

Emerging Knowledge

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Like other portions of the SEBoK, the notion and content of Part 8 is evolving. Part 8 consists of two Knowledge Areas (KAs): Emerging Topics and Emerging Research.



Figure 1. SEBoK Part 8 in context (SEBoK Original). For more detail see Structure of the SEBoK



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Scope and Purpose

While the practice and need for systems engineering began appearing in journals from 1950 onward, the practice currently seems to be gaining momentum in most engineering and even non-engineering circles.

The classically trained systems engineers of the 1970s and even 1980s are faced with a C note shift in thinking brought on by the rapid advance of the software centricity of our systems, cybersecurity, agent-based, object-oriented, and model-based practices. These emerging practices bring their own methods and tools. Hall (1962, p. 5) may have been prescient when he wrote “It is hard to say whether increasing complexity is the cause or the effect of man's effort to cope with his expanding environment. In either case a central feature of the trend has been the development of large and very complex systems which tie together modern society. These systems include abstract or non-physical systems, such as government and the economic system.”

These changes and the rate of change are causing systems engineering to evolve. Some of the practices may not even be recognizable to classically trained systems engineers. This Part of the SEBoK is intended to introduce some of the more significant emerging changes to systems engineering. As topics discussed in this Part evolve and become mainstream, they will be moved into the appropriate Part of the SEBoK.

System of Systems Engineering (SoSE) provides examples in recent times of an emerging topic from Systems Engineering community that generated emerging research, ultimately resulting in a foundational body of knowledge that continues to expand. A recent article describing this evolution from emerging topic to solution is now referenced in Part 4 - Systems of Systems (SoS).

Overview of Emerging Topics

See further: Emerging Topics

The Emerging Topics section is meant to inform the reader on the more significant and emerging changes to the practice of systems engineering. Examples of these emerging topics include:

- What is the potential to change systems engineering processes or the ways in which we perform systems engineering?
- How will the development of artificial intelligence impact systems engineering?
 - Will AI change the way we think of systems architecture?
 - How will we perform V&V of an AI system?
- How will the push towards vertically integrated digital engineering influence systems engineering?
- How are social features becoming more tightly connected to technical features of systems, and how is the modeling of socio-technical systems infusing into practice?

Overview of Emerging Research

See further: Emerging Research

As these emerging topics gain visibility, researchers will begin to investigate them. Corporate R&D may do early work, but academia and government will formalize this research. The Emerging Research section is a place to gather the references to this disparate work into a single repository to better inform systems engineers working on related topics. The references are collected from the following sources:

- PhD dissertations
- INCOSE publications and events
- IEEE publications and events
- Research funded by National Science Foundation (NSF) – Engineering Design and Systems Engineering (EDSE)
- Research funded by Systems Engineering Research Center (SERC)

References

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Primary References

None.

Additional References

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