of the SEBoK and allows for new areas of content to be introduced before being transitioned into other SEBoK parts.

Part 2: Foundations of Systems Engineering

This part provides an introduction and overview of areas of knowledge which provide the foundations of SE.

A discussion of the definitions and basic concepts of systems is followed by an overview of the principles, concepts, methods, models and patterns of some of the key foundational areas of systems science. This includes a detailed consideration of the foundational knowledge related to systems models and modelling.

Part 2 looks in more detail at two aspects of this foundational knowledge of particular value to SE. The first is to discuss aspects of systems knowledge related to a systems approach to complex problems and opportunities. This approach provides foundations for how SE is defined and practiced (see Parts 3 and 5 below). The second is to describe the different ways in which system concepts are applied to real world concerns. The SEBoK defines an engineered system (ES) as the primary focus for the application of SE (see Part 4 below).

Part 3: Systems Engineering and Management

This part describes generic knowledge on the practice of SE and related management activities.

Part 3 begins with the life cycle models common in SE and the general principles behind their application. It then moves on to SE management activities. It covers both technical activities such as requirements, architecture, test and evaluation; and management activities such as planning, measurement, and risk. Next is product and service life management, a distinct area of SE management that emphasizes the entire life cycle including retirement and disposal. An account of SE

standards concludes this part.

Focused on what many think of as the main body of SE, including best practices and common pitfalls, this part constitutes a substantial proportion of the SEBoK. As already discussed, the knowledge in Part 3 is based on the systems approach from Part 2. The links between Part 3 and the other parts of the SEBoK are discussed below.

Part 4: Applications of Systems Engineering

This part describes how to apply SE principles to different types of system context.

Part 4 focuses on four major engineered system contexts in turn: products, services, enterprises, and systems of systems (SoS). For each one, the system abstraction, commercial relationships and application of generic SE is described.

The generalized contexts above should be viewed as overlapping models of how SE can be applied in different kinds of situations. Combinations of one or more of them are fully realized when applied in an application domain. Part 4 currently describes this application in a small number of such domains. This will be expanded in later updates. The applications of SE in this part describe the real-world practice of SE. The generalized knowledge in both Parts 2 and 3 evolves through what we learn from these applications. Part 2 includes a discussion of this relationship between theory and practice.

Part 5: Enabling Systems Engineering

This part describes approaches to organization that may enable the successful performance of SE activities.

Part 4 covers knowledge at the enterprise, team, or individual level. The range of considerations extends from value proposition, business purpose, and governance, down to competency, personal development as a systems engineer, and ethics.

All of these relate to the baseline definitions of SE in Part 3, further generalized in the levels of application in Part 4. The systems approach in Part 2 should also form a foundation for this part. Since the practice of SE is transdisciplinary, Part 5 also has a link to Part 6 as discussed below.

Part 6: Related Disciplines

This part describes the relationships between SE and other disciplines.

Part 6 covers the links between SE and software engineering (SwE), project management (PM), industrial engineering (IE) and procurement. It also describes how SE is related to specialty engineering, which describes the various system "–ilities" (like reliability, availability, and maintainability) that SE must balance and integrate.

The knowledge in this part provides an interface to other bodies of knowledge, focused on how it is linked to Parts 3, 4 and 5 above.

Part 7: Systems Engineering Implementation Examples

A set of real-world examples of SE activities demonstrates implementations of the systems engineering knowledge in previous parts of the SEBoK. These examples come in two forms: case studies, which refer the reader to and summarize published examinations of the successes and challenges of SE programs, and vignettes, which are brief, self-contained wiki articles. This part is a key place to look within the SEBoK for lessons learned, best practices, and patterns. Many links connect material in the examples to the conceptual, methodological, and other content elsewhere in the SEBoK.

Part 8: Emerging Knowledge

One of the challenges associated with a body of knowledge is that cutting edge and/or emerging ideas are difficult to include. Bodies of knowledge are based on existing literature and resources, and these often do not exist for new topics. To address this, Part 8 of the SEBoK contains those emerging ideas and items that are not easily covered in the other sections of the SEBoK. As these areas mature and as a body of literature is created around them, they will be moved into the other Parts of the SEBoK.

Addenda

The SEBoK contains a Glossary of Terms, which provides authoritatively-referenced definitions of key terms. This

information is displayed when the reader hovers the mouse pointer over a glossary term within an article. It also contains a list of Primary References, with additional information about each reference. Quicklinks in the left margin provide additional background information, including a table of contents, a listing of articles by topic, and a list of Acronyms.

References

Works Cited

Adcock, R., Hutchison, N., Nielsen, C., 2016, "Defining an architecture for the Systems Engineering Body of Knowledge," Annual IEEE Systems Conference (SysCon) 2016.

Primary References

None.

Additional References

None.

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SEBoK v. 2.10, released 06 May 2024
