INCOSE
International Council on Systems Engineering

GfSE
Gesellschaft für
Systems Engineering e.V.
GERMAN CHAPTER OF INCOSE

„Agile needs Systems Engineering“

Who we are – Working Group Agile SE

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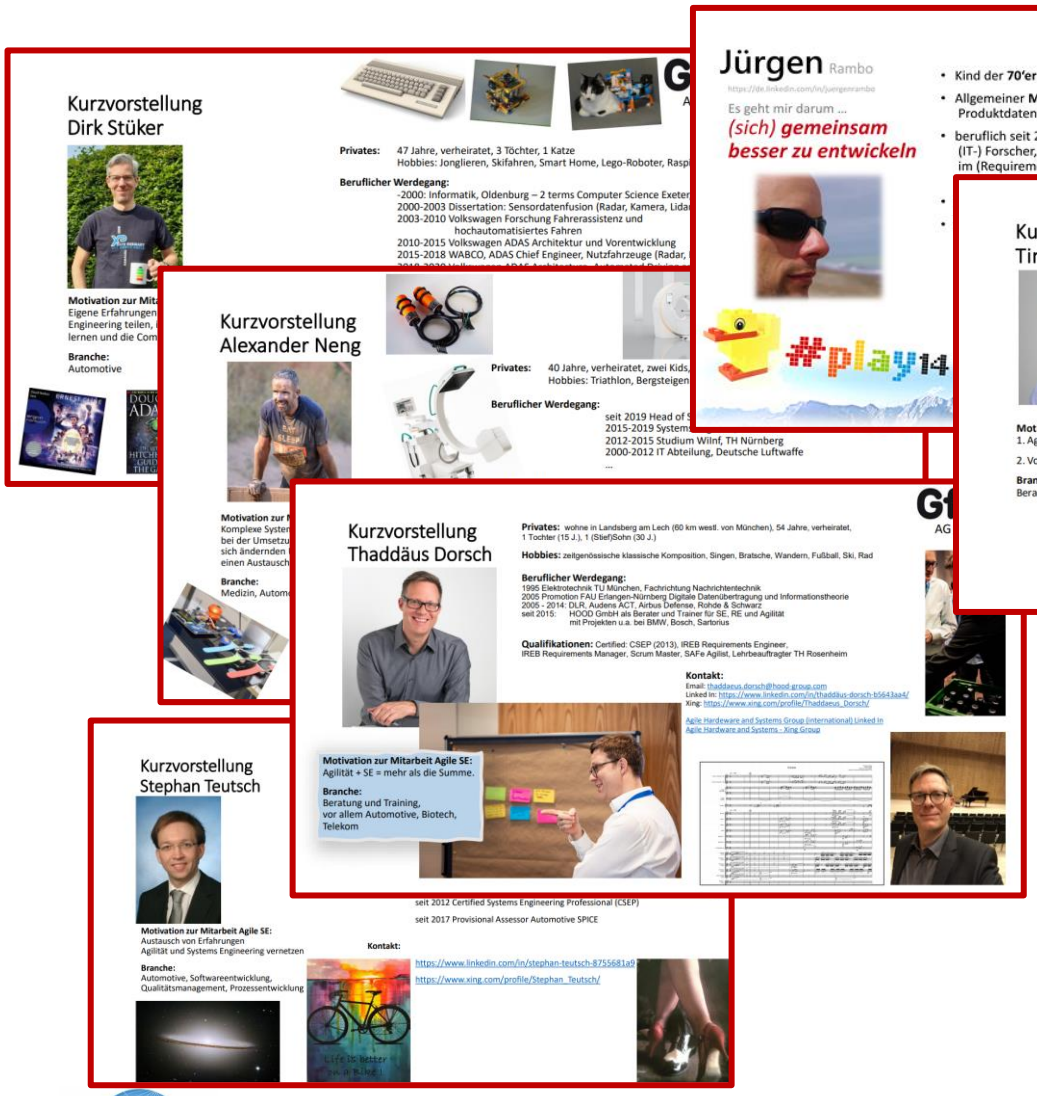


Interested?
Drop us a line:

AGAgileSE@gfse.org

Inhalt

- What is Agility and what is Systems Engineering
- Agile vs. Systems Engineering – comparing apples with pears
- Agile Systems Engineering

What is Agility and what defines Systems Engineering

What is "Agile"?

A rapid whole-body movement with change of speed or direction in response to an impulse, but without loss of control.

Source: Sheppard und Young (2006)

Agile - In the deep

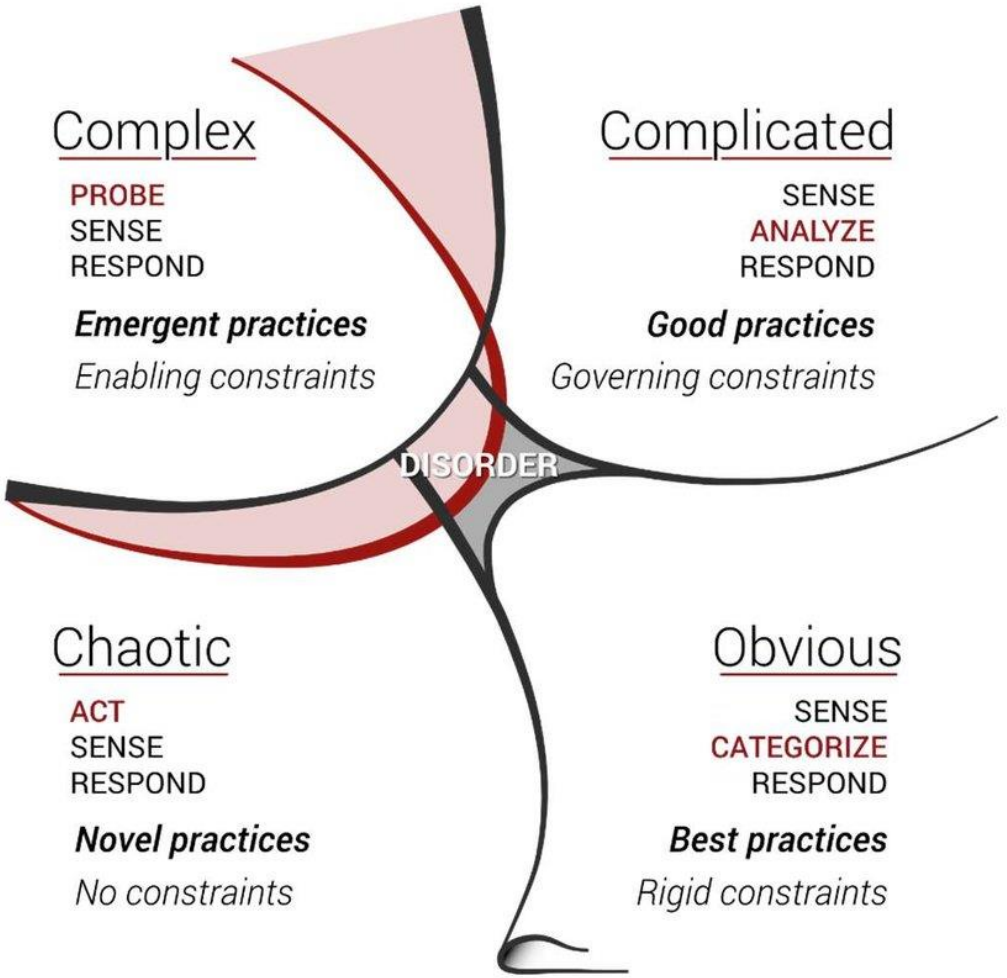
Methods (Scrum, XP, SAfe...)

Practices: Daily, Planning...)

Principles

Values

Agile – Dealing with change of speed



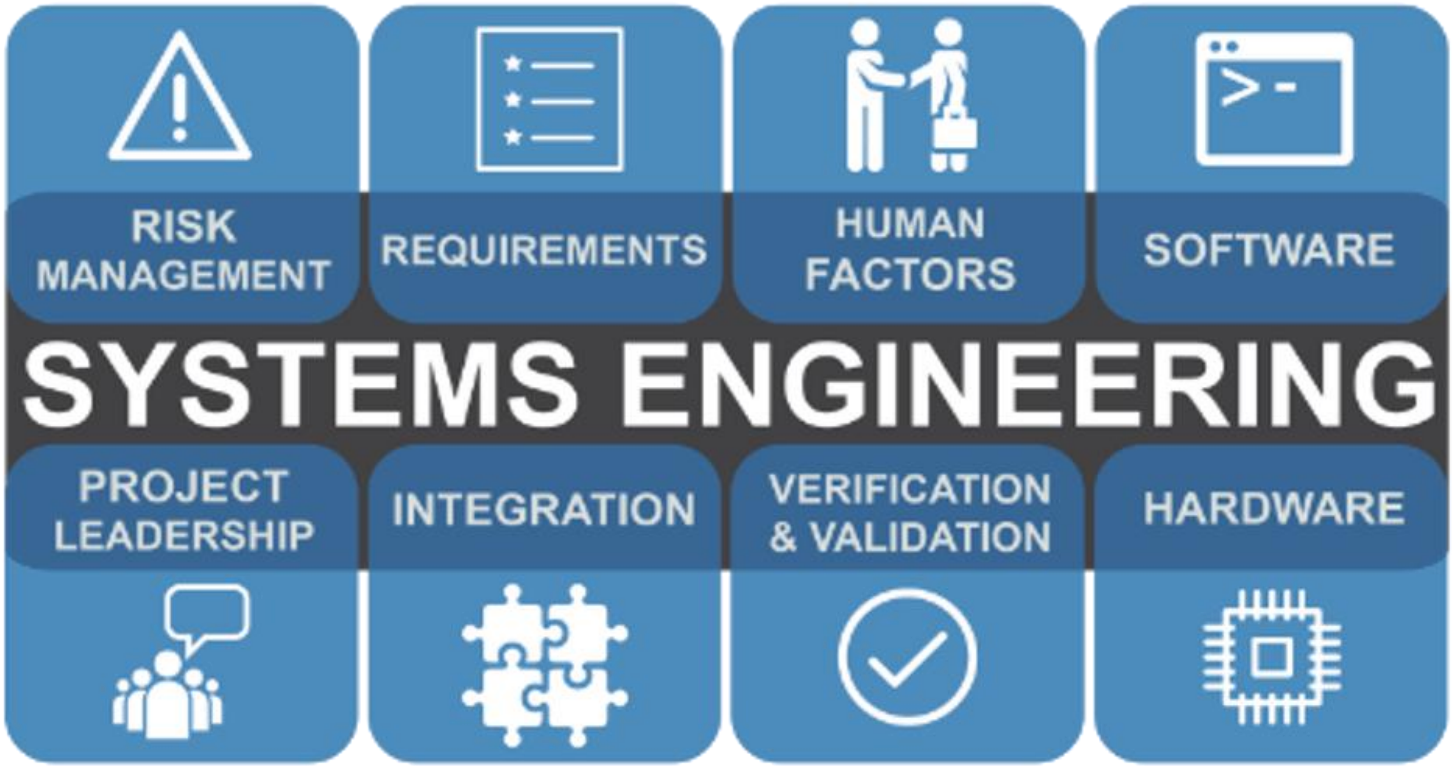
Source: Cognitive-Edge

Systems Engineering – A Definition

Systems Engineering is a transdisciplinary and integrative approach to enable the successful realization, use, and retirement of engineered systems, using systems principles and concepts, and scientific, technological, and management methods.

Source: Incose.org

Systems Engineering – Dealing with complexity



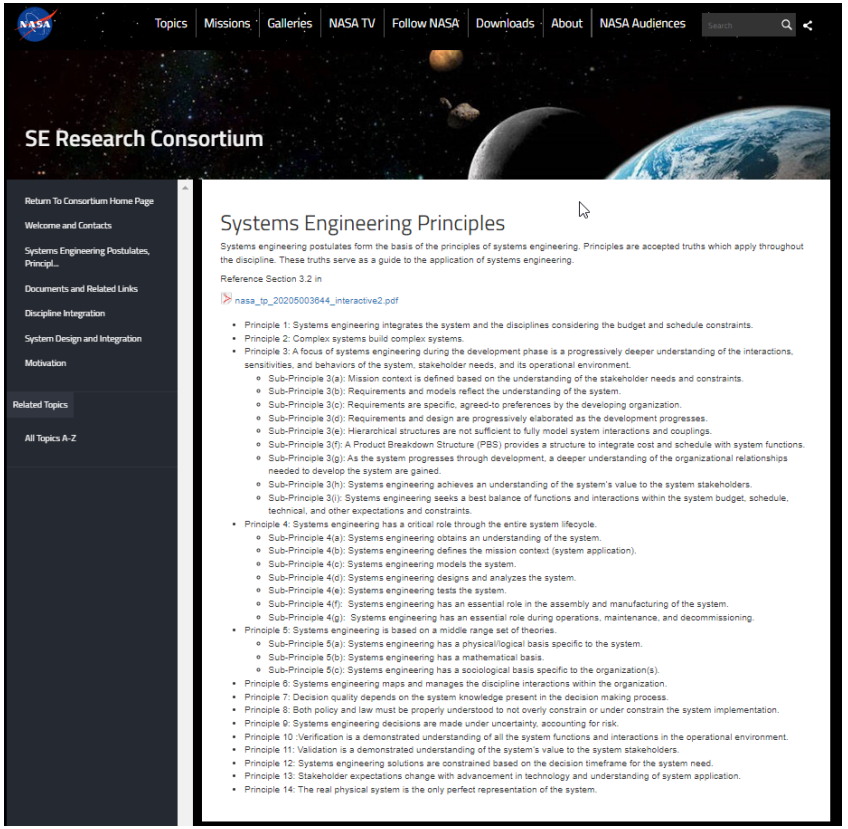
Source: incose.org

Agile vs. Systems Engineering –

Comparing Apples with Pears.

Agile vs. Systems Engineering

Source: http://agilemanifesto.org/



Source: https://www.nasa.gov/consortium/SystemsEngineeringPrinciples

Let's compare the principles of agile and SE

Agile vs. Systems Engineering

Agiles Prinzip 1

Our highest priority is to **satisfy** the **customer** through early and **continuous** delivery of valuable software.

Systems Engineering Prinzip 3

A focus of systems engineering during the development phase is a **progressively deeper understanding** of the interactions, sensitivities, and behaviors of the system, **stakeholder needs**, and its operational environment.

The customer as one stakeholder is in central focus of the development of the product in both viewpoints. The term stakeholder is widening the focus to additional aspects.

Agile vs. Systems Engineering

Agiles Prinzip 2

Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.

Systems Engineering Prinzip 13

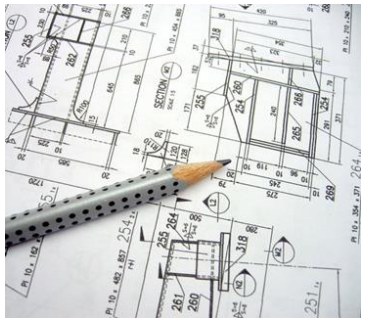
Stakeholder expectations change with advancement in technology and understanding of system application.

Changing requirements is part of the system evolution.

Agile vs. Systems Engineering

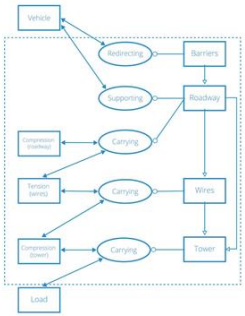
Agiles Prinzip 9

Continuous attention to **technical excellence** and **good design enhances agility**.



Systems Engineering Prinzip 7

Decision quality depends on the **system knowledge** present in the decision-making process.



Thrive for excellence and good decision by design.

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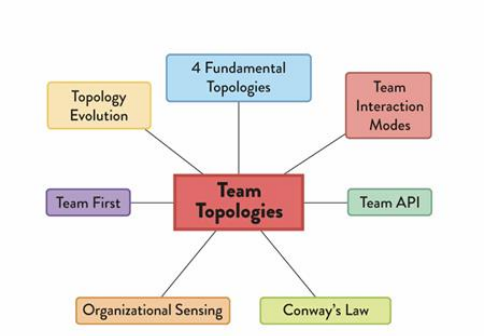
Agiles Prinzip 10

Simplicity--the art of maximizing the amount of work not done--is essential.

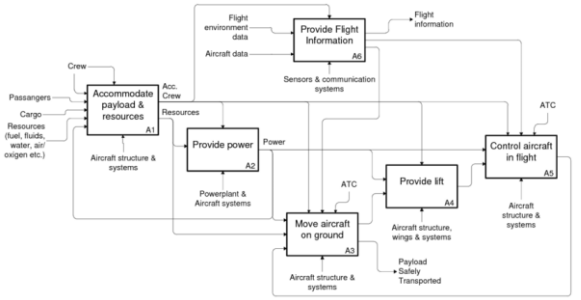
The main driver of useless complexity is the complexity of the organisation, who is building the system.

Systems Engineering Prinzip 2

Complex systems build **complex** systems.



Source: https://teamtopologies.com/



Source: 277021129_Development_of_Core_Functions_for_Aircraft_Conceptual_Design_Methodology_and_Results

Use Conways Law instead of being haunted by it!

Agile vs. Systems Engineering

The Foundation complex systems engineering as conclusion of agile manifesto

Almost the „Software Manifesto values“

- ➜ Individuals and **interactions** over processes and tools
- ➜ Working ~~**software**~~ **solutions** over comprehensive documentation
- ➜ Customer **collaboration** over contract negotiation
- ➜ **Responding to change** over following a plan

lead to the foundation of complex systems engineering

- ➜ **Multifunctional teams** over engineering silos
- ➜ Focus on **purpose** over focus on requirements
- ➜ **Empowered teams** over tasked individuals
- ➜ **Early learning** over late failures

„Agile Systems Engineering Manifesto“ ? (agile-systems-engineering.com)

Better Agile with Systems Engineering!

Agile vs. Systems Engineering

Agile does not contradict Systems Engineering!

Agile as development leadership mindset focusing on how the Organization is shaped and how the team operates and interacts.

Systems Engineering as engineering discipline is focusing on what is to be developed and what are the outcomes / products to be delivered to achieve the working solution.

Neither Systems Engineering nor Agile dictate one or the other process model.

We will need agile systems engineering to develop complex systems in an agile environment.

Sources

- Sheppard und Young (2006) - https://de.abcdef.wiki/wiki/Agility
- Manifesto for Agile Software Development (agilemanifesto.org)
- Agile Systems Engineering (agile-systems-engineering.com)
- Systems Engineering Principles | NASA
- David F. McClinton: 25 Laws of Systems Engineering
- https://www.sebokwiki.org/wiki
- INCOSE Systems Engineering Handbook
- ISO/IEC/IEEE 15288:2015
- System and SE Definitions (incose.org)
- Melvin E. Conway: How Do Committees Invent? In: F. D. Thompson Publications, Inc. (Hrsg.): Datamation. Band 14, Nr. 5, April 1968, S. 28–31
- Matthew Skelton and Manuel Pais "Team Topologies"

Thanks for all the fish!

Agile vs. Systems Engineering

- Agile Principle 3,
- **Deliver working** ~~software~~ **solutions frequently**, from a couple of weeks to a couple of months, with a preference to the shorter timescale.
- Agile Principle 7
- **Working** ~~software~~ **solution** is the primary measure of **progress.**
- Agile Principle 8
- Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a **constant pace** indefinitely.

- Systems Engineering does **not** define the time-frame or cycle of development as this is to be defined by the used development process (e.g., agile).
- BUT the definition of **working solution** with systems engineering methods enables agile development.

Development pace and cycles are not predefined by systems engineering, but SE helps to define the working solution.

Agile vs. Systems Engineering

- Agile Principle 4
- Businesspeople and developers must **work together daily** throughout the project.
- Agile Principle 6
- The most efficient and effective method of **conveying information** to and within a development team is **face-to-face conversation.**

- Systems Engineering does emphasize the **interdisciplinary collaboration and communication tasks** of systems engineers.

Communicate, communicate, communicate...

Agile vs. Systems Engineering

- Agile Principle 5
- Build projects around **motivated individuals**. Give them the environment and **support** they need and **trust** them to get the job done.
- Agile Principle 11
- The best architectures, requirements, and designs emerge from **self-organizing teams.**
- Agile Principle 12
- At **regular intervals**, the team reflects on how
  to become more effective, then tunes and adjusts its behavior accordingly.

➜Systems Engineering does **not define how** Teams are formed and motivated.

Organization of teams and motivation of people is not in the scope of systems engineering.