

Exercise Sheet 2 Systems Thinking

Exercise 2.1.

Given is the following paper on systemigrams:

Squires, A., Pyster, A., Sauser, B., Olwell, D., Enck, S., Gelosh, D. and Anthony, J. (2010), 6.1.1 Applying Systems Thinking via Systemigrams™ for Defining the Body of Knowledge and Curriculum to Advance Systems Engineering (BKCASE) Project. INCOSE International Symposium, 20: 739-753. <https://doi.org/10.1002/j.2334-5837.2010.tb01101.x> (also on LC).

We want to analyse a scenario in which a Systemigram was used to understand project complexity. Read through the paper carefully (you can skip the appendix of the paper) and answer the following questions:

1. **Purpose of systemigrams:**
 - What problems are systemigrams supposed to solve?
 - How do they help to understand and communicate complex systems?
2. **Areas of application and application scenarios:**
 - In which contexts or projects were systemigrams used in the paper?
 - What were the advantages for the project team?
3. **Structure & Approach:**
 - What elements make up a systemigram?
 - What rules or conventions are observed during creation?
 - Which phases of the development of a systemigram were described in the paper?
4. **Discussion:**
 - Can you present similar uses for systemigrams in your projects or studies?
 - What challenges do you see in creating systemigrams?

- description of a complex project that is easy to understand, shared understanding and vocabulary of the project
- "visually pleasing and intuitively comprehensible description of a system"
- iterative clustering of dependencies and subsystems that help understand the parts of a system and how they work together

- strategic intent of UK Ministry of Defense policy markers in the development of network enabled capability
- Maritime Transportation System of Systems stakeholder perspectives
- advg: pictorially demonstrate strategic intent, value proposition and objectives of the project

- start node (upper left), end purpose (lower right), nodes, connections
- relationships should not end in the middle of the diagram and can be described through phrases
- connection nodes collect nodes that belong into one group
- no duplication of systems

Phase I: Initial diagram creation based on established prose

Phase II: Compare and update diagram according to rules of Systemigram development

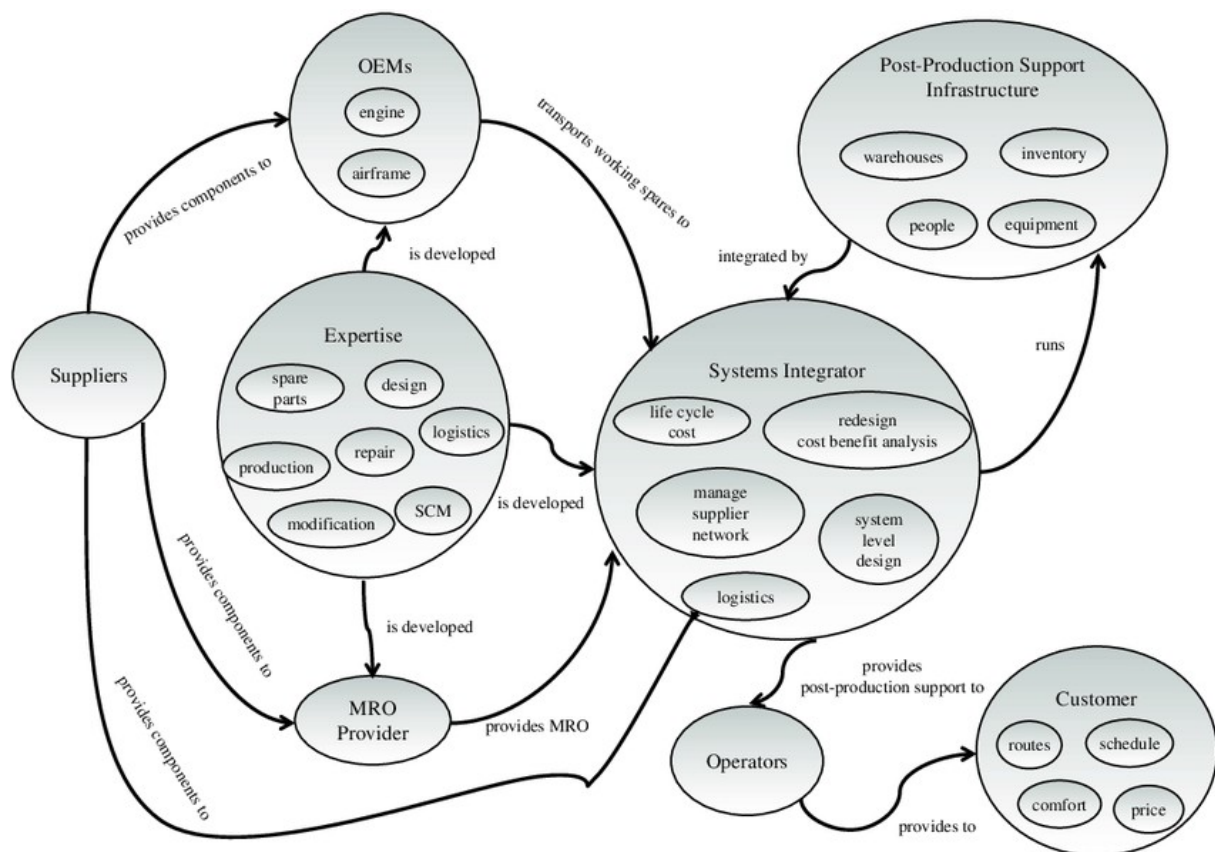
Phase III: Reach consensus with the core project team

Phase IV: Project story creation

Exercise 2.2

Look at the given Systemigram.

- What specific system or scenario is being modeled within this Systemigram, and what complexities does it highlight?
- Which are the key entities and interactions depicted in the Systemigram, and how do they contribute to the overall narrative flow?
- What is the main process or functionality described by this Systemigram, and how do the components interact to achieve the intended outcomes?



Source:

https://www.researchgate.net/publication/235305905_Explaining_the_effectiveness_of_performance-based_logistics_A_quantitative_examination

- development, engineering, upkeep and operation of aircrafts
- Expertise system is independent of all other systems
- key entities are expertise, oems, systems integrator, pps infrastructure, suppliers, mro provider
- > circular dependency between SI, supplier and oems, expertise as lynchpin of whole system
- systemigram describes the development and engineering of an aircraft, including its dependencies to its component supplier, as well as its upkeep after completion such as storage and disposal

Exercise 2.3 System Thinking

Let's do systems thinking on various examples (see assembly kits of lecture).

1. Identify the primary system form and function. Describe why.
2. Identify three system entities. Describe their form and function. If you find more, great! Show it graphically.
3. Identify the relationships of the entities. Use blocks and arrows to show the relationship graphically. Describe what the arrows mean.
4. Identify the boundary of your system. What is inside and what is outside? Highlight the boundary in your graphic.
5. Think of emergent behavior of your printer: 1 example for intended emergence, and one example for unintended emergence. Describe the functional interaction.

Here are our systems:

