

ModuleSEFS Cross Cutting Topics

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Abstract

Various topics, such as Trends and Future and Value of Systems Engineering, and Human Factors.

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status: preliminary

draft

version: 0



SEFS Future and Trends

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Abstract

In the previous century, the military and aerospace domain developed systems engineering to support the development of complicated systems. The functionality and services that we are using depend on the interaction of many systems and organizations. We call this complex rather than complicated. When developing complex systems, the developers cope with more uncertainties, and unknowns, and the inherent complexity of the dynamics between many systems and humans. Digitalization facilitates the development of interconnected systems. We view models as a means to help us coping with the complexity

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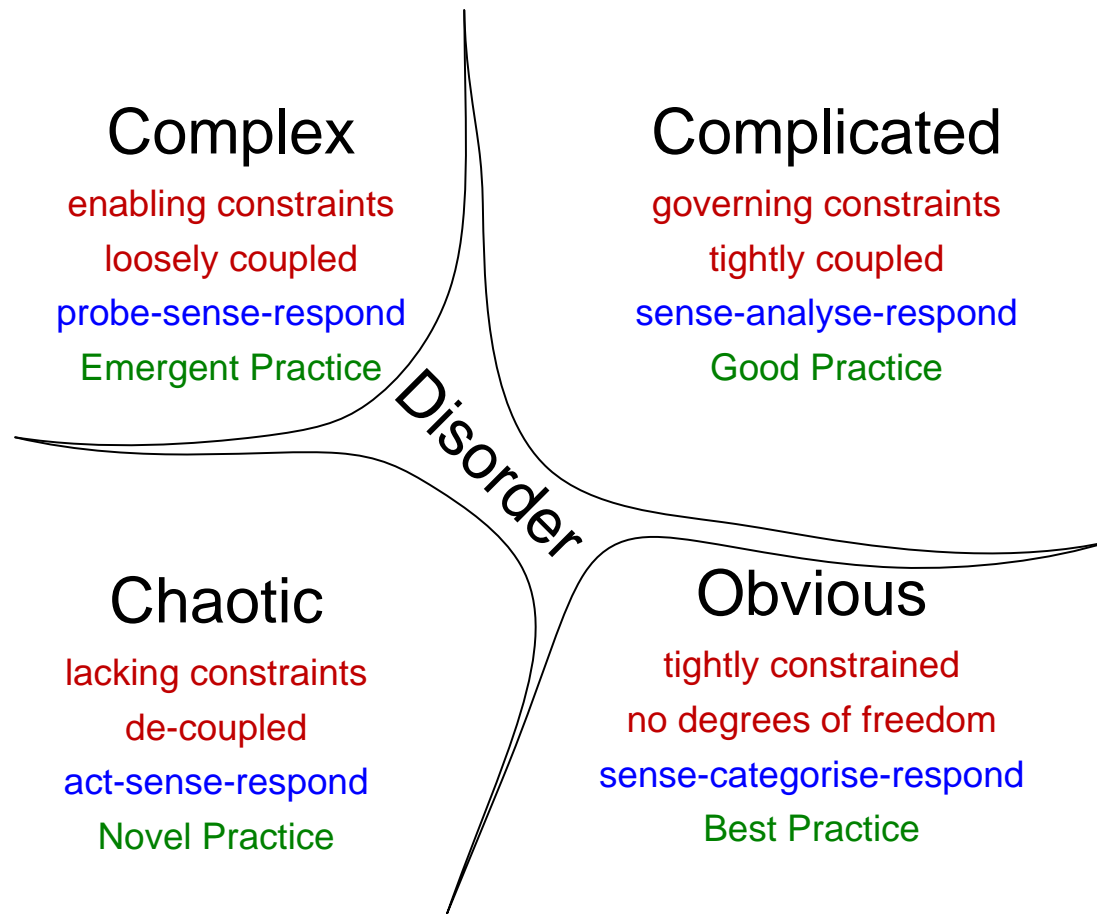
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SE in Cynefin; Moving into Complex

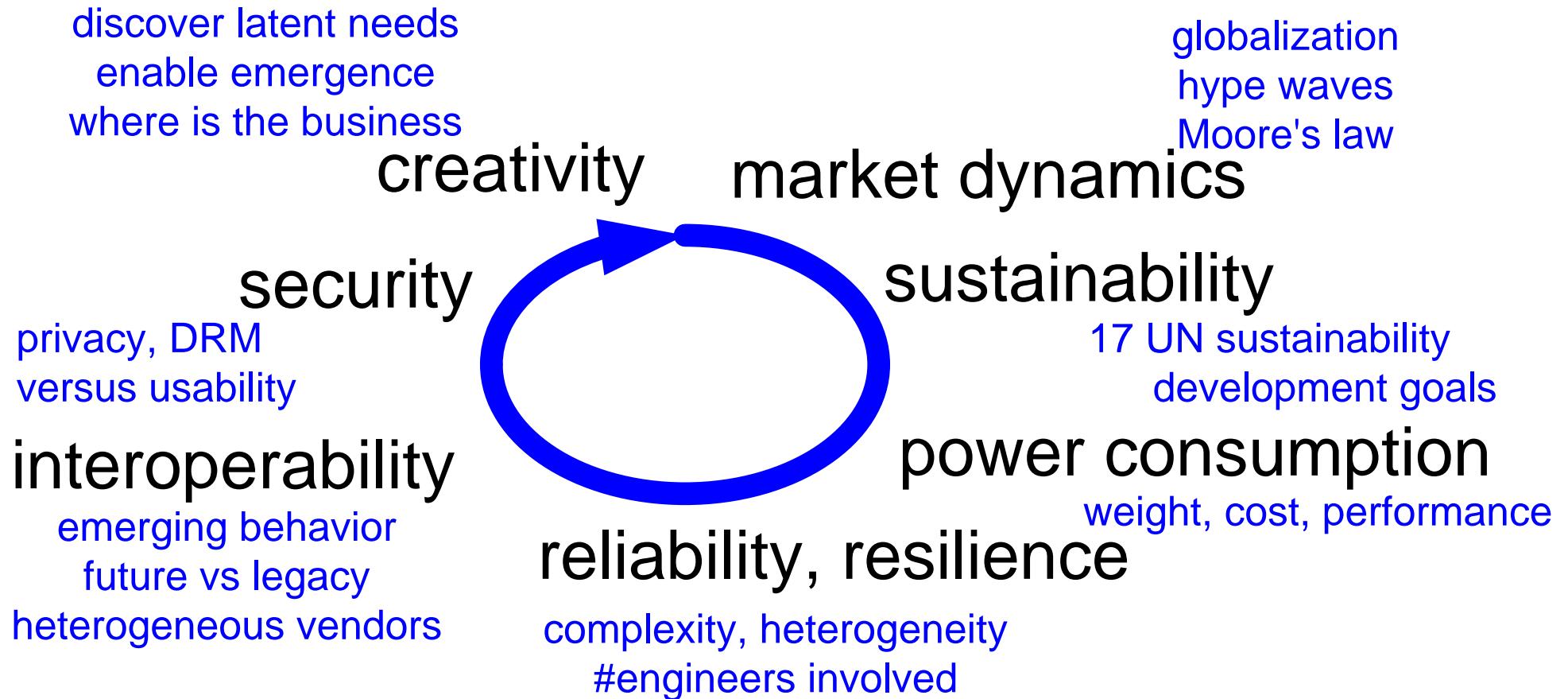


Systems Engineering
originates in Complicated

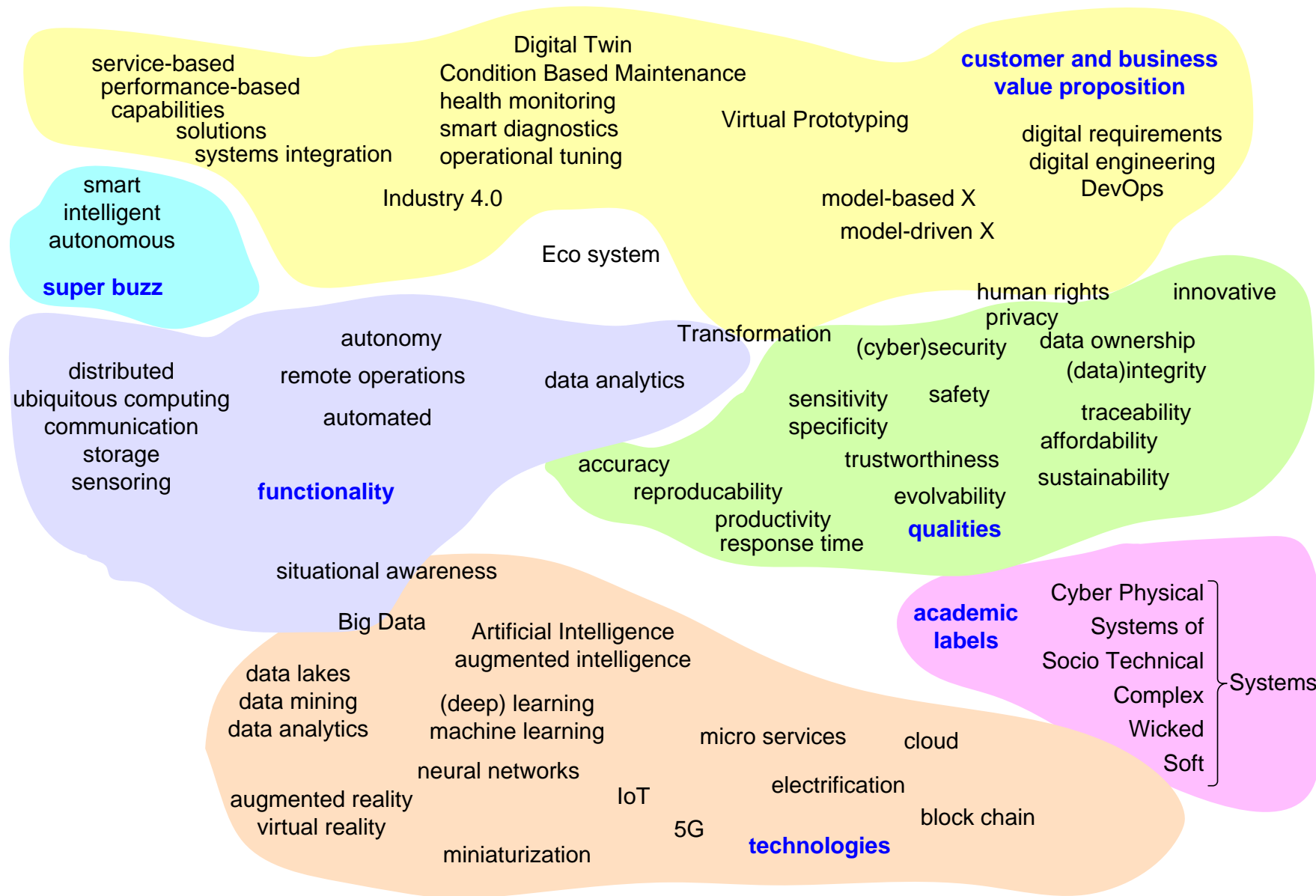
Many problems move
into Complex

after: Dave Snowden 2003, a.o. https://en.wikipedia.org/wiki/Cynefin_framework
accessed on 10-10-2023

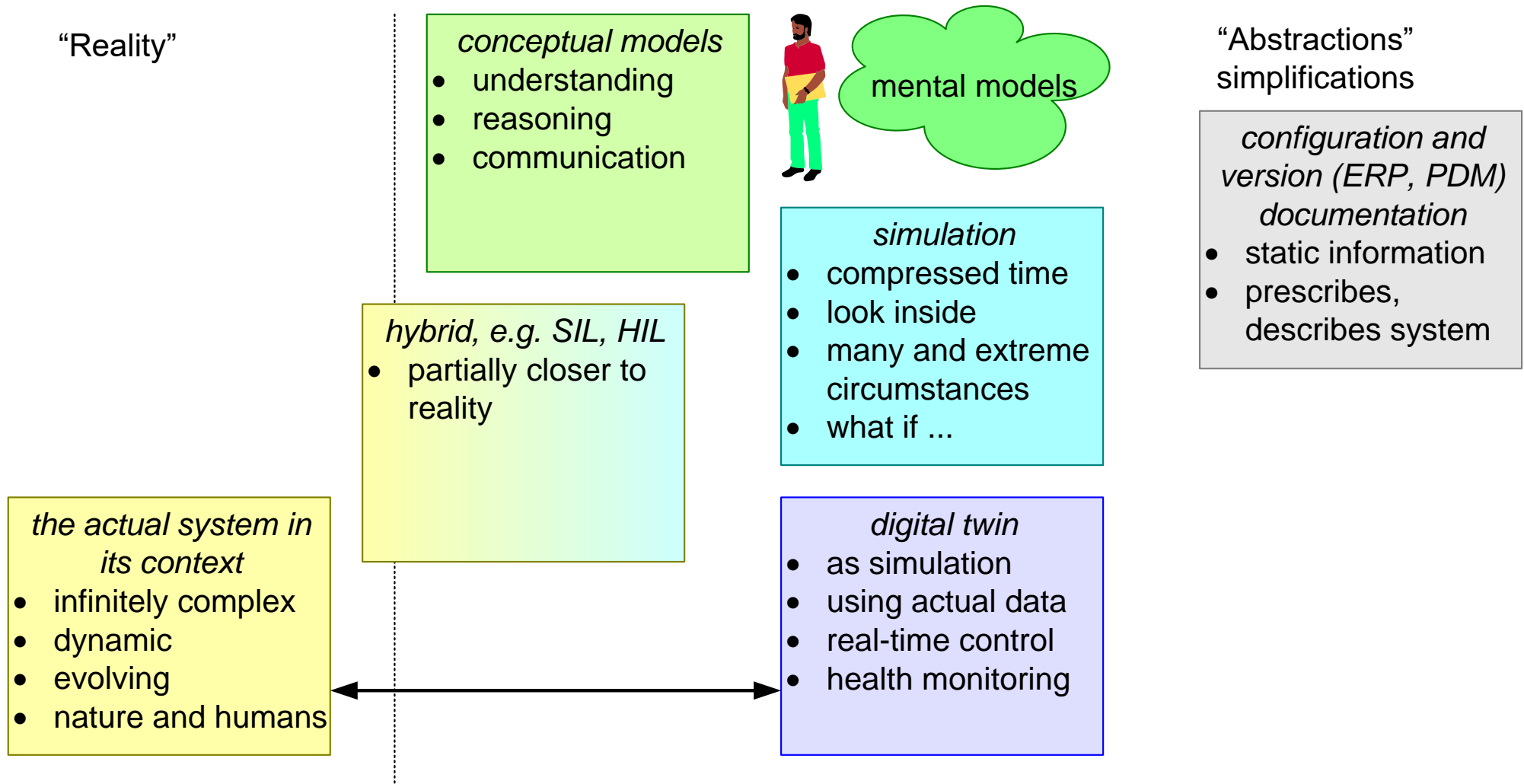
Challenges in Systems Engineering



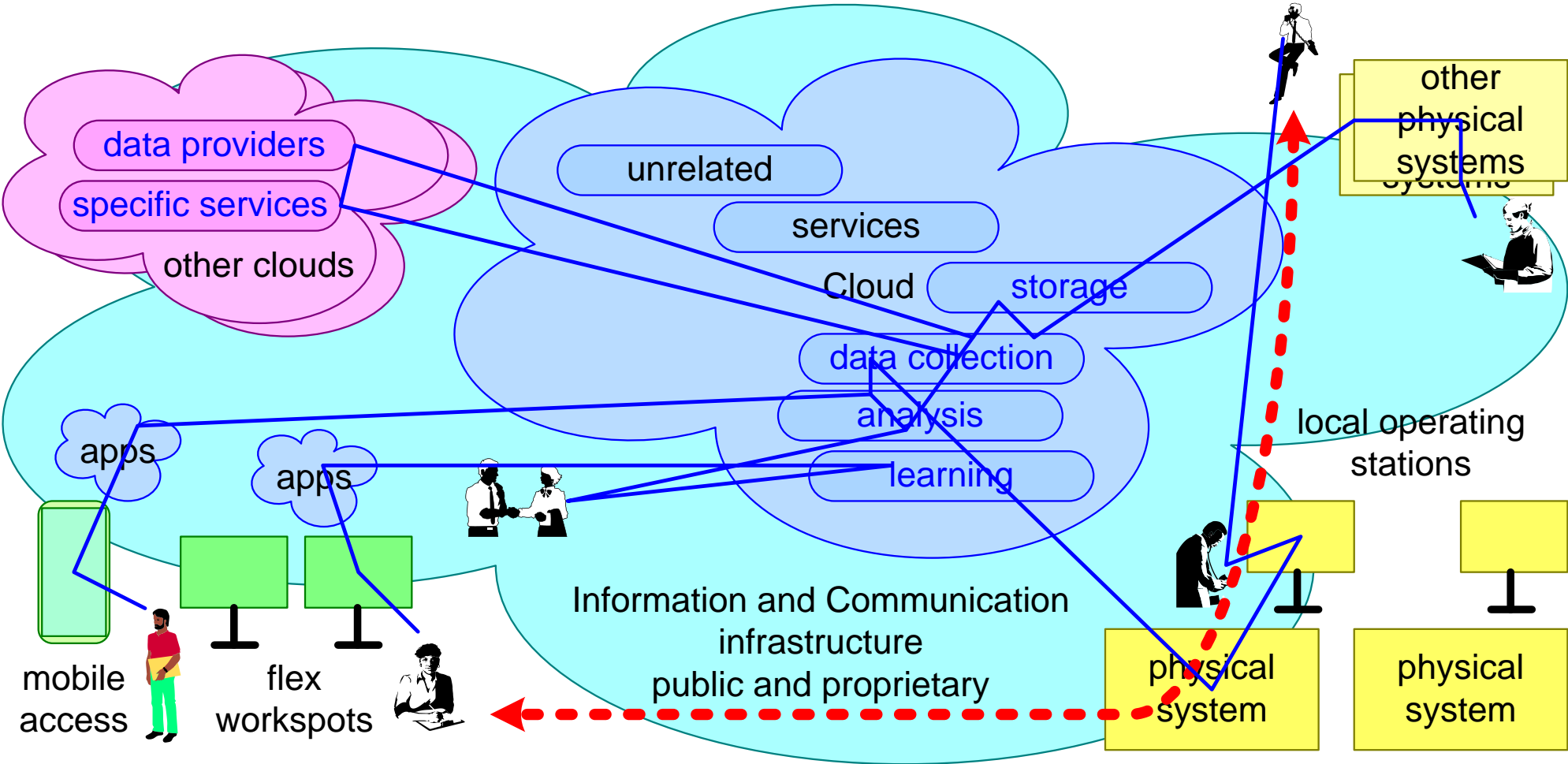
Digitalization Cloud



Digital Twins



Systems of Systems



SEFS Value of Systems Engineering

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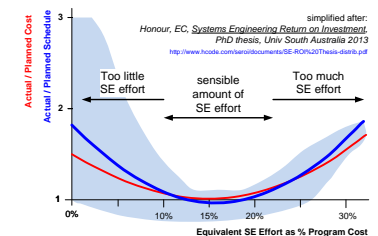
Abstract

How can we explain to managers, customers, or colleagues what the value is of applying systems engineering? This nugget uses Eric Honour's work to explain the value of systems engineering.

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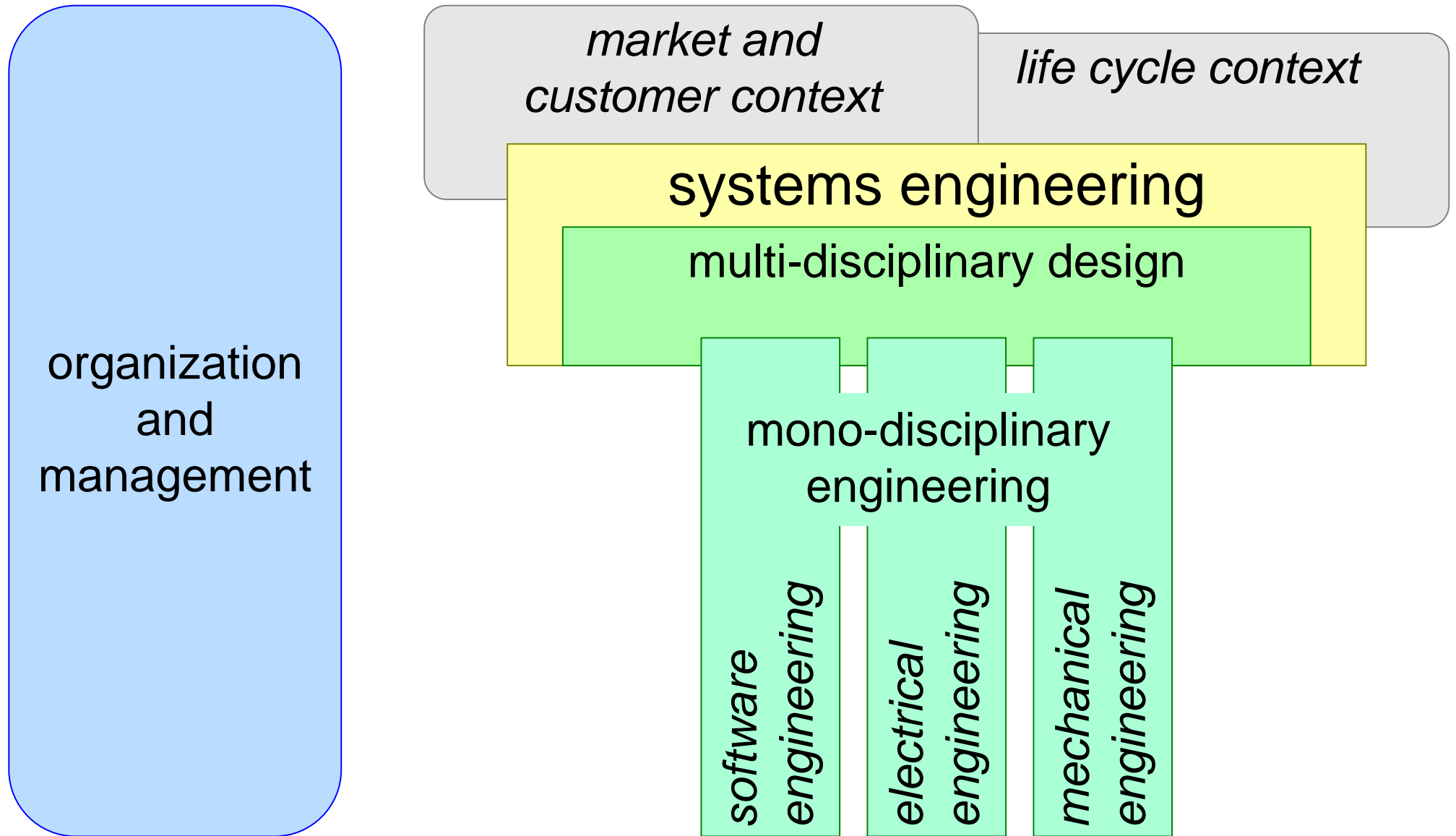
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Why is it so difficult to convince people (managers, customers, colleagues) to use systems engineering?

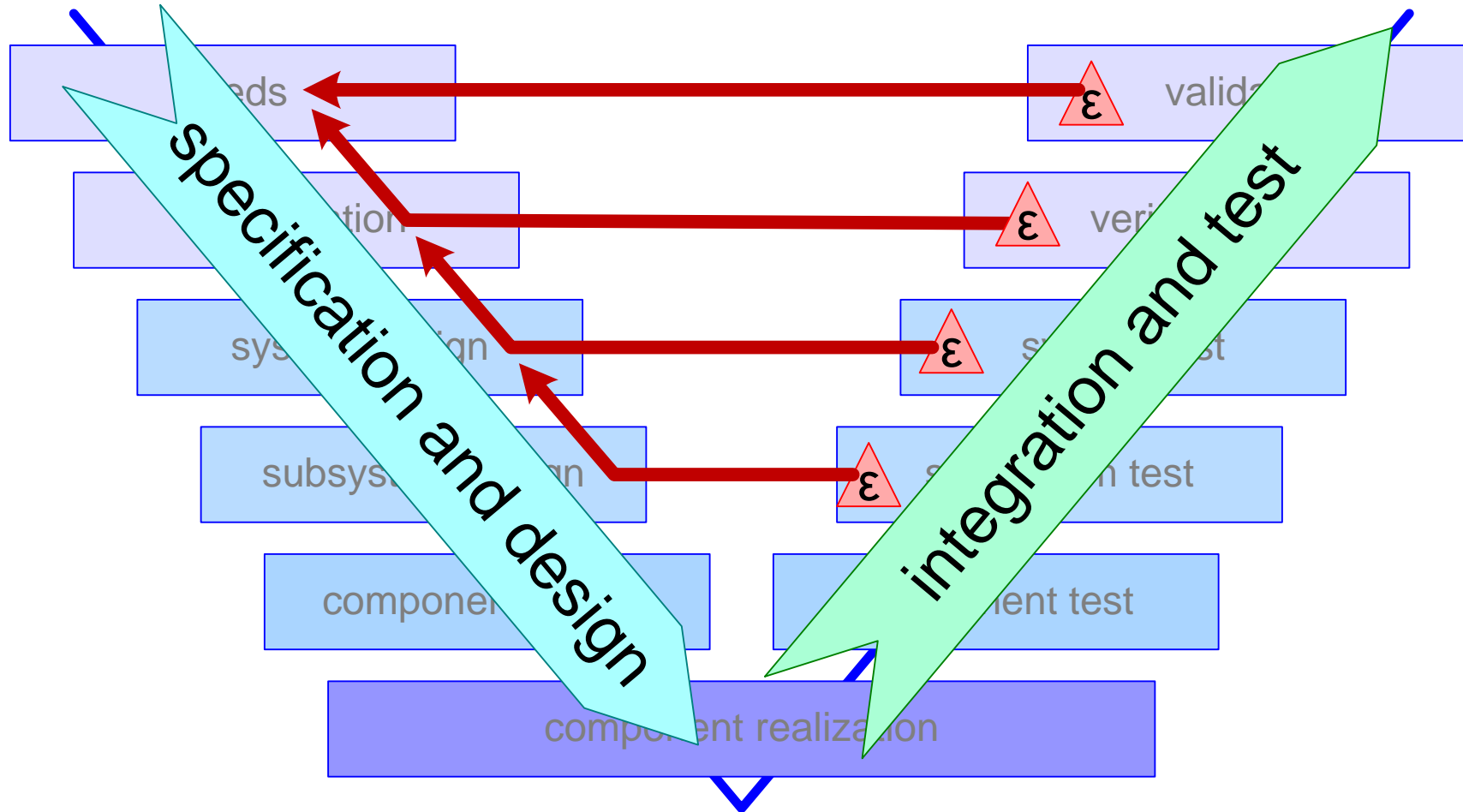
- Many of them see only a **part of problem** and **solution** space
- and are **unaware** of the **relations** between the parts
- Consequences of **lacking a systems view** become visible **at the end** of development or in the field
- when repairing them is **costly** and **time consuming**
- **Introducing systems engineering** is a change, requiring **change management**

Operational Scope

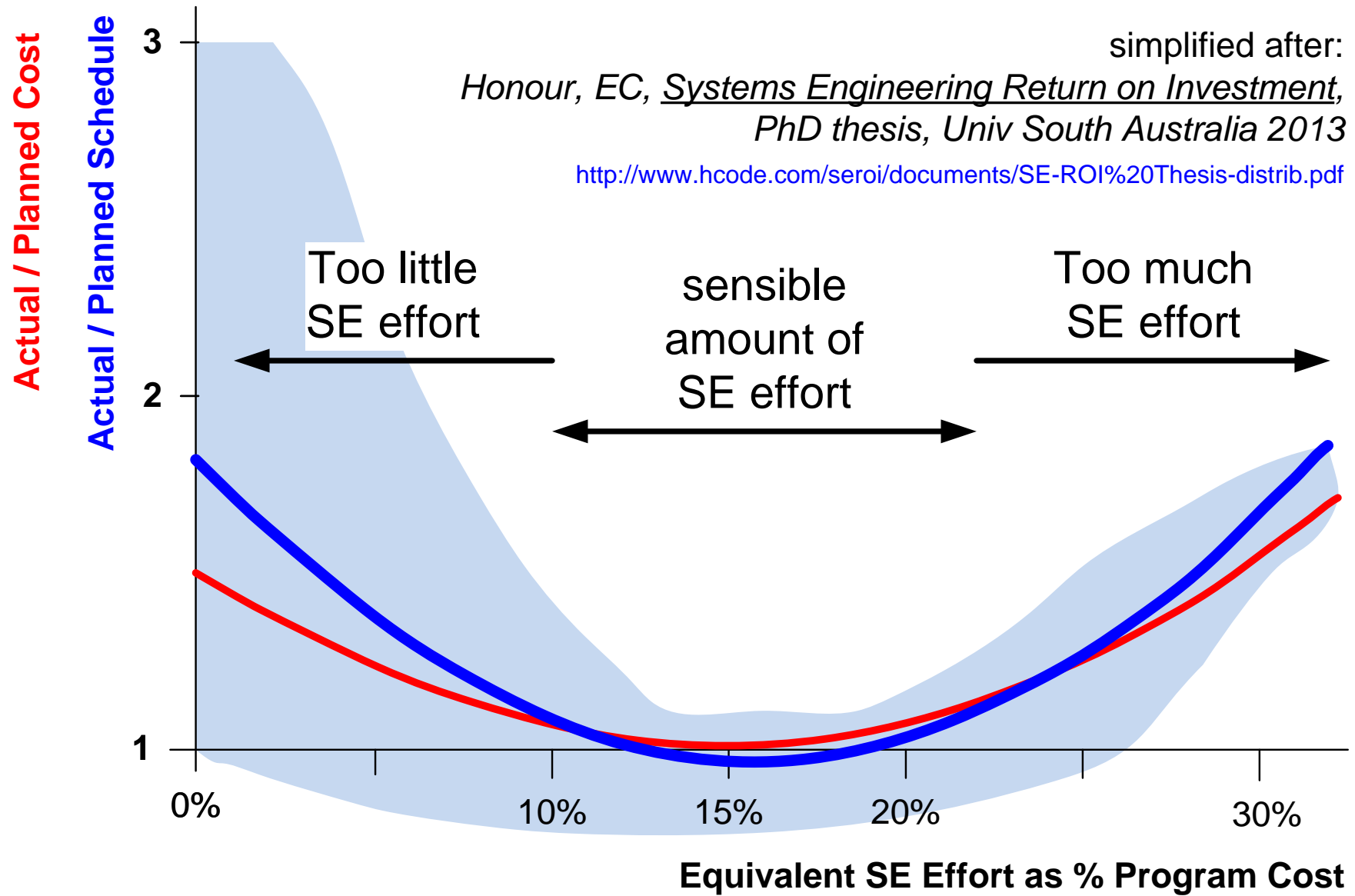


Lacking Systems Engineering Results in Late Failures

failures found late in development
can be traced back to *unknowns*,
unforeseens, and *wrong assumptions*



Eric Honour's Research



SEFS Human Factors

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Abstract

Humans interact with systems. Humans have behavior and properties that we do not control, nor can we predict them. The emotional and physical state of humans impacts their behavior and capabilities. Humans show group behavior, emerging from the interaction of the individuals in the group. Organizations show more complex behavior resulting from individuals, groups, and organizational processes. Legislation and standards are means to cope with human aspects when developing systems.

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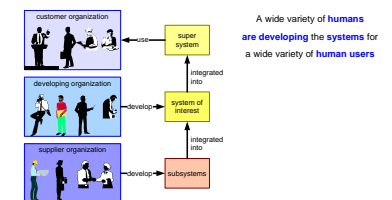
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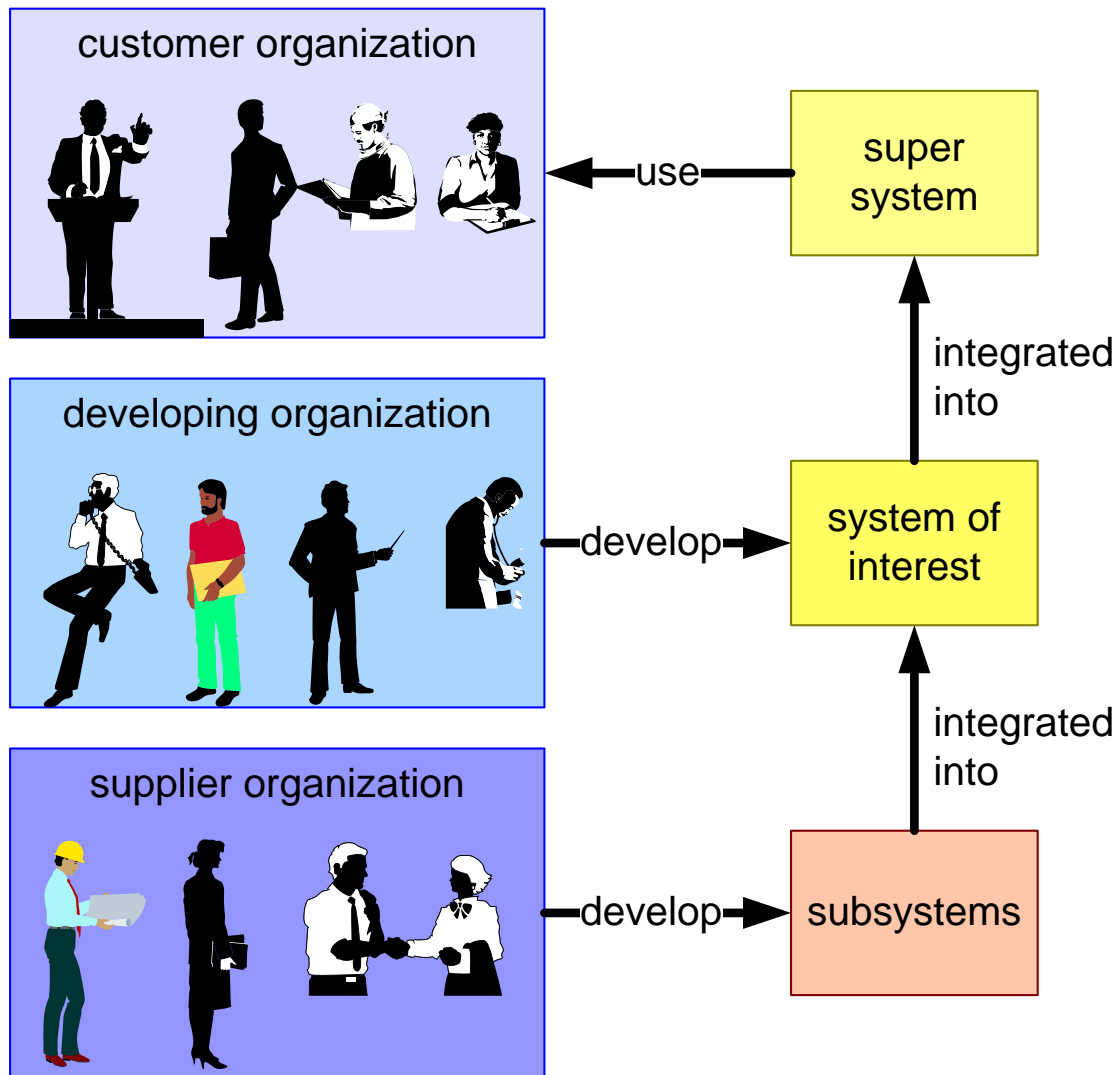
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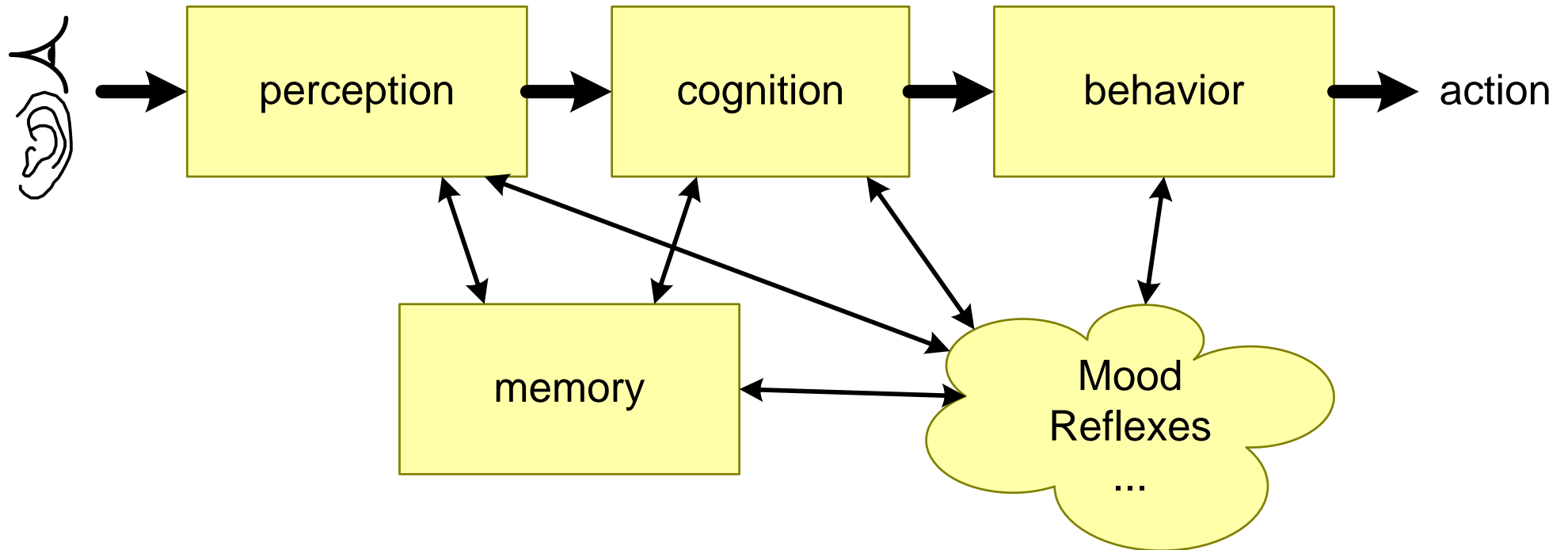


For and By Humans



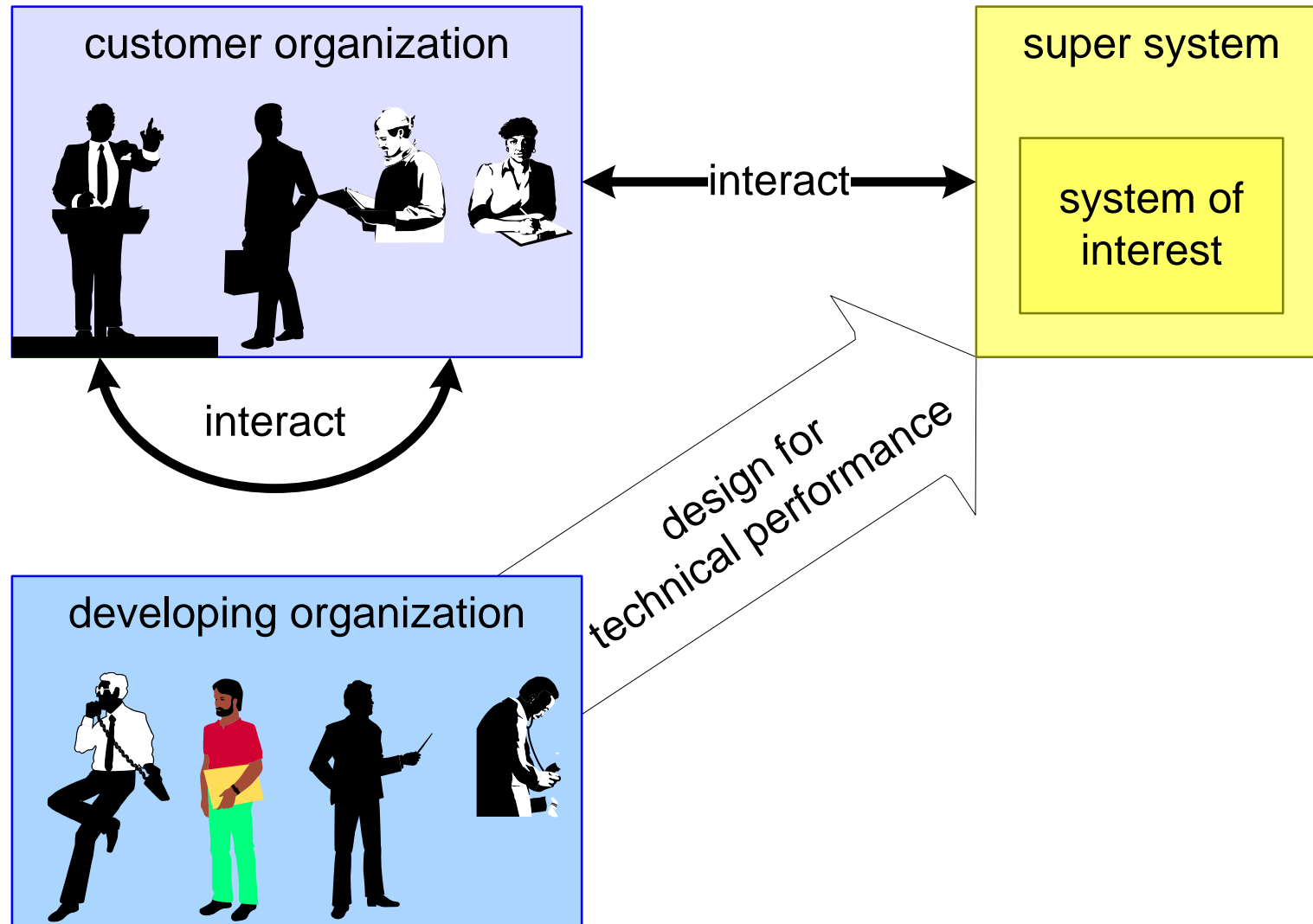
A wide variety of **humans**
are developing the **systems** for
a wide variety of **human users**

Humans: Ratio + Emotion



Risk of Engineer-Only Design

unexpected behavior causing **safety** and **usability** problems



Many Human Factors Experts

